OTDR

Optical Time Domain Reflectometer

User Manual

PREFACE

Thank you very much for purchasing and using this series optical time domain reflectometers (OTDR). This manual mainly contains information on common operation safety instructions, basic operations and specifications of the instrument, as well as common troubleshooting guides. For your convenience, before operating this instrument, please read this manual carefully and follow the instructions in the book correctly.

This manual is only for use with this instrument. Without the authorization of the company, any unit or individual shall not tamper, copy and disseminate the contents of this manual for commercial purposes.

The contents of this manual are subject to change without notice. If you have any questions, please call the supplier and we will be happy to provide you with the best service!

CONTENTS

1. Summary

1.1 Unpacking inspection

This instrument is packaged and transported strictly in accordance with GB/T 9174-2008 "General Technical Conditions for General Cargo Transport Packaging". When you receive the instrument, please carefully check the appearance of the product according to the packing list, and if timely find out any possible damage for the product during the shipping process, please notify the shipping company immediately while keeping the original packaging materials, and contact the supplier of this product for a solution.

1.2 Product Overview

This instrument is a new generation of 7-inch capacitive touch screen comprehensive tester with rich functions, sturdy and durable structure, and beautiful and novel appearance. Using excellent intelligent hardware and software design, it is used to measure parameters such as the length, loss and connection quality of optical fibers and optical cables. It integrates rich Ethernet testing functions to provide convenient testing methods for Ethernet fault diagnosis. Provides the highest performance solution in the construction and installation of fiber optic networks and subsequent fast and efficient maintenance and troubleshooting tests. The working time of the whole machine is about 12 hours, which is suitable for long-term outdoor use.

The instrument comes with standard OTDR, light source, optical power meter, red light, event map, optical loss test, Ethernet test (partial functions), and Ethernet remote functions.

1.3 Safety tips

⚠ **External power supply**

The power adapter input meets the following requirements：100V～240V，50/60Hz.

The power adapter output meets the following requirements：5V/3A、9V/2A、12V/1.5A.

Please use the adapter provided with the instrument and use the external power supply strictly in accordance with the specifications, otherwise the equipment may be damaged.

⚠ **Internal battery**

The inside of instrument is special lithium battery, which can only be used for this instrument and cannot be removed. For safe use, the internal charging circuit of instrument has set multiple protection measures for battery voltage, charging current, charging temperature and so on. The battery charging temperature range is 0℃～50℃. When the ambient temperature is too high, the charging will be terminated automatically. When the instrument is not used for a long time, please charge the battery regularly. It is recommended to charge the battery every 2 to 3 months to ensure the best performance of the battery. Please do not let the battery close to fire or strong heat environment; the temperature range for long-term storage of the battery is: -20℃～45℃.

If the battery leaks or explodes, the electrolyte will damage clothing or skin it has come in contact with. Electrolyte may cause blindness. If accidentally gets into the eyes, please wash the eyes thoroughly with clean water and seek

medical attention immediately.

⚠ **Laser Safety**

When using this instrument, please avoid looking directly at the laser output port, and do not look directly at the end of the optical fiber during testing; when the instrument is used, please cover the light output port dust cap.

LCD Screen: The display of this series of optical time domain reflectometers is a 7-inch color LCD screen with a touch screen, In order to maintain good viewing effect, please keep the LCD screen clean and clean. When cleaning, the LCD screen can be cleaned by wiping with soft fabric.

Tip: Do not press the LCD screen with sharp objects or wipe the LCD screen with organic solvents, otherwise the LCD screen may be damaged.

During the use of the instrument, it is strictly forbidden for the user to disassemble the machine without permission, otherwise the warranty will be lost!

Except for the 1625nm/1650nm wavelength, other wavelengths cannot be tested with light (on-line test). Forcible use will burn out the internal components of the instrument and cause the instrument to malfunction (the malfunction caused by this operation will not covered by the warranty)!

1.4 Instrument Maintenance

The whole machine is guaranteed for 18 months, and the battery, adapter, and consumable parts of the optical interface are guaranteed for 6 months. The items provided with the product are not within the scope of this warranty. For specific warranty terms, please refer to the warranty description "After-sale Service Warranty Card".

If you need to return the product due to product calibration or other reasons, please contact your supplier in advance, and briefly explain the reason for the return of the product, so as to provide you with more timely and effective services.

When the product returns, please note that:
- Wrap the instrument with a soft, thin pad such as polyethylene to protect the integrity of the instrument case;
- Please use a hard packing box and ensure that there is at least 3 cm of soft stuffing around the instrument;
- Fill in the product after-sales service warranty card correctly, including company name, address, contact person, phone number, problem description and other information, reliable shipping to the agent who supplies you.

2. Basic Knowledge of OTDR

Optical Time Domain Reflectometer (OTDR) is a precision optical fiber measurement instrument made by using the principle of back-scattering generated by Rayleigh scattering and Fresnel reflection when laser light is transmitted in optical fiber. It measures the transit time of a light pulse back and forth, use the formula

L=c×t/(2n) to calculate the distance L, the unit of L is m, c is the propagation speed of light in vacuum 2.99792× 108m/s, t is return light pulse (the unit is s), where n is the refractive index, specified by the fiber manufacturer, and divided by 2 in the formula because the round-trip time is measured.

When light is transmitted in an optical fiber, due to the in-homogeneity of the optical fiber doping composition or the defects of the optical fiber link itself, the optical pulse propagating in the optical fiber undergoes Rayleigh scattering, and part of the optical signal will be scattered in the opposite direction of the pulse incidence. Back, it is called back Rayleigh scattering. By regularly observing the changes of Rayleigh back-scattered light signal intensity, the loss distribution and connection quality of optical fibers and cables can be accurately measured.

According to the light transmission theory, when light encounters the boundary of two transmission media with different refractive indices (such as a flexible connector, a break or an optical fiber termination) during the propagation process, the Fresnel reflection phenomenon will occur. Timed reception of the nel-reflected signal enables accurate location of discontinuities along the length of the fiber. The magnitude of the reflection depends on the refractive index difference and the flatness of the boundary surface.

An OTDR tested event is an anomalous point that causes a sudden change in loss or reflected power. Including

various connection points, fusion points and bending, cracking or breaking positions in the optical fiber link that lead to the loss of transmission signals, mainly divided into reflection events and non-reflection events.

（1）**Reflective event**

When the laser pulse sent by the OTDR is transmitted along the fiber under test, if it encounters an active connection point or the end of the fiber, reflection will occur due to the sudden change of the refractive index, and part of the optical signal will return to the instrument along the fiber under test. The instrument will detect this reflection event by accepting this reflection signal. On the OTDR test curve, it appears as an upward spike signal with a certain width. The width and amplitude of the spike are mainly determined by the pulse width used for the test and the reflection intensity that occurs.
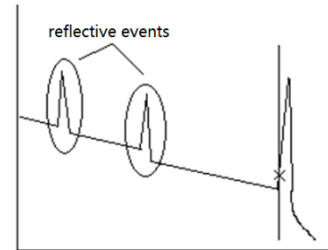
（2）**Non-reflective event**

When the laser pulse emitted by the OTDR is transmitted along the fiber under test, if it encounters a position where the energy is partially lost, such as a fusion point or bending, the reflection phenomenon will not occur because there is no sudden change in the refractive index. , or can be ignored.
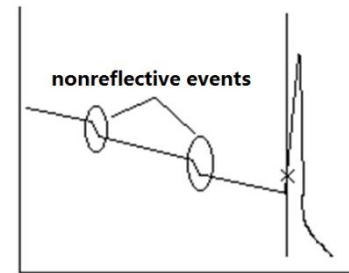
The OTDR detects the energy change difference entering the OTDR receiver through backscattering, and can detect the non-reflection event parameters at this point. A non-reflection event appears

as a signal with a drop in energy on the OTDR curve, and the magnitude of the drop indicates power loss.

（3）Dynamic Range

Dynamic range is an important parameter of optical time domain reflectometry, measured in dB. This parameter is expressed as the maximum optical loss that the OTDR can analyze from the back-scatter level at the output port of the instrument down to a specific noise level. In actual use, this parameter is usually measured by the farthest distance that the OTDR can test under the condition of the maximum test pulse width provided by the instrument. Therefore, under the same link conditions, the larger the dynamic range, the longer the distance of the fiber optic link that the instrument can test. The maximum test distance of an OTDR is different in different applications, and connectors, fusion splices, and optical splitters are also factors that reduce the test length of an OTDR.
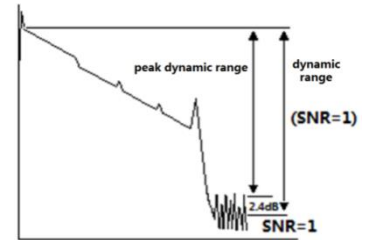
（4）Event Blind Zone and Attenuation Blind Zone

There are places in the link that cannot be measured due to tie points or connectors. The OTDR blind area is divided into event blind area and attenuation blind area, which is generated by Fresnel reflection and expressed in distance (meters) that varies with the reflected power.
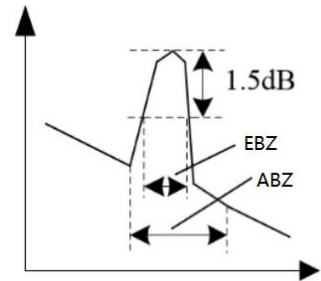
Event Blind Zone: The shortest distance between the detection of Fresnel reflection signal and the recognition of

the next Fresnel reflection signal by OTDR is defined by the pulse width less than 1.5dB of the peak value.

Attenuation Blind Zone: The shortest distance that OTDR goes through from detecting Fresnel reflection signal to normal testing backward Rayleigh scattering signal, that is, the phase cannot measure fusion loss due to adjacent large reflection.

（5）**Splice Loss**

The OTDR tests the distance and loss between specified points. This series OTDR mainly use the 4-point marking method:

Measurement start point A, splice loss start point B, splice loss end point C, and measurement end point D. The splice loss is calculated by the level difference between the approximate line between B-A and the approximate line between C-D where the marker B is located. Please place marker B at the exact position. The splice loss value depends heavily on the position of B, the measured loss value between marks depends on the specified approximation method
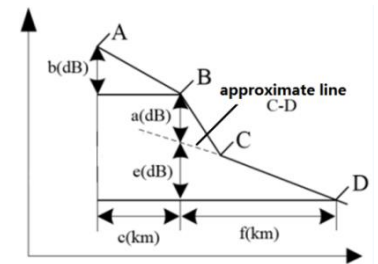
(6)Return Loss (RL)

RL is the ratio of reflected light Pr to incident light Pi in dB. Using the formula RL=-10log (Pr/Pi), the greater the echo loss, the smaller the reflected light energy, indicating that the better the measured light path.

3.Features of this series of OTDR products

3.1Main function

（1）**OTDR**：Support transmitting fiber, receiving fiber setting, Pass/Fail threshold determination, test report generation and other functions.

（2）**Event Map**：Intelligent link test (multi-pulse width test) and visual event list.

（3）**Laser Source**：Generate CW、270Hz、1kHz、2kHz laser source.

（4）**Optical Power Meter（OPM）**：-70dBm~+6dBm and -50dBm~+26dBm multi-wavelength power detection range，support the identification of laser source modulation frequency.

（5）**Visual Fault Location function（VFL）**：Continuous,1Hz, 2Hz visible red light，visually locate fiber faults.

（6）**Optical Insertion Loss Test**：Support laser source and optical power meter to be turned on at the same time，Insertion loss for testing devices and links.

（7）**Fiber Inspection**：Visual fiber end-face inspection.(**Note: this function is an optional function**）

（8）**Ethernet Tools**：Network test functions include PING, PPPOE, IP scan；the link test function includes link speed measurement, RJ45 Find, RJ45 Length and RJ45 Order. （**Note: RJ45 Find, RJ45 Length and RJ45 Order**

are optional functions）

（**9**）**Remote Test：**Remotely connect the instrument via Ethernet to realize remote control of the OTDR function.

3.2 Other function

- **Support fast charging and power bank functions**

  The Type-C interface supports PD/QC/AFC/FCP/PE/SFCP and other fast charging protocols to charge the built-in battery；the instrument is powered by U -SBA as a power bank.

- **Mobile APP wireless operation**

  The mobile APP is connected to the instrument through a wireless interface such as Bluetooth to realize basic control testing and file acquisition.

- **User-defined power-on password**

  Flexible power-on password settings ensure instrument management and test data security.

- **Quick screenshot**

  A convenient drop-down window provides a quick screen capture function to record the status of the

instrument at any time.

- **Quick and easy help**

A quick drop-down window provides customized help services to ensure hassle-free operation with the instrument.

- **Large-capacity battery, long battery life**

Built-in 10400mAh rechargeable lithium-ion battery, with long battery life, worry-free outdoor testing.

Note: The typical battery life is about 12 hours (OTDR real-time test, backlight brightness 50%)

- **One-key automatic test**

The excellent automatic test function provides you with a convenient one-key automatic test.

# 4. Basic operation and usage of OTDR products of this instrument

4.1 Instrument panel
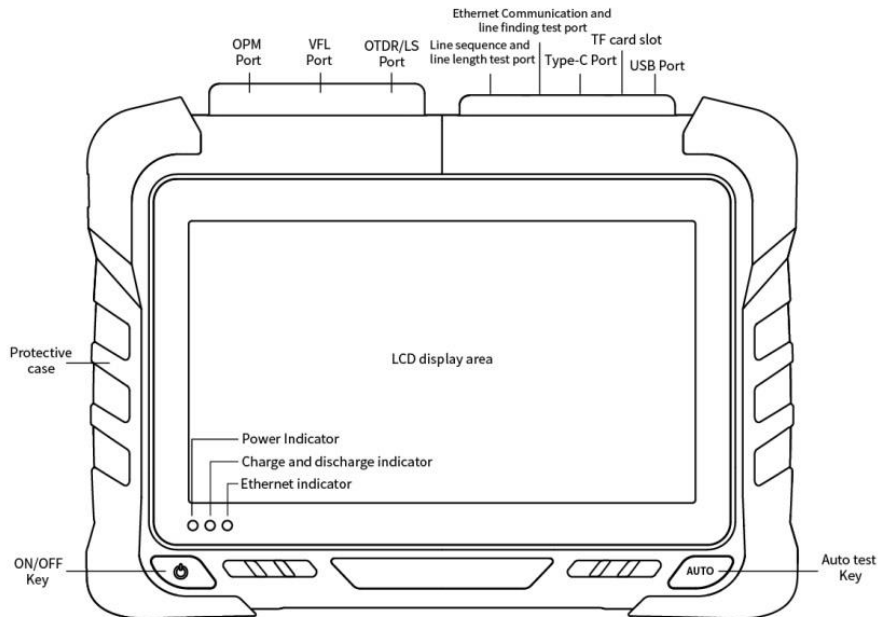
4.2 ON/OFF

● Power-on operation: In the power-off state, press the power-on button for >2s and the battery power >3% when the instrument is turned on, and the power-on indicator lights up.

● Soft shutdown operation:

(1) Press the on/off button for > 2s, a shutdown prompt box will pop up, select "Yes", and the instrument will shut down.

(2) Pull down the status bar to pop up the shortcut operation menu, click Shut down, a shutdown prompt box will pop up, select OFF.

● Forced shutdown operation: in the power-on state, after pressing the power button for >8s, the power indicator turns off and the instrument shuts down.
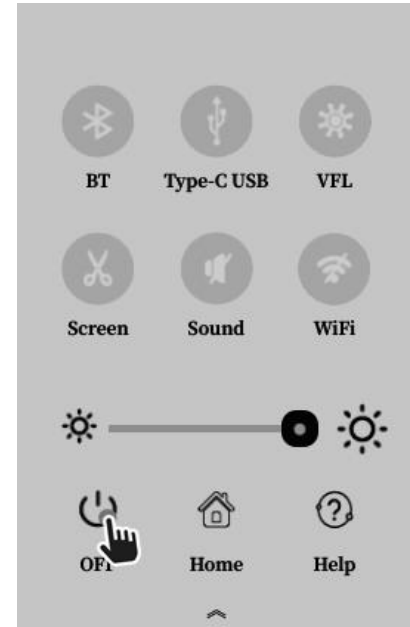
4.3 Charge and Discharge

Charge：The instrument is charged via the Type-C USB interface，support 5V/3A normal charging and 9V/2A, 12V/1.5A fast charging mode up to 18W. The indicator light is on when charging, and the charging icon is displayed in the status bar.

Discharge：When the instrument is powered off/on and the battery level is >10%, it can supply power through the USB - A interface（Power bank function）, the indicator light is on when discharging.

State	Indicator light	Remark
Normal charge	Green	5V charging
Fast charge	Blue	9V/12V charge
External power supply	Purple flashes	Power bank function
Low battery	Red	Prohibition of external power supply

4.4 Connect Optical Cable

⚠ **Warning**

● **The light is emitted from the light source port of instrument, please do not unplug the connected optical cable, the light can damage the eyes.**

● **If there is no optical cable connected to the light source port, close the cover of the light source port. When using an instrument with more than 2 light source ports, it may cause eye damage if it reflects in the eyes.**

Attention：

● Before connecting the optical cable connector, please confirm whether the connector type matches and whether the connector is clean. The wrong connector type or contaminated connector will not only lead to inaccurate measurements, but may even damage the optical interface of the instrument. The correct way to clean the end face is: before inserting the optical fiber connector (jumper), use anhydrous alcohol to clean the jumper, especially the end face, and connect it to the instrument after the alcohol evaporates.

● When connecting the optical cable connector, it should be inserted into the optical port vertically and slowly. If it is turned to the left, right or too much force, the optical connector or the optical port will be damaged.

● If there is no optical cable connected to the port, immediately put on the dust cover to prevent dust or other dirt from adhering to the optical output port of the instrument.

## 4.5 Homepage and status bar

Status bar: Indicates red light, TF card, Bluetooth, U disk, charging status, and power in turn.

Pull down the status bar to pop up the shortcut interface, click other areas to close the shortcut interface.

The quick operation interface controls the Bluetooth switch, Type-C USB (data transfer) switch, red light switch, quick screenshot, main sound switch, and brightness adjustment, and can also perform shortcut operations of shutting down and returning to the homepage.

Click ✂ screenshot，save the screen display in real time. Click ② help，quickly open the operation guide of the current interface.
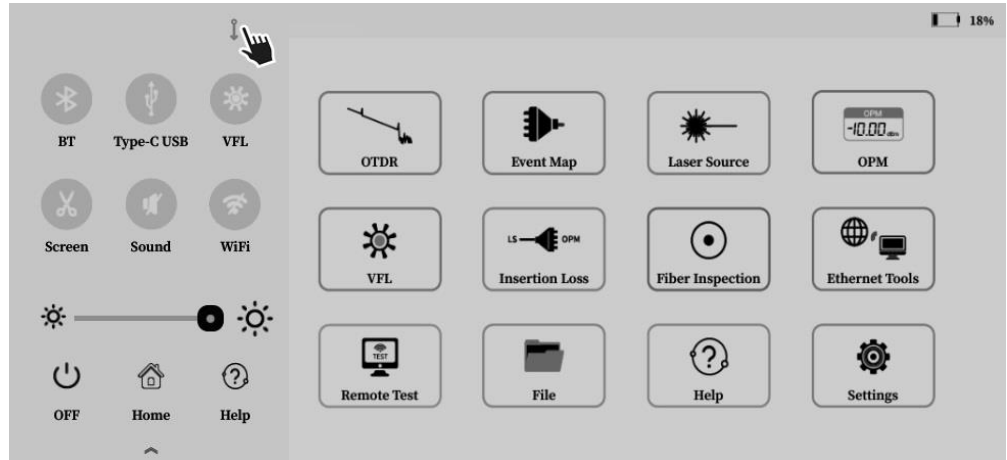
4.6 OTDR

（1）Settings

The setting interface is the first interface of the OTDR function: select test range, pulse width, time, wavelength, mode. Different ranges correspond to different optional pulse widths. RT is the real-time test mode, and the selected test time is the average mode.
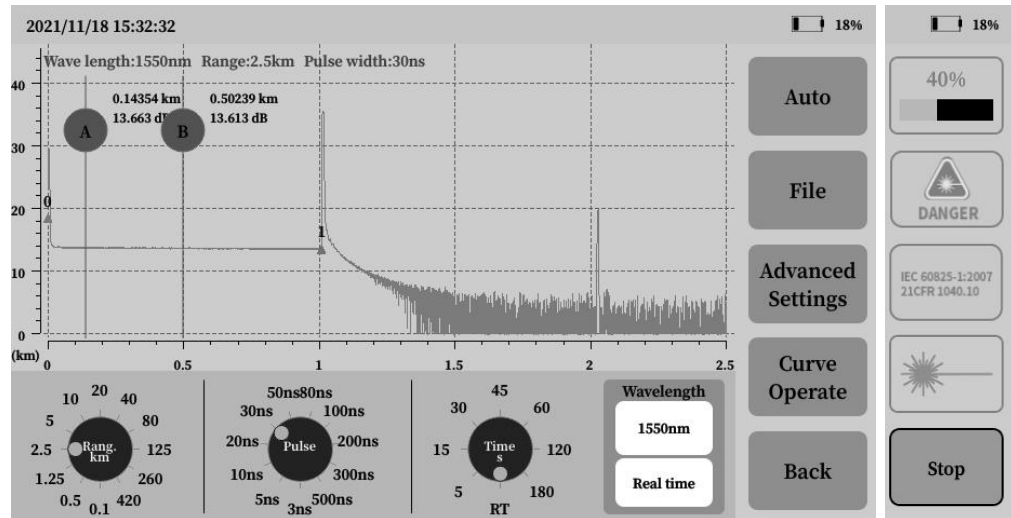
Auto test: Auto test mode;

File: Open, copy and delete the SOR saved by the OTDR and the generated PDF report;

Advanced settings: consists of measurement settings, analysis settings, pass/fail , and general settings;

Curve operation: automatically enter the curve operation interface after test is completed, including event list,
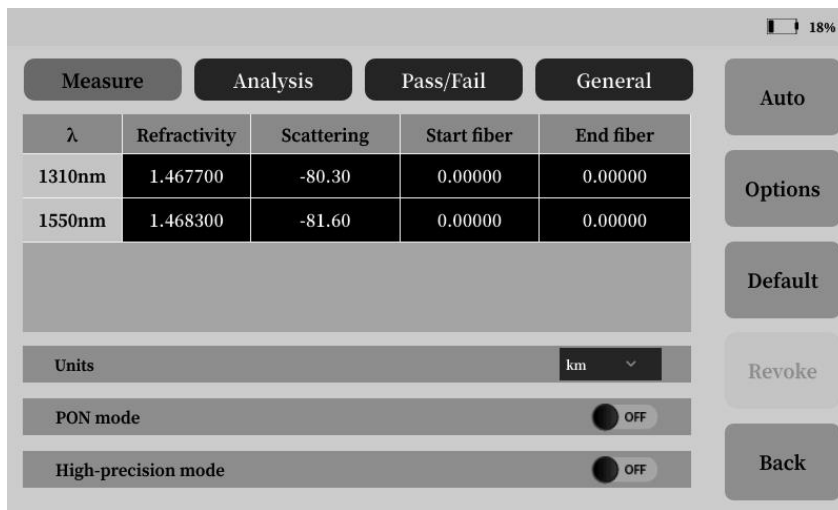
waveform analysis, curve saving, etc.

Note: During test, the test parameters can be modified in real time (except for automatic test and multi-wavelength real-time test), and the output port cannot be directly viewed.

(2) Advanced settings (Click)

- Options: Click "Options"/set title to switch the setting content;
- Restore default: The current interface setting parameters are restored to the factory settings.

① **Measurement settings:**

Set the refractive index, backscatter coefficient, transmitting fiber, receiving fiber, measurement unit; PON mode: After the OTDR with PON function turns on the PON mode, the PON network test performance is improved;

					18%
Measure	**Analysis**	**Pass/Fail**	**General**		**Auto**

λ	Refractivity	Scattering	Start fiber	End fiber
1310nm	1.467700	-80.30	0.00000	0.00000
1550nm	1.468300	-81.60	0.00000	0.00000

Options

Default

Revoke

Units	km ∨
PON mode	OFF
High-precision mode	OFF

Back

High-resolution mode: After turning on the high-resolution mode, the minimum point spacing within the 5km range is ≤ 0.02m, and the maximum number of sampling points above the 260km range is ≥256k.

When the start fiber and end fiber are set to 5km, the test is shown on the right.

② **Analysis settings**

Set the reflection threshold, non-reflection threshold, and end threshold required for event analysis.

③ **Pass/Fail**

Pass/Fail is used to set the Pass/Fail function parameters, and can set the average loss of different wavelengths, total link loss, splice loss, connection
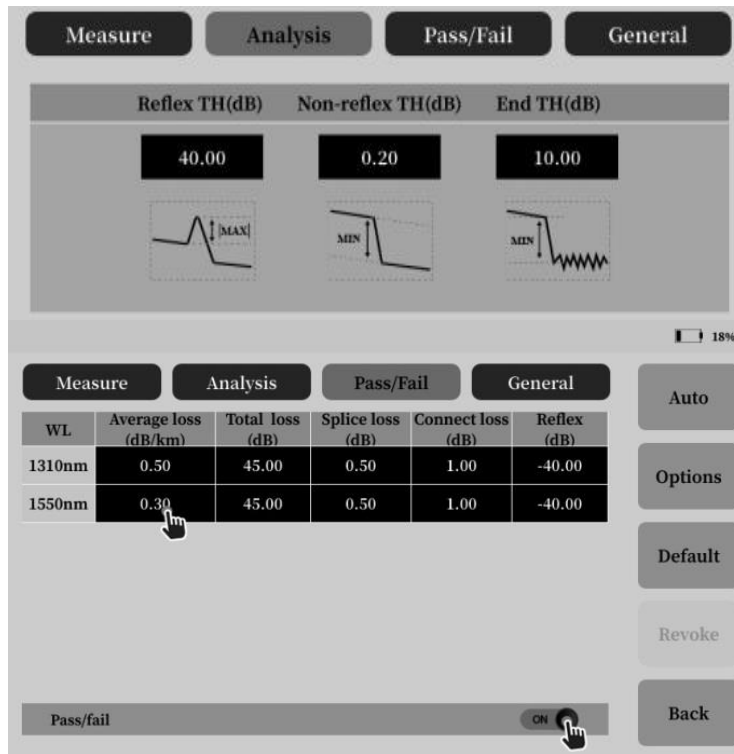
loss and reflectivity judgment threshold, exceeded, they will be marked in the event list.

Step 1: Touch the "Pass/Fail Threshold" switch to enable the Pass/Fail function;

Step 2: Click the number area to pop up the key-board to modify the parameters;

Step 3: Test: after the pass/fail threshold function is enabled, the event list display effect is as shown in the right figure.

④ **General settings**

Auto save: After opening, save the OTDR curve after testing according to the default naming format;

Prompt save: prompt the user whether to save the test curve when testing again after opening;

Grid: After opening, the background of the OTDR curve will display the grid;

The event list is displayed by section: After it is turned on, the event list will be displayed according to the section;

Save name prefix: user-defined automatic naming, quick naming prefix, the name is incremented by numbers;

20
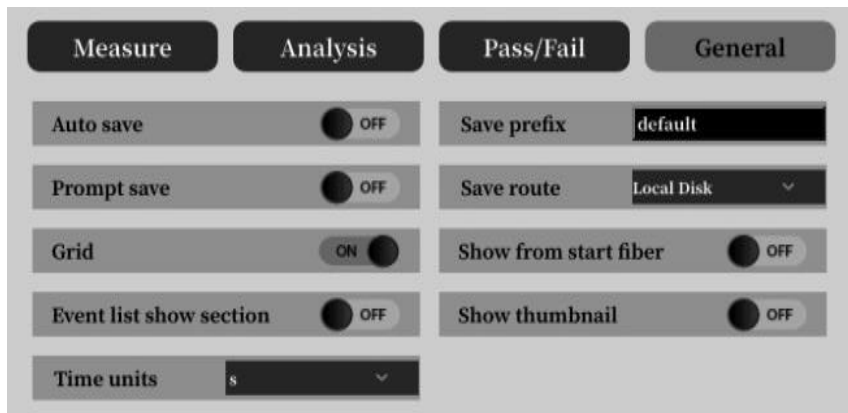
Save route: select the storage path;

Show from start fiber: After it is turned on, the display starts from the set launch fiber position;

Show Thumbnail: When turned on, the curve thumbnails are displayed in the upper right corner of the test interface.

（3）**File (Click)**

"File" in the OTDR can operate the SOR file saved by the OTDR test and the generated test report PDF file, SOR files are saved in date-named folders.

" √ " means selected, and operations such as opening, deleting, renaming, and copying the selected file can be performed.

"Change color" indicates the current cursor position, and you can view the thumbnail of the SOR file curve at the cursor position.
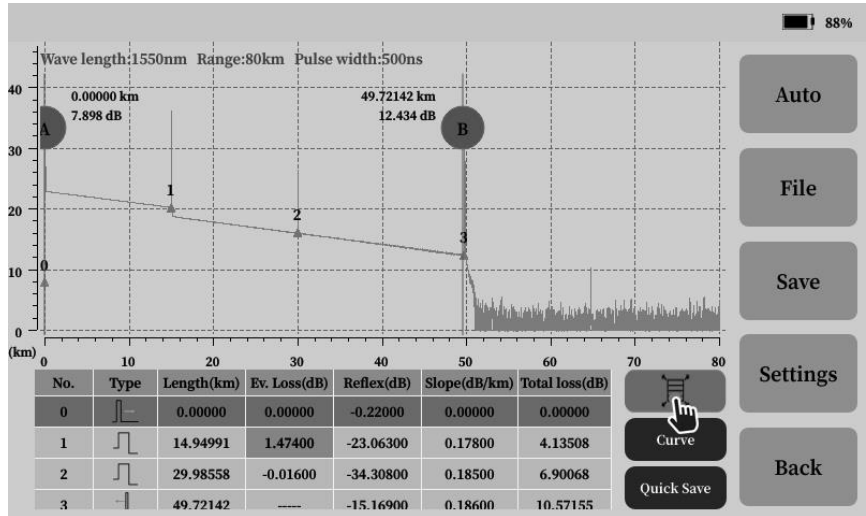
（4）**Curve operation**

- Save：Save the current curve and generate a test report by SOR;
- Settings：Click return to the setting interface and set the test parameters;
- Curve: Perform operations such as zooming in, moving the cursor, and comparing curves to the test curve;
- Quick store: Quickly save the currently displayed test curve (Automatically named according to the common setting name prefix).

Event list:

After the analysis is completed, it will automatically jump to the curve operation interface, click the zoom out icon to zoom out the event list.

Click " Curve " to enter the waveform analysis interface.

Waveform Analysis:

Waveform zoom and move operations

- Waveform zoom: Full touch screen gestures expand outward to zoom in the zoom center area;

- Waveform zoom out: The full touch screen gesture shrinks inward in the zoom center area to zoom out;

- Waveform reset: Click the "1:1" button or double-click the screen to reset the waveform;

- Waveform movement: Click and hold the curve and drag.
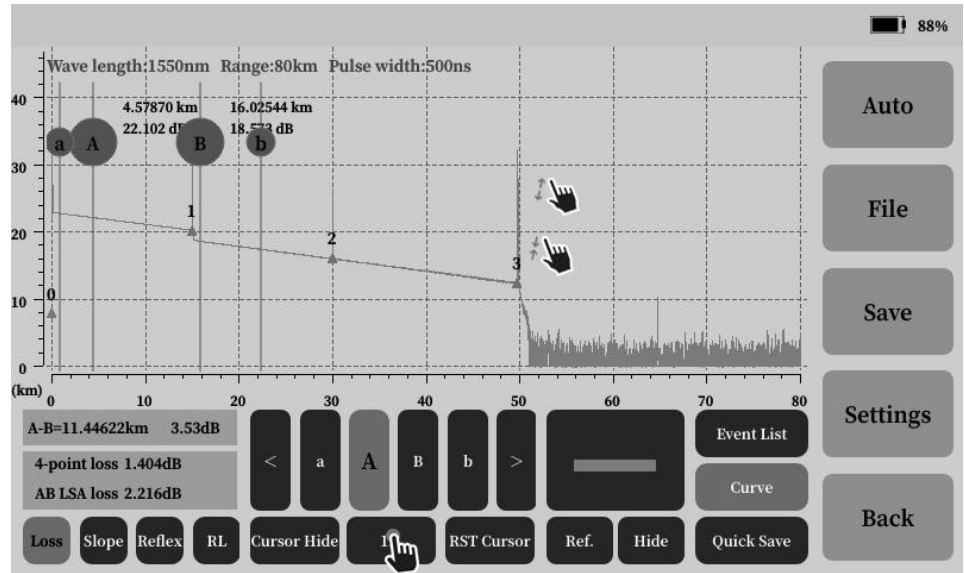
Cursor operation:

- Cursor movement: click and hold the cursor symbol and drag or select the cursor in the key area and click the direction of movement;

- Cursor Hide: All cursors can be hidden, and the cursor centering resets all cursors to the center of the screen

24
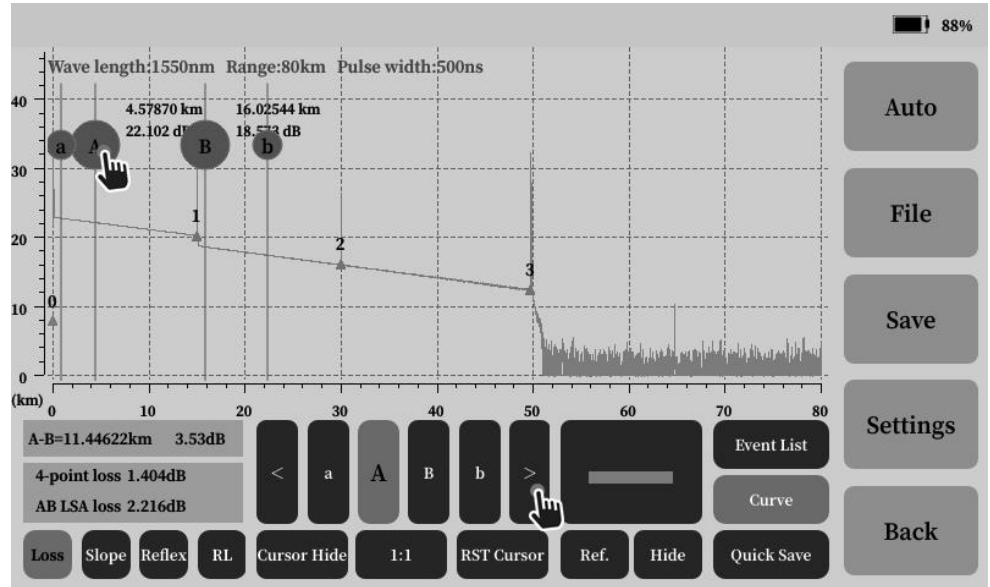
Open multiple curves

File -> Target SOR File -> Open

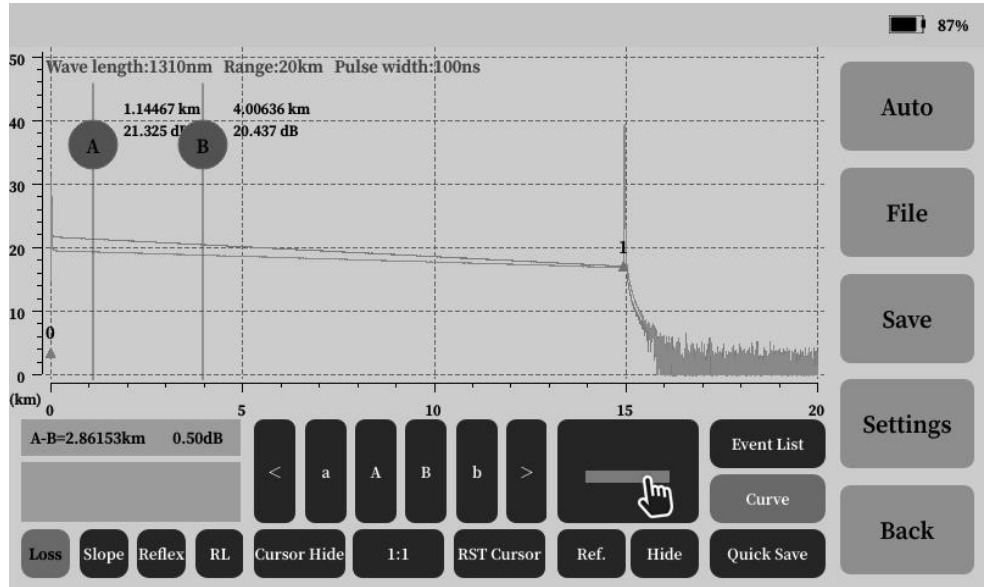Support to open 3 SOR files at the same time for curve analysis and comparison operations.

— ： The currently selected curve, click to switch;

Hide: hide the currently selected curve; Reference:

Select a curve as a reference, then test, the test curve can be compared and analyzed with the reference curve.
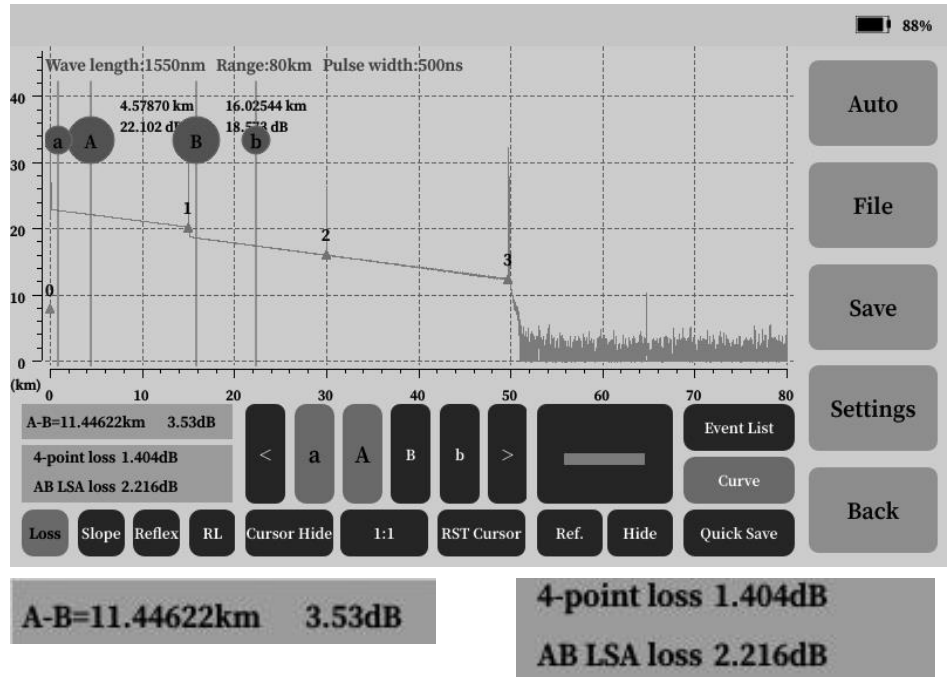
Loss Analysis

Loss analysis: When calculating the loss of "Event 1" in the figure, the cursor sequence position is shown in on the right.

The 2-point method displays the distance and loss of the A-B cursor in real time; as shown on the left below.

The 4-point method calculates the event loss in real time, and the LSA method calculates the A-B cursor loss in real time, as shown on the right below.

A-B=11.44622km   3.53dB

4-point loss 1.404dB
AB LSA loss 2.216dB

Slope Analysis:

When calculating the decay of event 1 in the figure, the cursor order position is shown on the right.

The 2-point method calculates the attenuation of the A-B cursor area in real time, and the LSA method calculates the attenuation of the A-B area in real time. as shown on the right below.
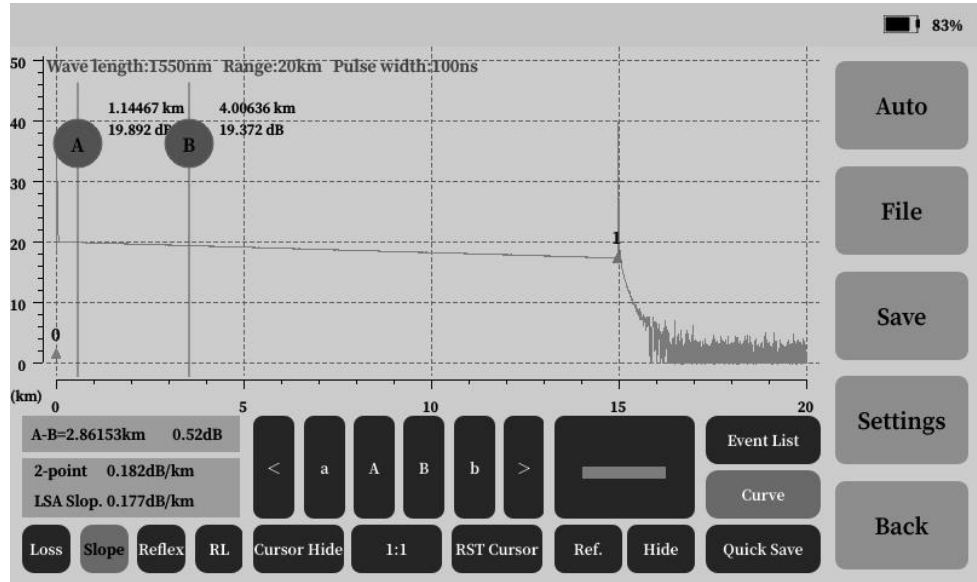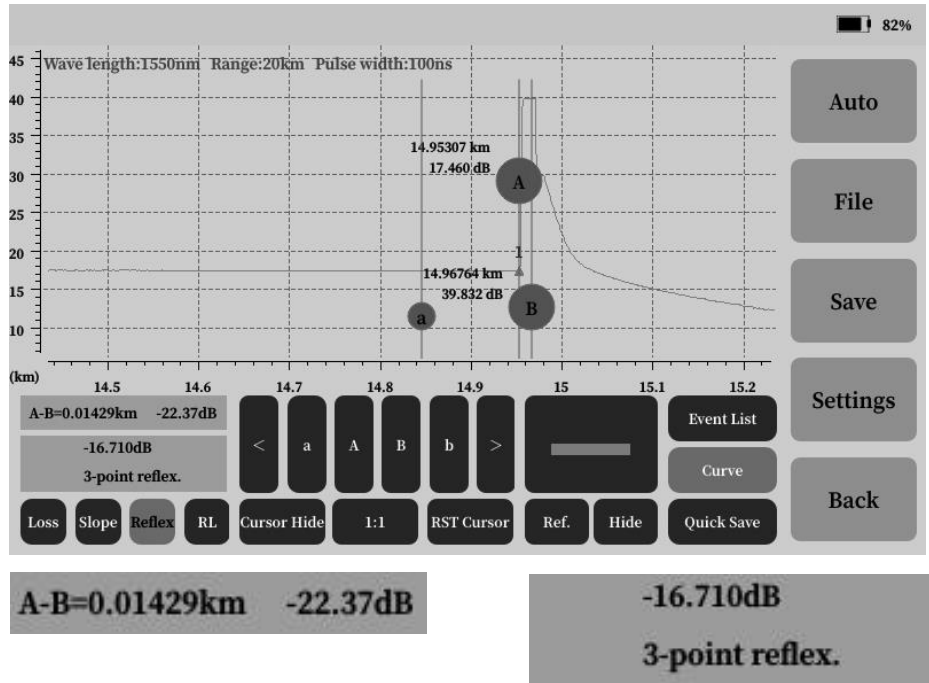
Reflectivity Analysis:

When calculating the reflectivity of event 1 in the figure, the cursor sequence position is shown on the right.

The distance and loss of the A-B cursor in real time using the 2-point method as shown on the left below.

The 3-point method calculates the reflectivity of the measured event in real time, as shown on the right below.
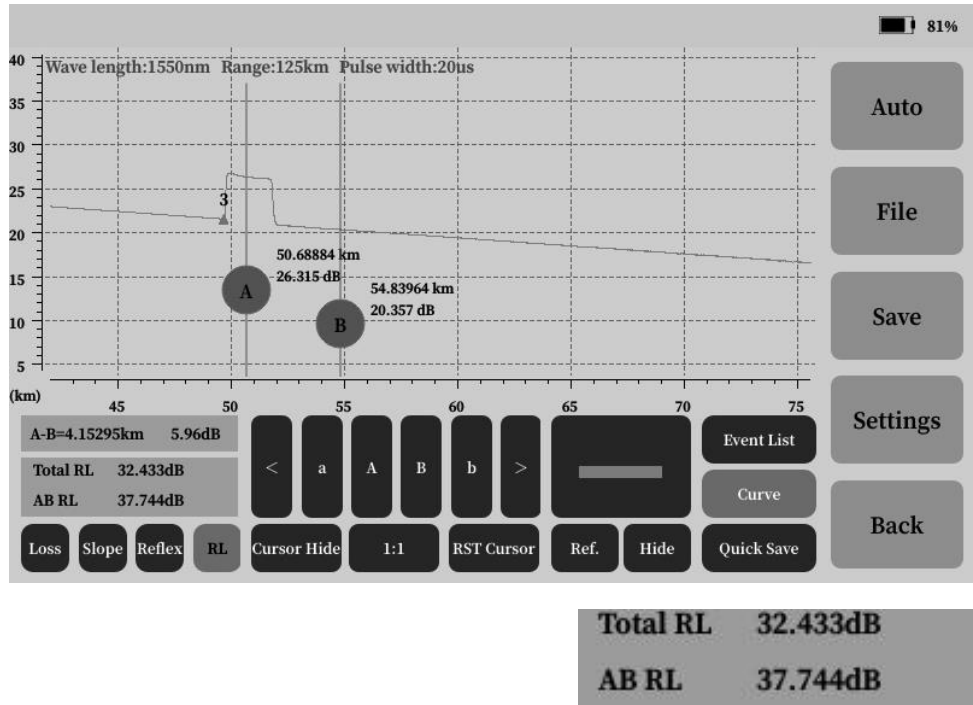
Return Loss Analysis:

Analyze the total return loss of the link under test and the return loss within the A-B cursor position, as shown on the right.

Calculate the total return loss of the link and the return loss within the 2- points of the A-B cursor, as shown on the right below.

（5）**Save**

① **Save File: Curve Operation -> Save -> Save File**

Step 1: Set the name and save parameters, select the storage path,

Step 2: Confirm to save.

Curve Operation -> Save -> Save File -> Save Settings

Save setting is used to set the SOR file save content such as fiber identification, cable identification, cable code, location and project type, project code, company name, operator, direction, etc.

②**To generate a PDF test report:**

Curve Operation -> Save -> Save PDF

Step 1: Set the name and save parameters, select the storage path,

Step 2: Confirm to save.
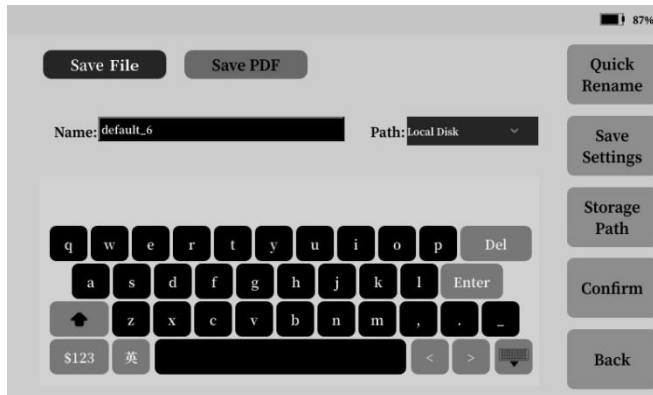
Curve Operation -> Save -> Save PDF -> Save Settings

Save settings are used to set the test information included in the generated PDF report.

4.7 Event map

（1）Test

Step 1: Select the test wavelength, you can choose single wavelength or dual wavelength test mode;

Step 2: Click Auto Test.

After the test is completed, the test results are displayed in the event map and list. Click the corresponding wavelength to view the event list for each wavelength.

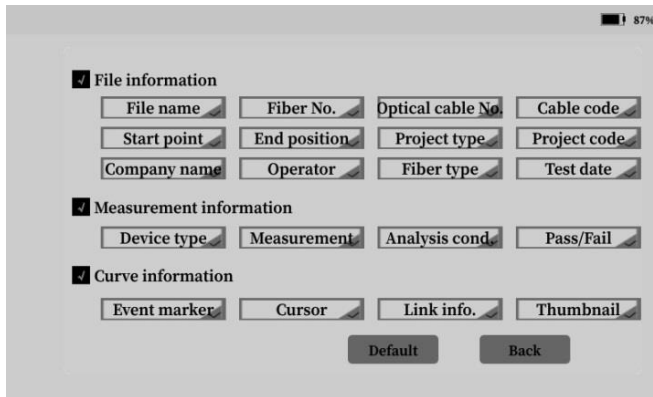| Wavelength	Length(km)	Total RL(dB)	No.	Pass/Fail
1310nm	49.72506	31.2319	5	
1550nm	49.72108	33.1725	4	Pass

49.72108km

	0	1	2	3	4
	0.00000km	14.95082km	29.98333km	49.60251km	49.721

No.	Type	Length(km)	Event loss(dB)	Reflex(dB)	Slope(dB/km)	Total RL(dB)
0		0.00000	0.00000	0.00000	0.00000	0.00000
1		14.94981	1.45371	-23.51069	0.17819	4.11507
2		29.98129	-0.02392	-34.29751	0.18502	6.87189
2		49.72108		15.52100	0.18540	10.52375

File name:default_1.emp

Auto
File
Save
Settings
Back

92%

1310nm
1550nm

（**2**）**File**

The file can open, delete, rename and copy the saved event map in .emp format.
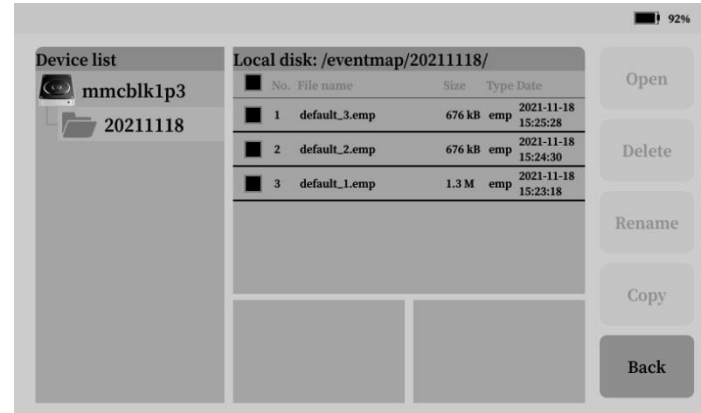
（**3**）**Save**

Save test results on event maps as .emp files or generate pdf test reports.

33
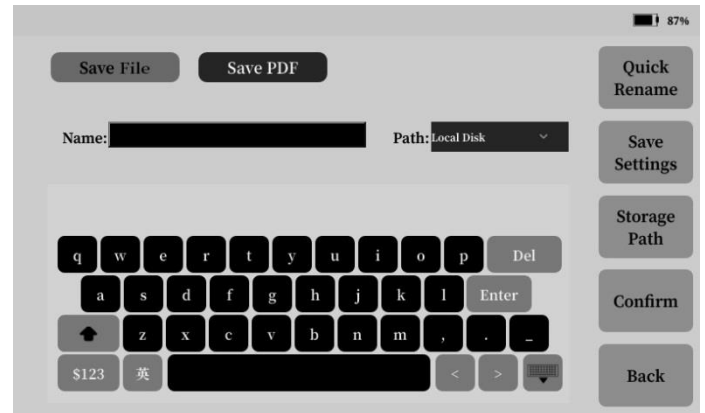
（4）**Settings**

① **Measurement settings**

Set the refractive index, back-scatter coefficient, start fiber, end fiber and measurement unit.
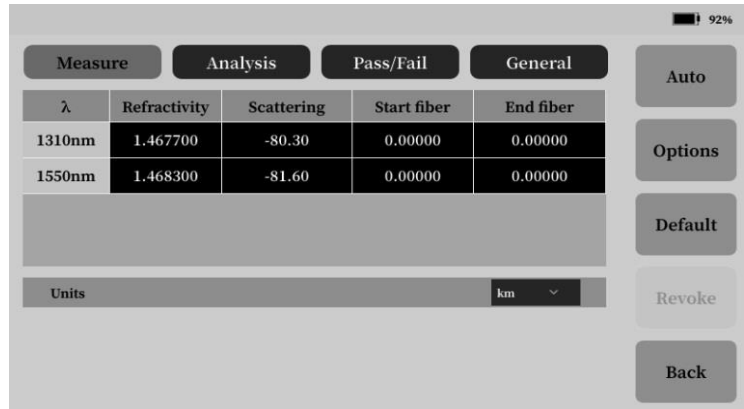
λ	Refractivity	Scattering	Start fiber	End fiber
1310nm	1.467700	-80.30	0.00000	0.00000
1550nm	1.468300	-81.60	0.00000	0.00000

Units   km

Auto   Options   Default   Revoke   Back

②**Analysis settings**

Set the reflection threshold, non-reflection threshold, and end threshold required for event analysis.

Reflex TH(dB)	Non-reflex TH(dB)	End TH(dB)
40.00	0.20	10.00

Auto   Options   Default   Revoke   Back
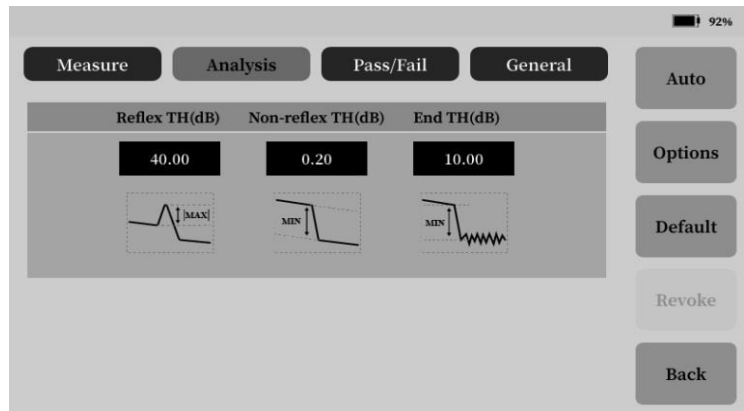
③Pass/Fail

Pass/Fail is used to set the Pass/Fail function parameters, and can set the judgment thresholds of different wavelength average loss, total link loss, splice loss, connection loss, reflectivity and splitter loss. marked in the list.

④General settings

Set the display mode of auto save, prompt save, save name prefix, save path and event list.

Measure	Analysis	Pass/Fail	General		Auto

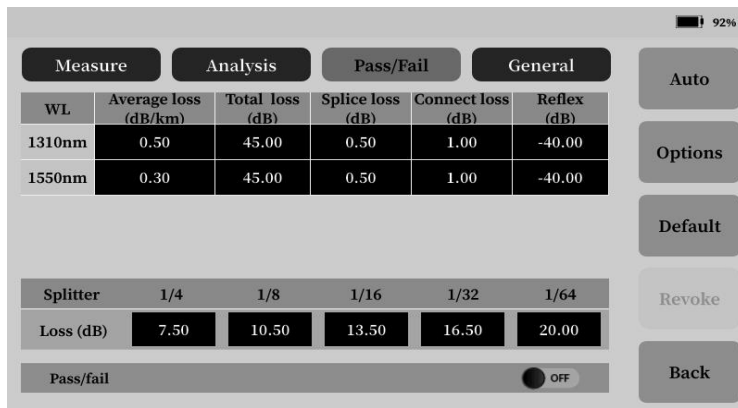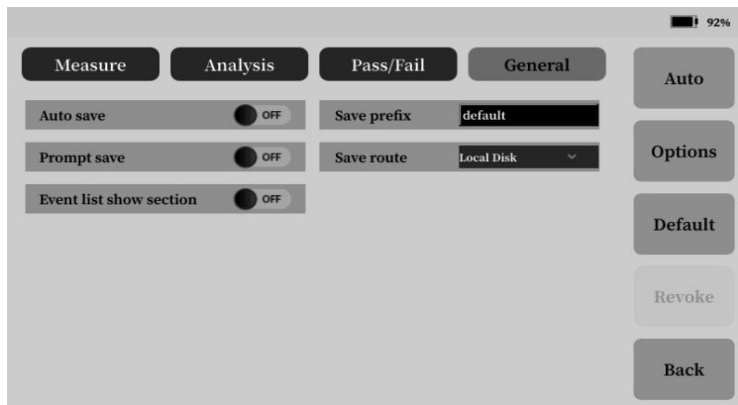| WL	Average loss (dB/km)	Total loss (dB)	Splice loss (dB)	Connect loss (dB)	Reflex (dB)
1310nm	0.50	45.00	0.50	1.00	-40.00
1550nm	0.30	45.00	0.50	1.00	-40.00

Options

Default

Revoke

Splitter	1/4	1/8	1/16	1/32	1/64
Loss (dB)	7.50	10.50	13.50	16.50	20.00

Pass/fail   OFF

Back

Measure	Analysis	Pass/Fail	General

Auto save	OFF	Save prefix	default
Prompt save	OFF	Save route	Local Disk
Event list show section	OFF		

Auto

Options

Default

Revoke

Back

35

4.8 Laser source

On the main interface, press the 【Light Source】 icon to enter the light source test interface.

The wavelength of the light source function is consistent with the wavelength of the OTDR, and supports the output of continuous CW light and 270Hz, 1kHz, 2kHz modulated light.

Step 1: Connect the LS interface (same as the OTDR interface);

Step 2: Click the switch button to turn on the light source and select the output mode, and the status bar shows ON. Switching the wave of the laser source can be operated by clicking the "Option button" in the above figure.

Note: The laser will cause damage to the human eye. The long-wavelength laser cannot be seen by the naked eye. Don't look direct at the output port without wearing protective glasses after turning on the light source.
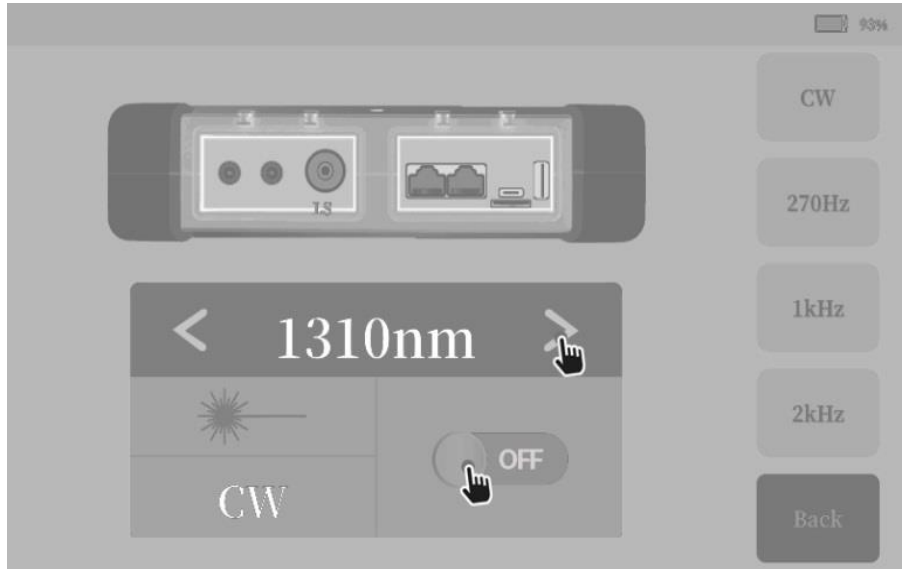
4.9 VFL

The red light function means that the wavelength of the visual fault locator is 650nm, and it supports constant light and 1Hz, 2Hz debugging light output.

Step 1: Connect the VFL interface;

Step 2: Click the constant light to turn on the red light function or pull down the status bar to switch the red light on and off through the shortcut menu, and the status bar will display the status.

The VFL function supports background operation, it remains open after exiting the operation interface.

Note: The VFL is a laser, which will cause damage to human eyes. Do not look directly at the output port without wearing protective glasses after turning on the VFL.
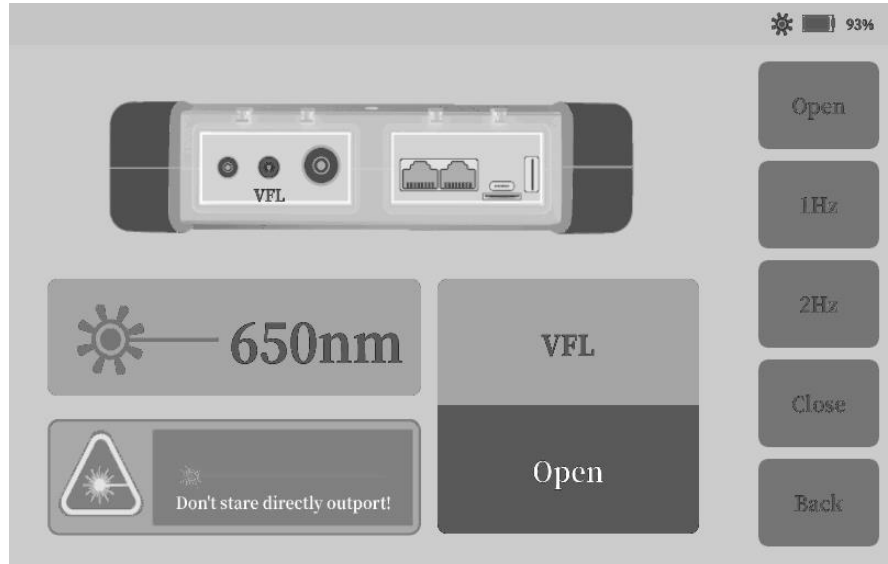
4.10 OPM

The optical power meter function displays the optical power value of the DUT in dBm and mW in real time, and automatically determines and displays the frequency of the DUT (power value >-20dBm)

Step 1: Connect to the DUT, click Start;

Step 2: Select the wavelength.

The optical power meter supports user self-calibration. The operation is as follows:

（1）Enter the target value, click Save, the calibration deviation range does not exceed ±10dB;

（2）Restore default: restore factory calibration value, clear user calibration data.

38
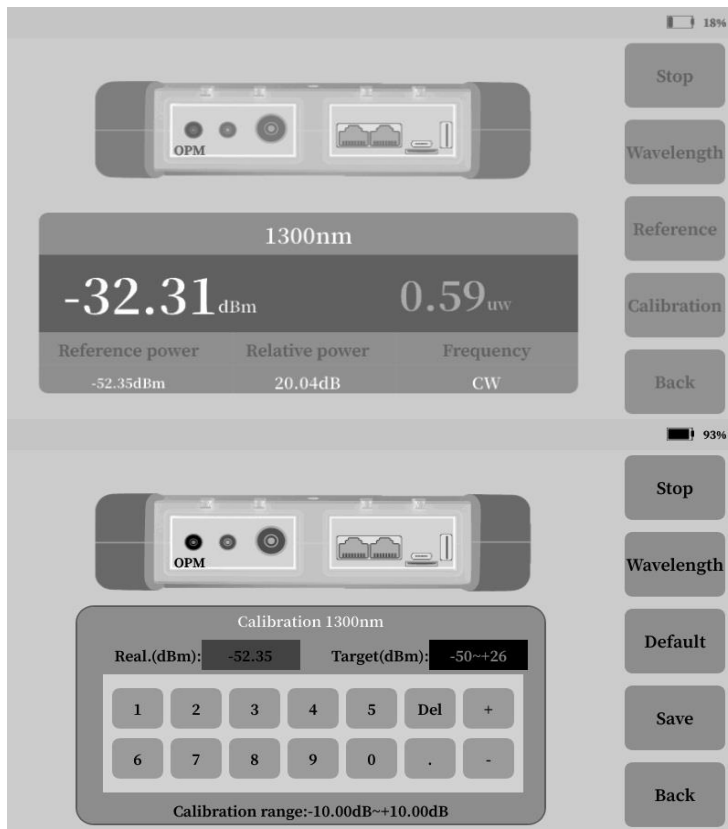
4.11 Insertion Loss

The optical loss test function supports turning on the light source and the optical power meter at the same time, and is mainly used to measure the insertion loss of the DUT.

Step 1: Click Start;

Step 2: Use a short jumper to short-circuit the light source LS and the OPM port of the optical power

meter, and click the reference; It is connected between the light source LS and the optical power meter OPM, and the IL displayed in real time is the insertion loss value.
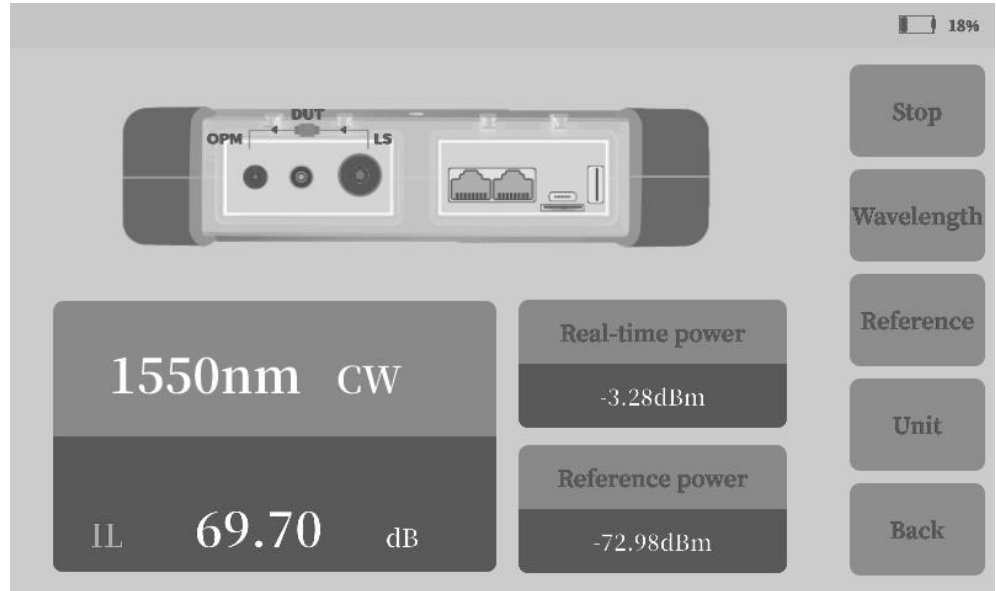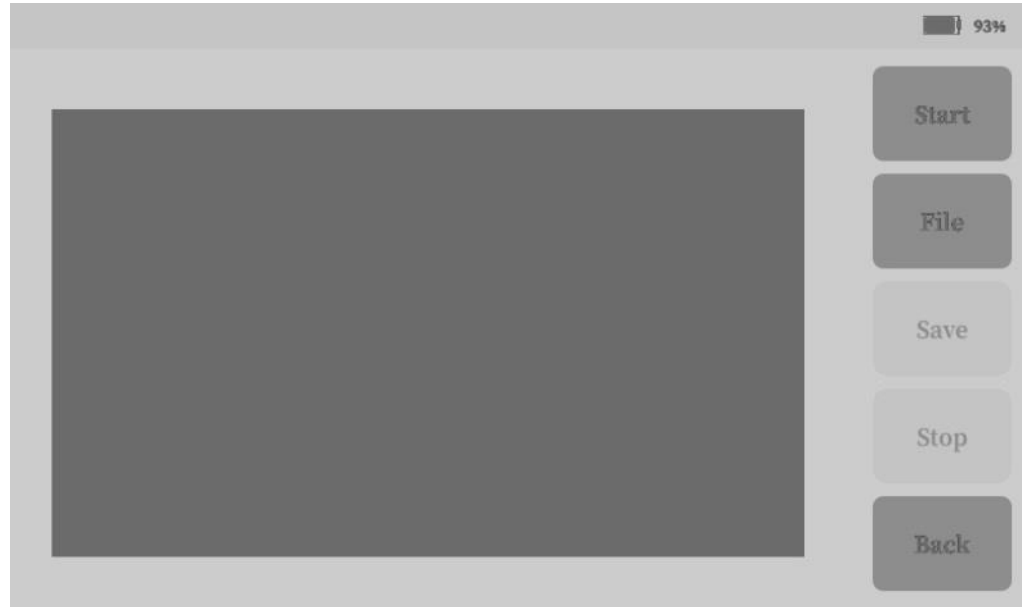
4.12 Fiber inspection (optional)

End-face inspection enables real-time viewing of fiber connector cleanliness.

Step 1: Connect the end face detection probe to the USB -A interface;

Step 2: Click Start;

Step 3: Connect to the DUT and check the cleanliness of the end face under test in real time.

93%
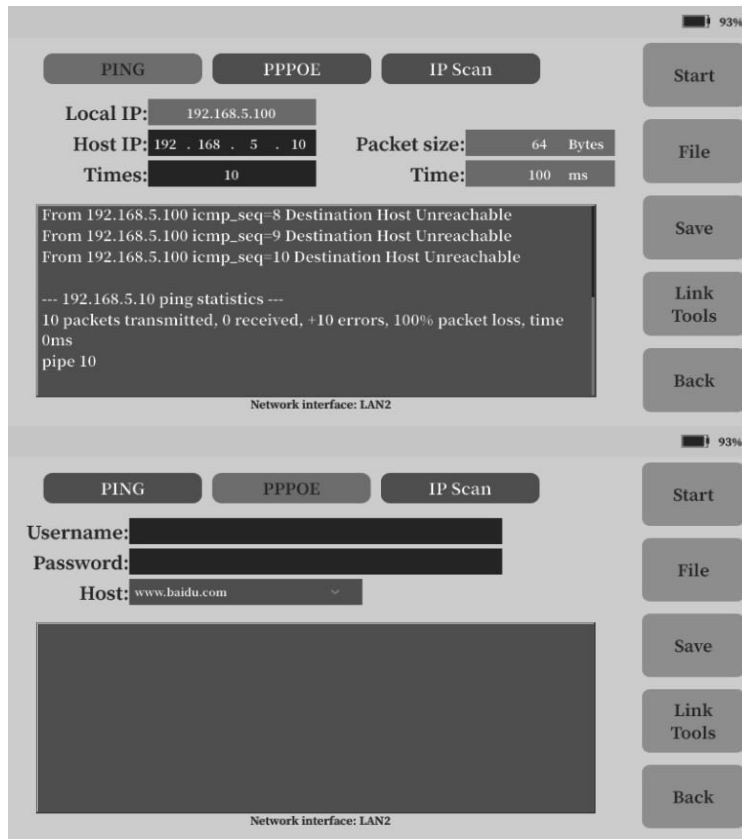
Start

File

Save

Stop

Back

4.13 Ethernet Tools

（1）**Network tools**

①**PING**

Connect to Ethernet LAN2, enter the remote host IP in the PING test, and click Start. To determine whether the Ethernet physical link is successfully connected, the test result can be saved as a txt file.
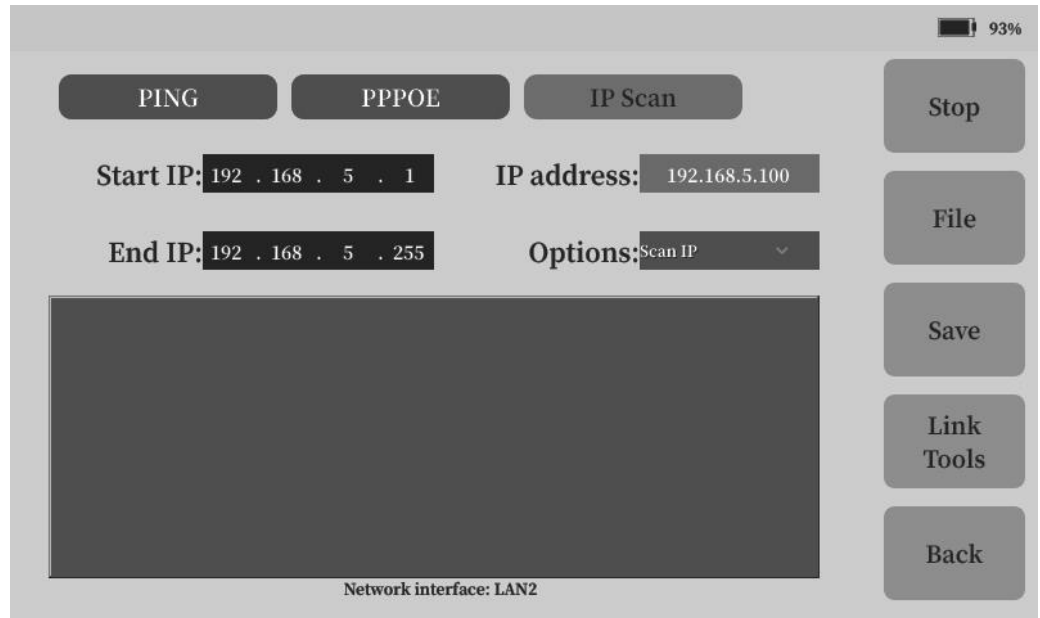
②**PPPOE**

Connect to Ethernet LAN2, enter the user name and password in PPPOE, select the remote host, and click Start to determine whether the network can dial up and whether the network communication is normal.

③IP Scan

Connect the Ethernet LAN2, enter the start scan IP and end scan IP in the same IP segment, and scan the IP used in the IP segment.

（2）Link Tools

① Link speed(optional)

The link test is used to test the speed performance between the physical links, routers, switches, photoelectric conversion devices, etc. of the two instruments, and supports a maximum speed test of 100Mbps.

Step 1: Connect the DUT between the two instruments through the LAN2 interface;

Step 2: One instrument is set as the server, and the other is set as the client;

Step 3: Set the other party's IP address and port number and other information, and click Start.
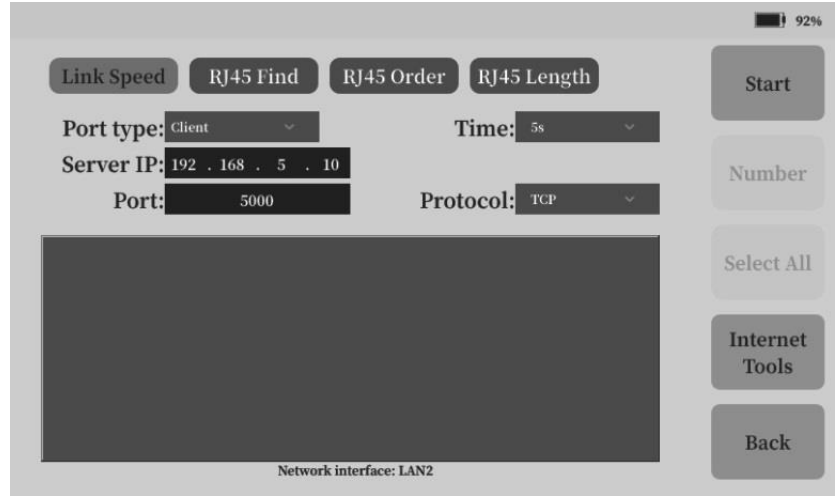
② **RI45 Find (Optional)**

Step 1: Connect the tested network cable to the Ethernet port LAN2 and select the network cable channel;
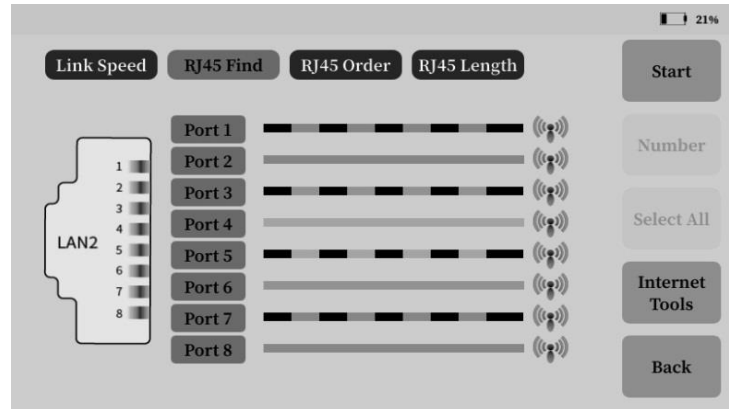
Step 2: Click Start;

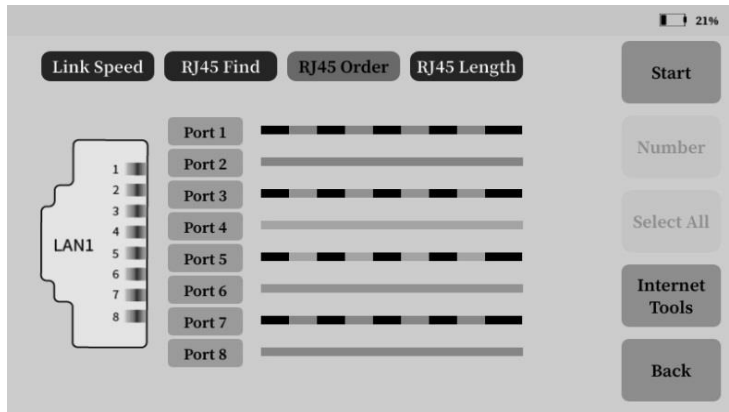Step 3: Test with a separate line finder.

③ **RJ45 Order (Optional)**

Step 1: Connect the network cable under test to the Ethernet interface LAN1;

Step 2: Connect and separate the remote end at the end of the network cable under test;

Step 3: Click Start.

44

④ **RJ45 length (Option)**

Step 1: Connect the network cable under test to the Ethernet interface LAN1;

Step 2: Click Start.

4.14 Ethernet Remote

The host computer is connected to the instrument through Ethernet, and the software of the host computer realizes remote control such as parameter distribution, start-up test and graphic display. （For operation details, see Appendix 1 on the last page）

Step 1: Set the IP address and port number of the machine;

Step 2: Start the listening service:

Step 3: Input the IP and port number of the instrument into the host computer software, and perform the control test after the connection is successful.
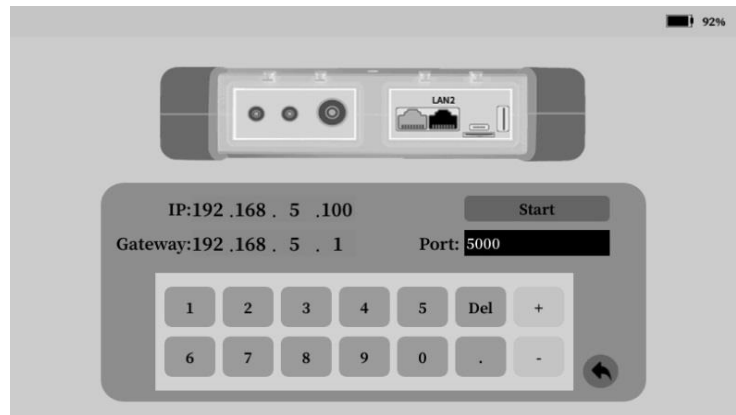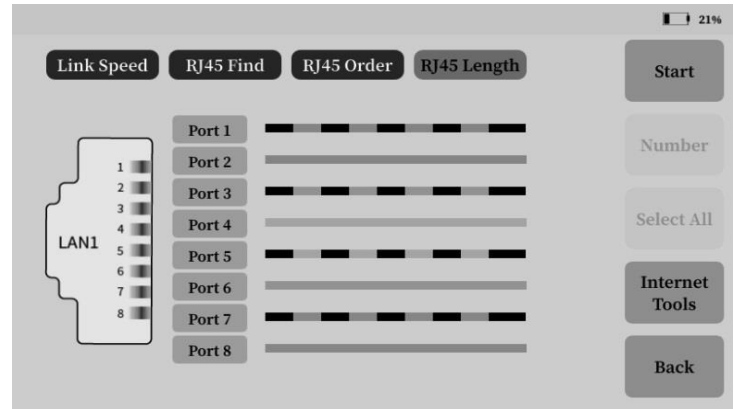
4.15 File management

System-level file management can open, delete, copy, rename and other internal files of local disks, external U disks, TF cards and other storage devices (files can be imported through the Type-C USB interface).

The files in the local disk are stored and displayed according to functional modules.

No.	File name	Size	Type	Date
1	picture	4 kB	?	2022-02-25 18:00:24
2	screenshot	8 kB	?	2022-02-26 09:20:18
3	sor	4 kB	?	2021-11-19 07:19:16
4	default_5.sor	41 kB	sor	2021-11-19 07:19:50

Device list
- mmcblk1p3
  - OTDR
  - Event map
  - Fiber Inspe…
  - Ethernet T…
  - Screenshot
- sda1

U Disk:/

Open
Delete
Rename
Copy
Back
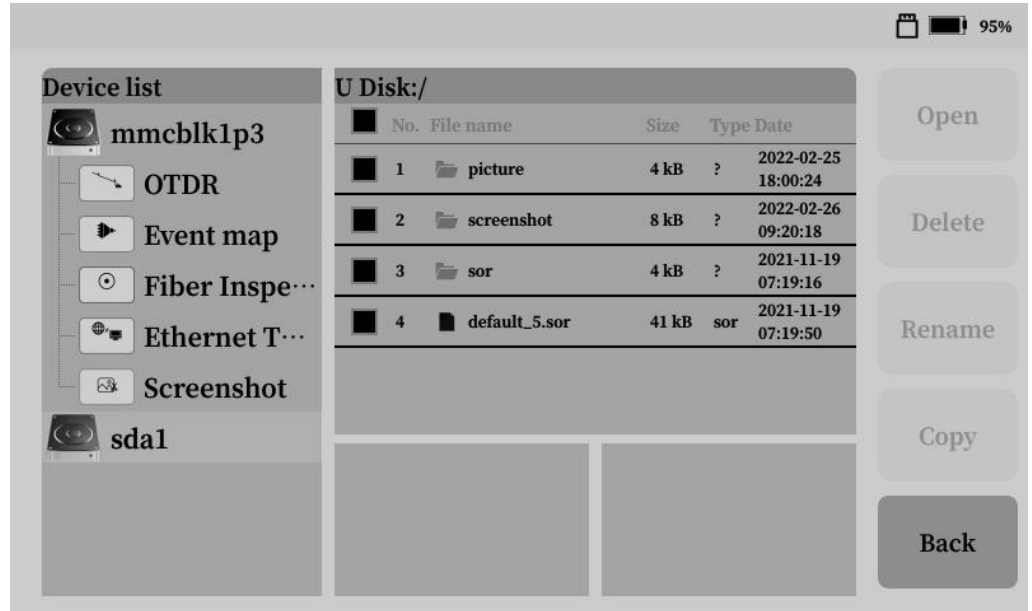
4.16 System settings

（1）**Backlight**

Set the backlight brightness and backlight sleep time. If there is no operation within the set time, the backlight will automatically turn down and recover after operation.

（2）**Date and time**

Set the date and time of the system, and click Save after modification.
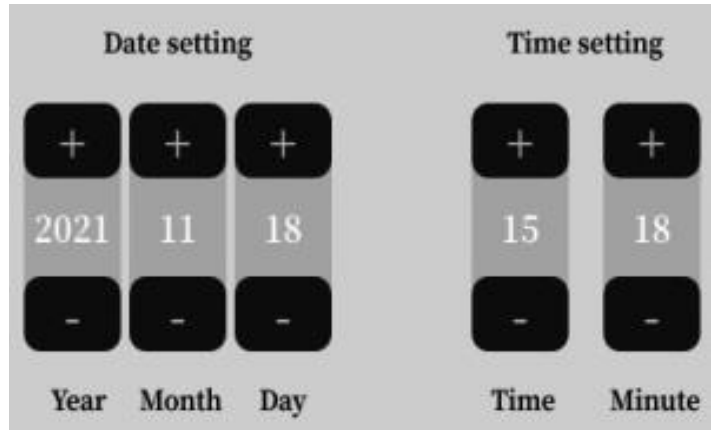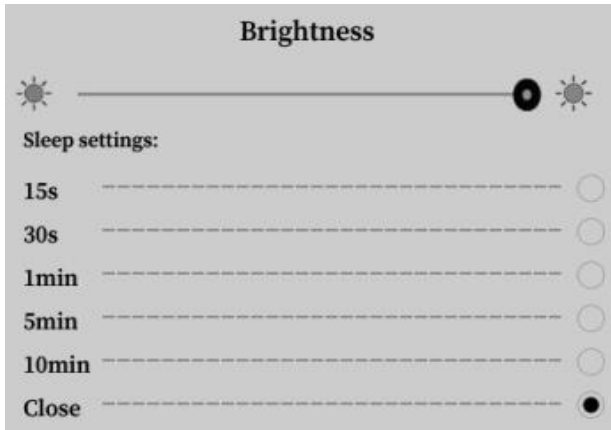
（3）**Language**

Select the language of the system.

（4）**Power Options**

Set the automatic shutdown time of the instrument. If no operation is performed within the set time, the instrument will automatically shut down.

（5）**Connect** (For Bluetooth and APP connection operations, see Appendix II on the last page)

The main connections are Type-C interface USB switch and Bluetooth switch.

Turn on the Type-C USB switch, connect the instrument to the computer through the data cable, and export or import the internal test files of the instrument on the computer;

Turn on bluetooth, set the bluetooth connection name, connect the instrument through the mobile APP, it can realize the control and control of the functions of the instrument OTDR, VFL, optical power meter and light source. Get and upload internal files.

（6）**Audio**
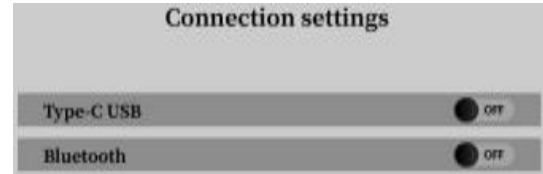
Switch setting options for instrument sound.

（7）**Lock screen**

Set and modify the power-on password operation of the instrument.

（8）**Storage**

View the storage space usage of internal storage, external U disk, and TF card.

（9）**Default APP**

Sets the default startup add-on when the instrument is powered on.

（10）**Internet**

Set the internal IP address of the instrument and other information, the IP is consistent with the Ethernet test and Ethernet remote.

（11）**Software update**

U disk upgrade: The upgrade file is located in the root directory of the U disk, insert the U disk, and click U disk upgrade.

（12）**Factory reset**

Click "Restore Factory Settings" to restore all the internal settings of the instrument to the factory settings.

Default startup program

Default startup program: Home page

IP settings

IP address: 192 . 168 . 5 . 100
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 168 . 5 . 1

| 1 | 2 | 3 | 4 | 5 | Del | + |
| 6 | 7 | 8 | 9 | 0 | . | - |

Software update

Current version: V-1.4.7

U Disk Upgrade   Remote upgrade
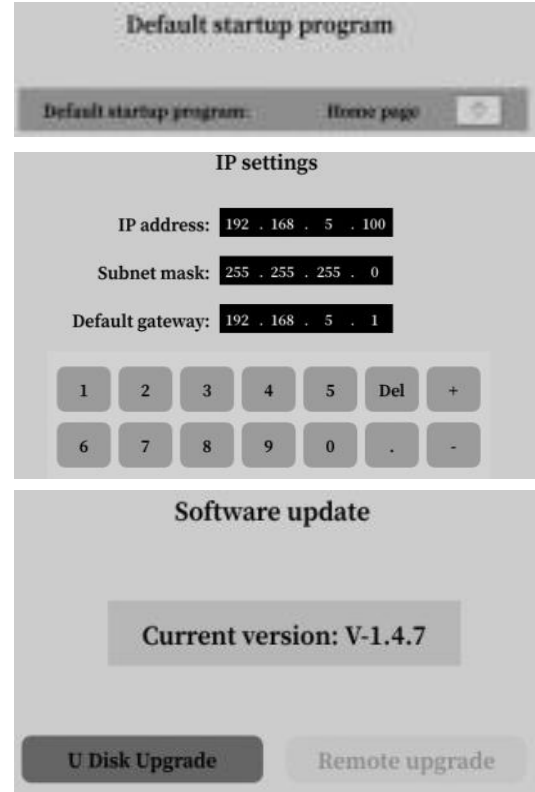
4.17 Analysis Software

The OTDR analysis software is equipped in the U disk of the instrument. Copy it to the computer. Double-click Open, click 【File】-【Open】and select Trace Storage Directory to view all files in the directory.

（1）**Trace Analysis**

Open the selected file, analyze and operate the trace through the trace operation menu, and the event information is displayed in the event list.
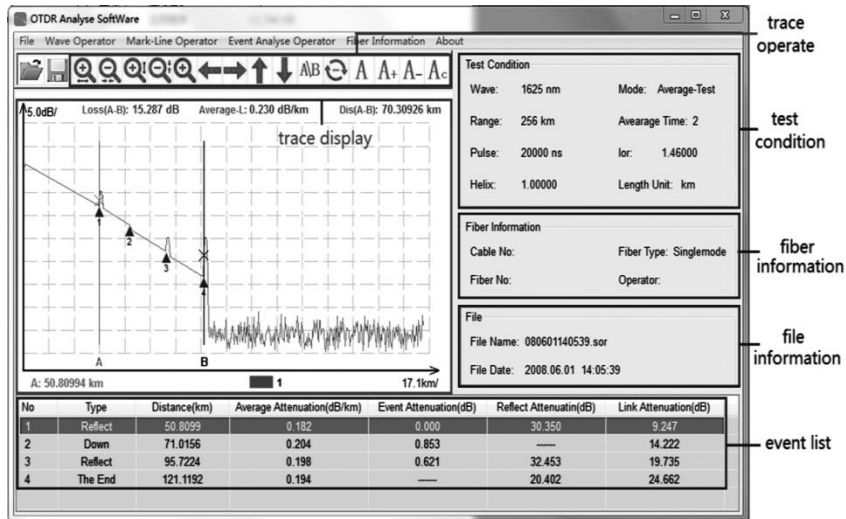
（2）Report Print

Click on File - 【BatPrint】to select the Trace Storage Directory to view all the files in the directory.

Add the printed file to the printing area, determine the type of printing, and perform the printing operation.

Tip: Traces can be printed preview and batch printing.

5. Common problems and Solutions

5.1 How to observe the optical pulse waveform?

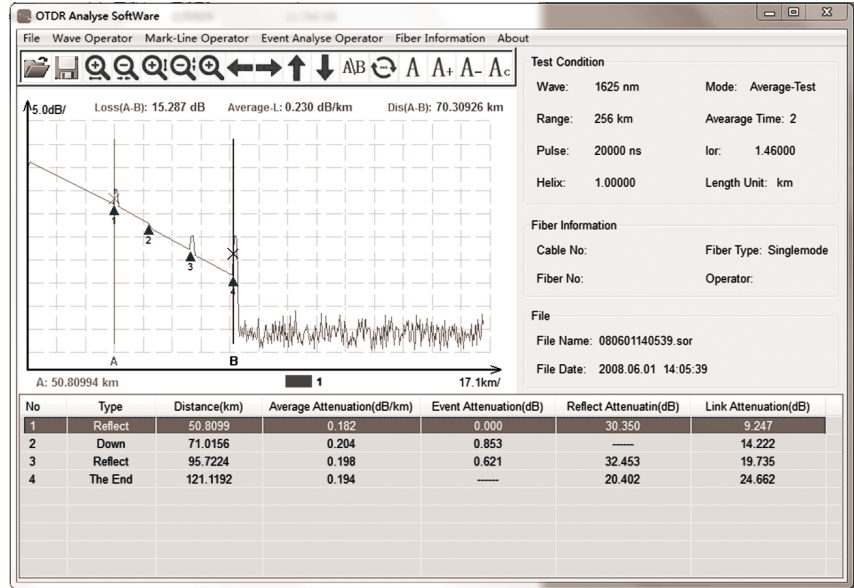Pulsed light emitted by OTDR injects into different locations of the measured optical fiber links, which can cause loss, such as connection points, bends and end of the optical fiber. The measurement results will be shown in the trace waveform, in which the horizontal axis represents the test distance, the longitudinal axis represents the loss power, and in the waveform, the measured loss or reflection is expressed in the event.

Near-end reflection: Reflection occurring at the junction between OTDR and the connector of the optical cable. This also includes the internal reflection of the instrument, the loss and reflection between the connecting points cannot be detected in the near-end reflective area.
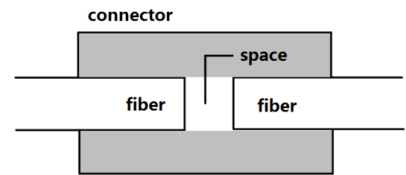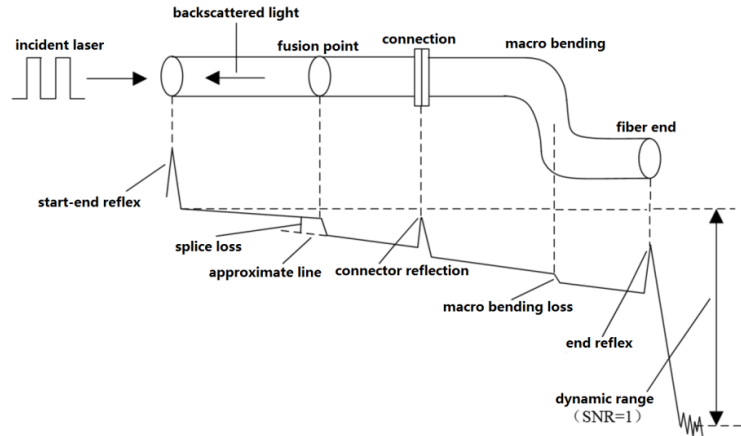
Splice loss: Due to the uneven density of the welded parts or the change of material quality, the increase of Rayleigh scattering loss results in the welding loss.

Reflection of Connector: There is a small gap in the connecting part of the connector, and the group refractive index of the gap changes, so the reflection occurs and causes loss.

Fresnel reflection at the end of the cable: Fresnel reflection occurs at the break-point of the cable or at the position where the group refractive index changes at the end of the cable (glass and air). When the end face of the optical fiber is vertical, the power reflection of the incident light is about 3%(-14.7dB).

（1）**Normal Curve**

As shown on the right, how to judge whether the curve is normal or not?

① The main slope of the curve is basically the same, and the slope is smaller, which indicates that the attenuation constant of the line is higher than that of the line Small, good uniformity of attenuation.

②There is no obvious "step", which indicates that the quality of line joints is better.

③ The tail reflection peak is higher, which indicates that the distal end-forming quality is better.
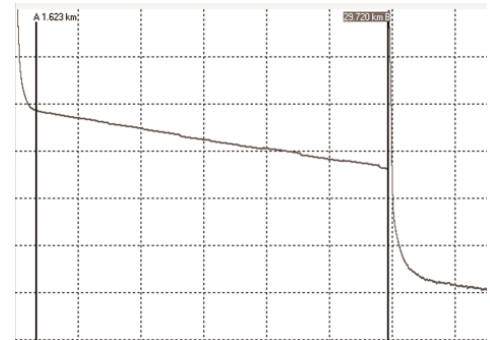
（2）Curves Have Large Steps

If there is an obvious "step" in the lower right figure, if this is the joint, it means that the joint is not qualified or that the bending radius of the optical fiber is too small or squeezed in the fused disc; if this is not the joint, it means that the optical cable is squeezed or sharply bent here.
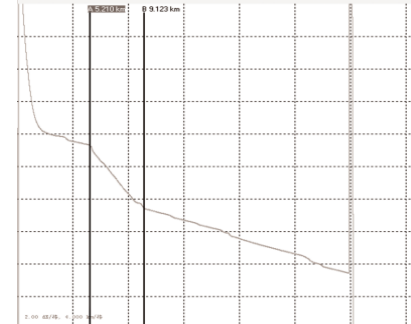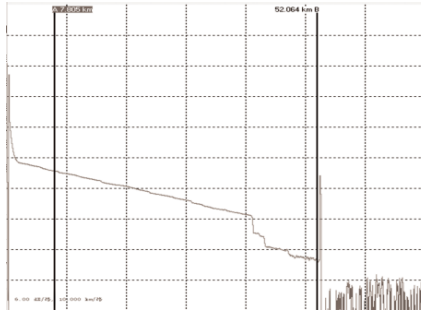
（3）High Slope of Curve

As in the upper right figure, the slope of this section is obviously larger, which indicates that the quality of this section of optical fiber is not good and the loss is large.
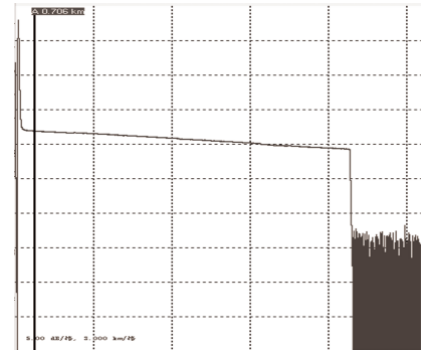
（4）No reflection peak at the far end of the curve

As shown in the lower right figure, there is no reflection peak at the tail of the curve, which indicates that the quality of the distal end of the optical fiber is not good or that the distal end of the optical fiber is broken here.

（5）**Recognition and Processing of Mirage Peak (Ghost)**

Recognition of phantom peaks (ghosts): The ghosts on the curve do not cause obvious loss (such as the upper right figure); the distance between the ghosts and the beginning of the curve is a multiple of the distance between the strong reflection event and the beginning, which is symmetrical (such as the lower right figure).
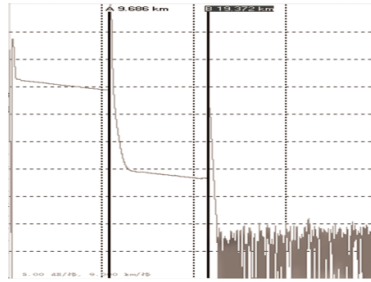
Eliminate phantom peak (ghost): select short pulse width, increase attenuation in strong reflection front end (such as OTDR output). If the event c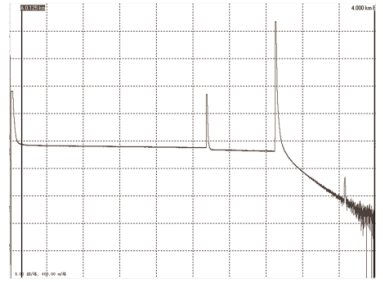ausing ghost is located at the end of the optical fiber, it can "bend" to attenuate the light reflected back to the beginning.

（6）**Positive Gain Phenomenon Processing**

Positive gain may occur on the OTDR curve, as shown in the right figure. Positive gain is due to more backward astigmatism produced by the fibers after the fusion point than those before the fusion point. In fact, the optical fibers have a loss at this fusion point. It often occurs in the fusion process of optical fibers with different mode field diameters or back-scattering coefficients. Therefore, it is necessary to measure the fusion loss in two directions and take the average of the results as the fusion loss.
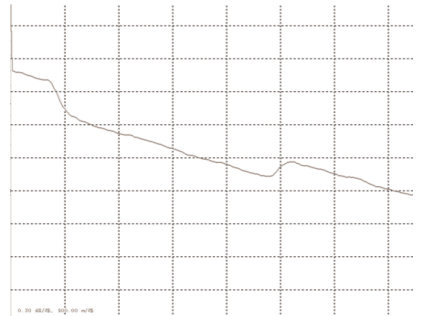
5.2 How to clean the optical output interface of OTDR?

The optical output interface of OTDR series is replaceable universal interface, which must be kept clean during use. When the instrument is unable to test the normal curve or the test results are inaccurate, the first consideration is to clean the optical interface of the instrument.

Specific cleaning methods: unscrew the output interface, wipe the end face of ceramic core with clean cotton sheets or special paper towels and cotton swabs wetted by alcohol, and then screw the output interface after the end alcohol evaporates.

Tip 1: When cleaning, make sure that both OTDR and VFL functions are stopped!

Tip 2: In the normal use of the instrument, please cover the dust cap after it is finished, and keep the dust cap clean at the same time!

5.3 How to copy the internal documents of the instrument to the U disk or computer?

Copy to U disk: Insert the U disk into the USB port on the top of the instrument, select the file, click [Copy] to copy the file, select the root

5.0dB/　　Loss(A-B): 0.691 dB　　Average-L: 0.334 dB/km　　Dis(A-B): 2.00956 km

Red: dirty connector or head face
Green:clean connector and gead face

A: 0.00000 km　　　　　　　　B　　　1　　　　　265m/
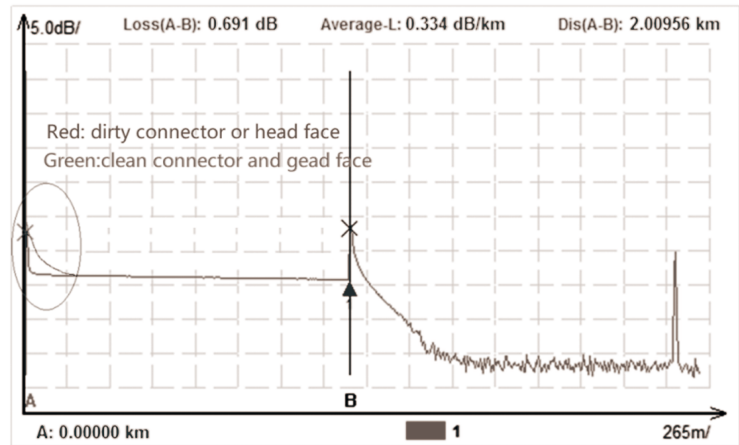
directory to be copied, and click [Paste] to copy the file.

Note: The file management of each function module can perform operations such as opening, copying, and deleting the file format saved by this function. In the file management of the system, operations such as copying and deleting files of all functional modules can be performed, but files such as SOR cannot be viewed.

Copy to computer: Use the data cable included in the box to connect to the computer through the Type-C port, turn on the Type-C switch on the instrument, and map the instrument as an external storage device on the computer. Enter the external storage device on the computer side, you can create new folders, copy, delete files and other operations. **Note: Do not copy irrelevant big data into the instrument (such as video, etc.)**

5.4 How to print test trace in batch?

Step 1: Copy the analytical software "Analyse_Otdr" from U disk to the computer.

Step 2: Click on File - [Batch Processing] to select the Storage Directory and view all the files.

Step 3: Add files to the printing area, determine the type of printing, and perform the printing operation.

5.5 How to print test trace into PDF report?

Open the software, click or [File] - [Open File], select the target file, click [Print], select PDF print.

5.6 Other common faults and treatment methods

Fault Description	cause of issue	Solution
Cannot be started normally.	The battery has run down.	Charge the battery and observe the switch key lamp. If the red light is displayed, continue charging. Otherwise, contact the supplier.
Cannot be charged properly.	The use environment does not meet the charging conditions.	Charging environment is 0℃～50℃.
	Battery contact is poor.	Open the battery bin cover and check whether the battery contacts are off.
	Battery or internal circuit problems.	Replace the battery.
Normal curve cannot be measured	Parameters setting are incorrect.	Reset the correct test parameters.
	The output connector is polluted.	Clean optical output connector.
	The output connector is damaged.	Replacement of output connector.
	Optical output connectors do not match.	Replace the matched connector, the locating pin of jumper joint should be aligned with the flange notch and tightened.
The test curve has big burrs, waveform unevenness.	The output connector is incorrect.	Reconnect the appropriate output interface.
	Pulse width setting is too small.	Increase the test pulse width.
Saturation (flat top) phenomenon at the front of test curve.	Pulse width setting is too large.	Reduce the test pulse width.
	Fiber coupling is not good.	Clean the instrument with clean cotton chips and the measured optical fiber end face.
The reflection peak at the beginning decreases slowly and	The output surface of fiber is polluted.	Replacement of output connector.
	The output connector is damaged.	Replace connectors.

	Optical output connectors do not match.	Replace matched connectors.
the tail appears.		
Reflection peak at the end of optical fibers cannot be measured	The range setting is too small.	Increase the test range value.
	Pulse width setting is too small.	Increase the test pulse width parameters.
Misreporting in curve analysis	The quality of test curve is poor/the setting of event threshold is small.	Increase the test pulse width parameter/increase the event threshold.
The measurement of optical fiber length is inaccurate	The parameter setting is incorrect.	Reset the appropriate parameters.
	The refractive index setting of optical fibers is inaccurate.	Reset the refractive index of the optical fiber.
	Incorrect setting of correction coefficient for optical cable.	Reset the cable correction factor.
The average loss of optical fibers measured is inaccurate.	The front end of the test curve is too long.	Clean optical output face.

The above description is for reference only. Please refer to the instructions for detailed usage. In the process of using the instrument, if you have any questions, you can contact the instrument supplier to solve them.

6. Technical Specifications

Model	OTDR														
	S0	S1	S2	S3	S4	T1	T2	T3	T4	T5	T6	F1	M1	SM1	SM2
Fiber Type	SM												MM	SM/ MM	
Wavelength	1310/1550nm					1310nm /1490nm /1550nm		1310nm /1550nm /1625nm		1310nm /1550nm /1650nm		1310nm /1490nm /1550nm /1625nm	850nm/ 1300nm	850nm /1300nm /1310nm /1550nm	
Max Dynamic (dB)	32/30	35/33	38/36	42/40	45/43	32/30/30	37/35/35	32/30/30	37/35/35	32/30/30	37/35/35	37/35/35/35	26/28	26/28 /35/33	26/28 /37/35
Event Blind Zone	0.8m			0.5m		0.8m	0.5m	0.8m	0.5m	0.8m	0.5m	0.5m	1m		
ATT Blind zone	4m			3.5m		4m	3.5m	4m	3.5m	4m	3.5m	3.5m	6m		

Model	PON OTDR						
	PD1	PS1	PS2	PT1	PT2	PT3	PT4
Fiber Type	SM						
Wavelength	1310nm ± 20nm 1550nm ± 20nm	1625nm ± 20nm (Filtered)	1650nm ± 15nm (Filtered)	1310nm/1550nm ± 20nm 1625nm ± 15nm(Filtered)			1310nm/1550nm ± 20nm 1650nm ± 15nm(Filtered)
Filter	/	Qualcomm >1595nm Isolation > 50 dB (1270nm~1585nm)	Bandpass 1650nm ± 7nm , Isolation > 50 dB (1650nm ± 10nm)	Qualcomm >1595nm , Isolation > 50 dB (1270nm~1585nm)			Bandpass 1650nm ± 7nm ; Isolation > 50 dB (1650nm ± 10nm)
Max dynamic (dB)	37/35	38	38	38/36/36	40/38/38	42/40/40	38/36/36

Event Blind Zone [1]	0.5m
ATT Blind Zone [2]	3.5m
PON Blind zone [3]	⩽ 30m
Test Range	100m/500m/1.25km/2.5km/5km/10km/20km/40km/80km/125km/260km/420km
Test pulse width	3ns/5ns/10ns/20ns/30ns/50ns/80ns/100ns/200ns/300ns/500ns/800ns/1us/2us/3us/5us/8us/10us/20us
Ranging Accuracy [4]	$\pm$(0.75m+ Sample interval + 0.0025 % $\times$Test distance)
Loss resolution	±0.001dB
Loss threshold	0.01dB
Linearity	±0.03dB/dB
Sampling points	⩾ 256k
Sampling resolution	0.015m~16m
Reflection Accuracy	±2dB
File format	SOR Standard File Format
Loss measurement mode	4 -point method
Laser Safety Level	Class II
Data storage	Standard: > 2GB (⩾ 200,000) ; Maximum storage: 64GB
Connector	FC/UPC (Interchangeable SC , ST)
OPM	
Wavelength range	800nm~1700nm
Connector	Universal joint FC/SC/ST
Measuring range	-50dBm ~ +26dBm (standard)

Uncertainty	±5%
Calibration wavelength	850nm/1300nm/1310nm/1490nm/1550nm/1625nm/1650nm

LS	
Laser type	FP-LD
Output wavelength	Consistent with OTDR output wavelength
Output Power[5]	≥-5dBm (Single mode fiber)
Operating mode	CW/270Hz/1kHz/2kHz
Stability	CW , ±0.5dB/15min (tested after 15min warm-up after startup)
Connector	FC/UPC (Interchangeable SC , ST)

VFL	
Wavelength	650nm±20nm
Output Power	≥ 10 mW
Mode	CW/1Hz/2Hz
Connector	FC/UPC (Interchangeable SC , ST)

The Optical Loss Test index refers to the above light source and optical power meter index.

Others	
Display	7 -inch color touch screen resolution: 800 × 480
Power supply	Type-C power adapter: input 100V~240V 50/60Hz , Output 5V/3A 9V/2A 12/1.5A ; Built-in Li- ion battery: 3.7V , 10400mAh ,

Data interface	USB-A, Type-C port, RJ45 LAN 10/100Mbit/s
Working temperature	-10 ℃ ～ 50 ℃
Storage temperature	-40 ℃ ～ 70 ℃
Relative humidity	0～95％，Non Condensing
Weight	≤1.2kg
Size	≤162mm×220mm×52mm

Note：1. Using 3ns pulses, the reflection coefficient is -35dB to -55dB typical.

2. Using a 3ns pulse, the reflection coefficient is -55dB (1310nm) typical.

3. Non-reflection FUT fiber under test, non-reflection beam splitter, 13dB loss, 50ns pulse, typical.

4. Uncertainties due to the refractive index of light are not included.

5.The multimode fiber 850nm/1300nm output power is about -24dBm，special 1650nm(38dB) output power is about-24dBm.

Standard configuration list

NO	Name	Quantity
1	Host (including battery)	1
2	AC/DC Power Adapter	1
3	U disk（contain software）	1
4	Data line	1
5	OTDR SC Adapter	1
6	User's manual	1
7	Calibration certificate	1
8	Certificate / Warranty card	1
9	Clean cotton piece	10
10	Leather handles	1
11	Special backpack for instrument	1

Options list

NO	Name	Quantity
1	RJ45 length	1
2	RJ45 Order	1
3	RJ45 Find	1
4	Fiber Inspection	1
5	OPM（-70dBm~+6dBm）	1

Note: ①The standard OTDR interface type is FC/UPC, and the

FC/APC type is optional.

②Due to design improvements, the above contents are

subject to change without notice.

7.Appendix I Ethernet Remote Operation

Step 1: Connect the device to remote computer through the Ethernet LAN2 interface (modify the IP address in the system settings);

Step 2: Select the Ethernet remote test function and start the monitoring service;

Step 3: Configure the TCP/IPv4 IP address of the host computer to be in the same segment as the device;

Step 4: Open the host computer control program and connect the device;

Step 5: After setting the parameters, complete the test.
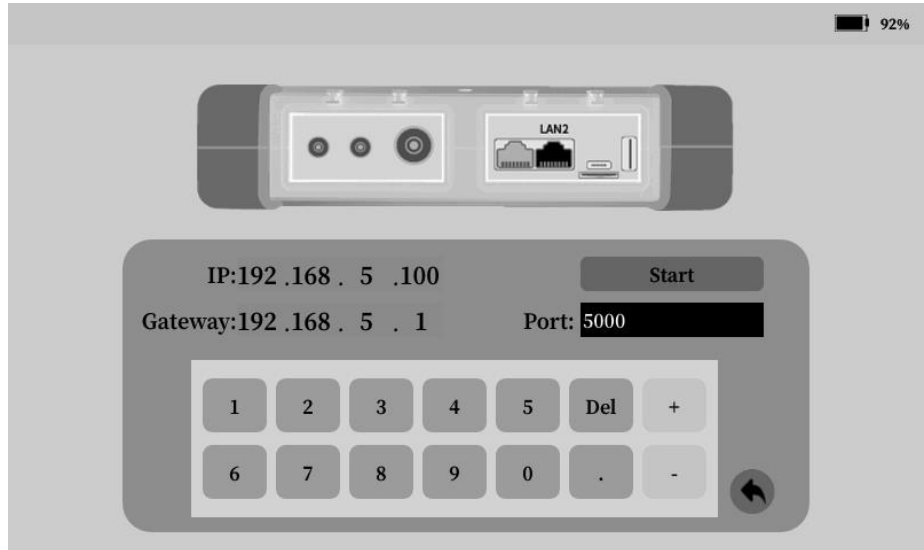
8.Appendix II APP-side Bluetooth control device

Please scan QI code to download the Bluetooth APP.

Android

IOS

Step 1: Turn on Bluetooth in System Settings -> Connect "Bluetooth", until display the Bluetooth MAC address;
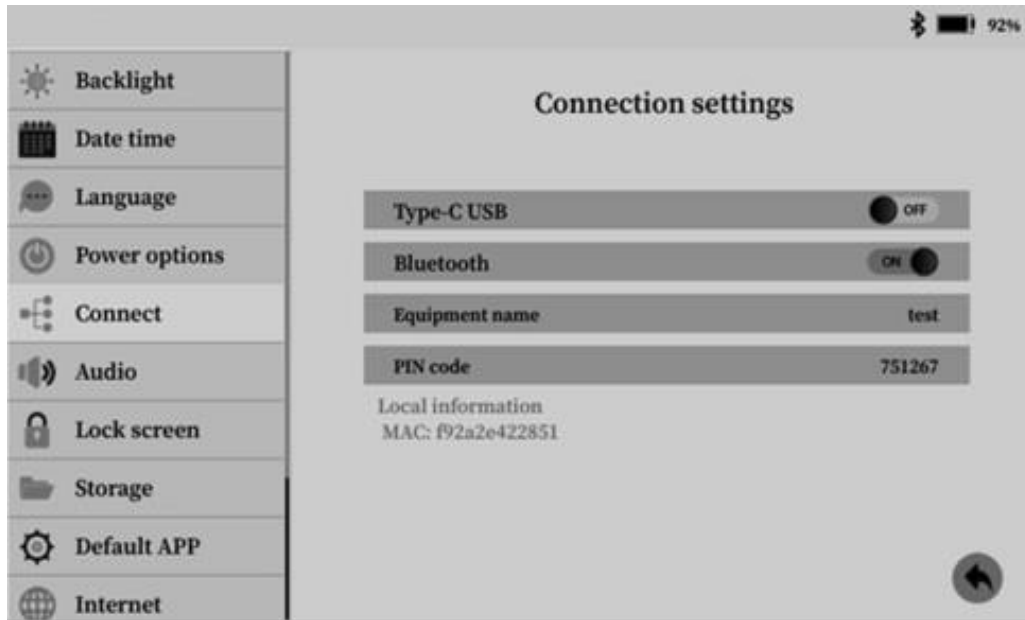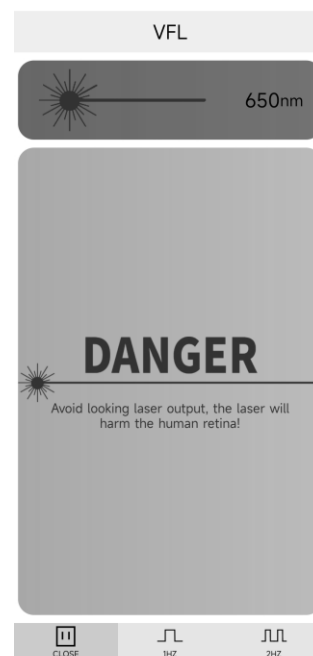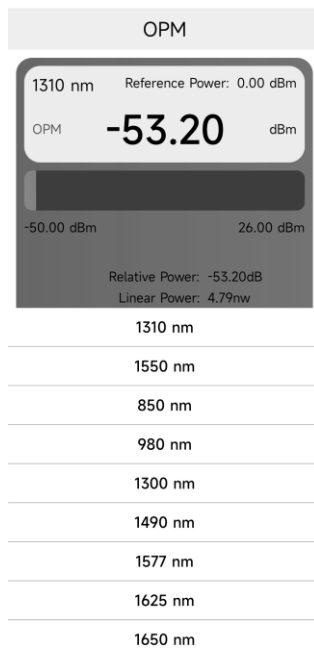
Step 2: On mobile phone APP, add a Bluetooth device, scan the corresponding MAC information, and then the connection is successful;
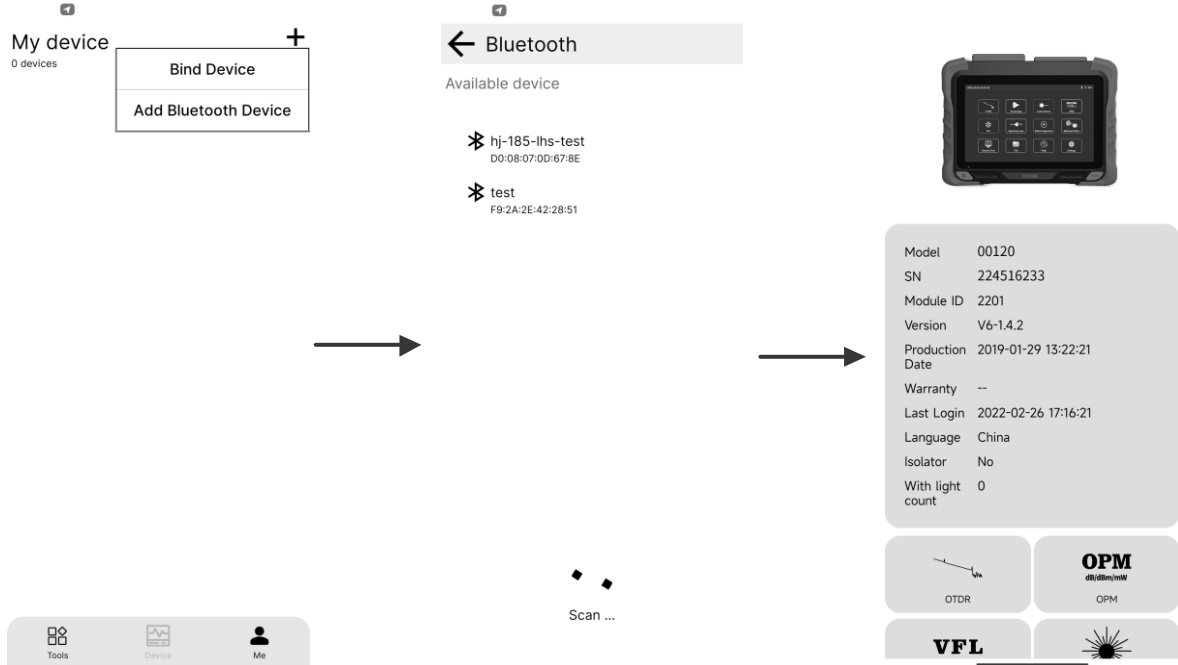
Step 3: The Bluetooth APP terminal can control the operation of the light source function, the optical power meter function (OPM) and the red light function (VFL);

Light Source	OPM	VFL
1310nm	1310 nm Reference Power: 0.00 dBm OPM **-53.20** dBm	650nm
Output Mode **CW**	-50.00 dBm 26.00 dBm Relative Power: -53.20dB Linear Power: 4.79nw	
DANGER Avoid looking laser output, the laser will harm the human retina!	1310 nm 1550 nm 850 nm 980 nm 1300 nm 1490 nm 1577 nm 1625 nm 1650 nm	**DANGER** Avoid looking laser output, the laser will harm the human retina!
CLOSE Wave Length Mode		CLOSE 1HZ 2HZ

Step 4: The Bluetooth APP terminal operates the OTDR function, sets the test parameters, starts the test and checks the test results；

Step

5: Open and share test results.