IVR-6123

Handheld OTDR Test Set

User Guide

IVR-6123 series is interVRE's handheld OTDR test set. It provides comprehensive optical test for metro, access/FTTx, and LAN network. Also IVR-6123 is designed for indoor and outdoor test with lightweight, flexible and rugged features. It is the best test set for service providers validating at installing phase or troubleshooting at running phase.

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Revision History

The following tables shows the revision for this document.

Date	Version	Revision
18/04/2011	1.0	Initial Release
26/06/2015	2.0	•Revised the whole document; •Add Auto zoom fibre span, and Span start functions in the General setting; •Add Port function in the OTDR setting; •Add Reflect threshold function in Threshold setting; •Edit File content of iOTA File setting; •Add Predefine Link function in iOTA setting; •Modify default value of Splice loss in Element setting; •Add Splitter loss function in Element setting.

The product and the user guide could be upgraded or modified without notice. Please visit the website of InterVRE (www.intervre.com) or contact us for the further information.

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1. Introduction

1.1 Overview

IVR-6123 Handheld OTDR Test Set is one of OTDR product of INTERVRE. This product is specialised designed for engineers to examine and detect optical fibres or cables in MAN (Metropolitan Area Network); AN (Access Network); and FTTx multilayer network with high flexibility, high efficiency, and convenience.

1.2 Main Features

IVR-6123 Handheld OTDR Test Set has the following features:

- Interface user-friendly, operation simply, and durable;
- High resolution LCD colour touchable screen;
- Support all OTDR functions, and various wavelengths;
- Support PON function, can do online PON test;
- Can pass 1:128 optical splitter;
- Rapid start technology;
- Battery life: more than 8 hours.

2. Description

2.1 Front Panel

2.1.1 Front Panel Diagram

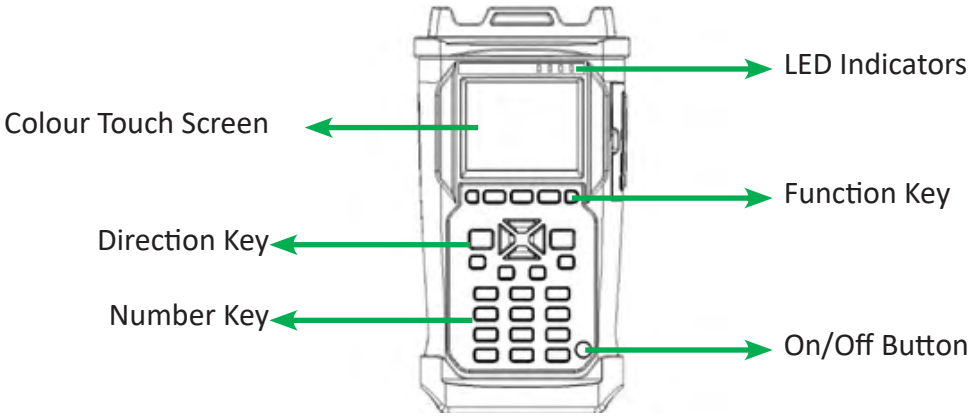


Figure 2.1 IVR-6123 Handheld OTDR Test Set Front Panel View

2.1.2 LED Indicators

LED locations for all LEDs on IVR-6123 has been shown in Figure 2.1. Table 2.1 describes the LEDs placed on IVR-6123 as indicators.

Table 2.1 LED Indicator Definitions

LED	STATUS	DESCRIPTION
⏻	Green	On
	Off	Off, and unplugged in
	Green	Plugged in and battery is fully charged
	Green (flashing)	Battery is on charge
⊣	Red (flashing)	Unplugged in, and battery is weak
	Red	Battery error
	Off	• Off • Unplugged in, and battery level is above the 'critical threshold'
	Green	Result status: success (Current result of the application does not exceed the predefined threshold)
	Red	Result status: failure (Current result of the application exceeds the predefined threshold)
⚠	Green (flashing)	Laser status LED, at least one module is transmitting an optical signal
	Off	No module is transmitting signal

2.1.3 Buttons

Table 2.2 describes the functions of IVR-6123 Handheld OTDR Test Set's buttons.

Table 2.2 Buttons Description

Button	Description
F1, F2, and F3	Function keys: Select the one sub menu from main menu displayed on the screen
◀ ▶	Function keys: Switch the main menu
CANCEL X	Cancel/Exit
OK √	OK/Confirm

	• AB lines:
	  • Move AB lines right or left
	  • Move AB lines up or down
	• Zoom:
	  • Zoom the curve horizontally
	  • Zoom the curve vertically
	• Move:
	  • Move the screen right or left
	  • Move the screen up or down

AUTO	Click to run the test automatically

	• Switch mode:
	  • AB lines
	  • Zoom
	  • Move

Menu	Back to main menu

Test	• Long press: Switch the test mode
	  • Manual
	  • Real-time
	• Short press: Start/Stop test

	[1] Number key: Event list
?	[3] Number key: Help information
INFO	[4] Number key: Curve information
VFL	[6] Number key: Open/Close VFL function
	Open file
	Save file
	Restore the curve
	On/Off *(Specific operation information can be seen in Section 5.1)*

2.2 Right Panel

2.2.1 Right Panel Diagram

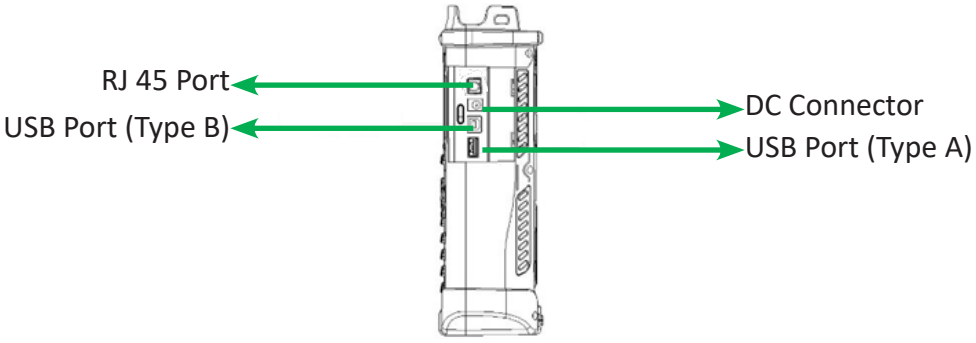


Figure 2.2 IVR-6123 Handheld OTDR Test Set Right Panel View

2.2.2 Interfaces

Table 2.3 describes the interfaces of IVR-6123 Handheld OTDR Test Set.

Table 2.3 Interfaces Description

Interfaces	Quantity	Description
RJ-45 Port	1	Connect to Ethernet network
USB Host Ports	1	• Connect USB memory drive; • Connect keyboard; • And connect mouse device, etc
Mini USB port	1	Connect a USB cable for data transferring between the device and a computer
Audio Output Port	1	Connect headphone/microphone
DC Connector	1	Connect A/C adapter

2.3 Top Panel

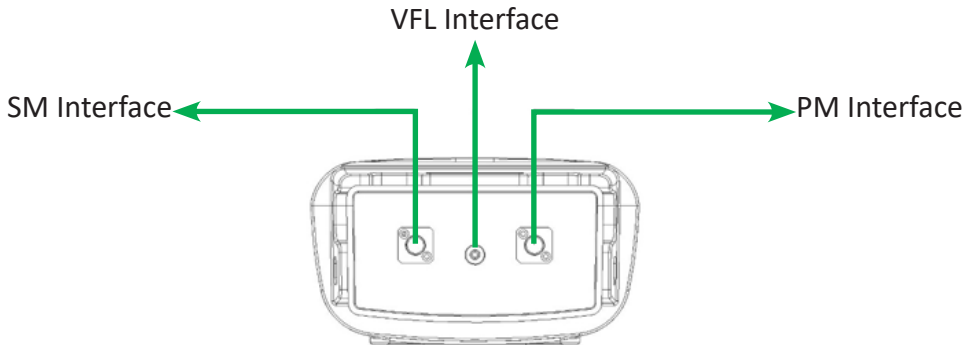


Figure 2.3 IVR-6123 Handheld OTDR Test Set Top Panel View

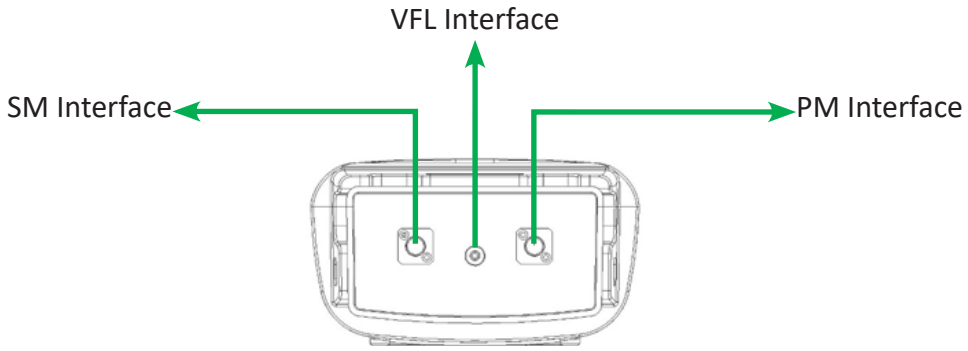


Figure 2.4 IVR-6123 Handheld OTDR Test Set Top Panel View (PON)

2.4 Bottom Panel

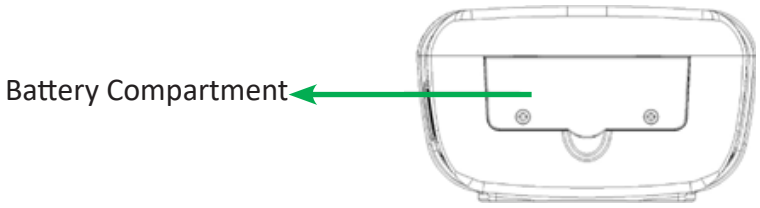


Figure 2.5 IVR-6123 Handheld OTDR Test Set Bottom Panel View

3. Specifications

3.1 Environmental Guidelines

The IVR-6123 can work normally and stably under the severe environmental condition. Table 3.1 defines these environmental conditions which are complied with the IVR-6123.

Table 3.1 Environmental Ranges

	Temperature Range	Humidity Range
Operational	-10°C ~ 50°C	0% ~ 95% (non-condensing)
Storage	-40°C ~ 70°C	0% ~ 95% (non-condensing)

3.2 Adapter and Battery

3.2.1 AC/DC Adapter

AC/DC adapter can be plugged into any standard electrical socket but only for indoor using, and can charge rechargeable Lithium-Ion battery.

Table 3.2 Input and Output Requirement

	Voltage	Current
Input	100-240VAC	Max 1.6A
Output	15VDC	2A

3.2.2 Rechargeable Lithium-Ion Battery

Rechargeable Lithium-Ion battery will supply the power for the device automatically when the AC/DC adapter has been unplugged.

(Note: IVR-6123 Handheld OTDR Test Set will only work normally when the battery has been installed in the battery compartment properly and the compartment cover has been locked properly whether the device is using power source or not).

- The device work will not be affected by switching power supply between power source and Lithium-Ion battery;
- Automatically charge when the device has been connected to power source;
- At least 8 continuous working hours under Bellcore TR-NWT-001138 standard.

3.3 Other Physical Specifications

Table 3.3 describes other physical specifications of IVR-6123 Handheld OTDR Test Set.

Table 3.3 Other Physical Specifications

Specification	Description
Power consumption	< 10W
Dimension	Dimension (H×W×D) = 80mm x 135mm x 250mm;
Weight	< 1.1kg

4. Safety Information

4.1 General Safety Information

If the device has not been stored properly under the storage temperature range, the device's temperature must be guaranteed to reach the operational temperature before turn it on *(Specific environmental information can be found in Table 3.1)*.

4.2 Laser Safety Information

- Do not install or detach fibres directly when a light source is activated;
- Do not attempt to look directly into the fibre, in case your eyes will be injured by optical signal;
- The device is Class 1M laser product, complies with IEC 60825-1 Amendment: 2001 and 21 CFR 1040.10, hence invisible laser radiation could be emitted from optical fibre output port;
- Safety can be guaranteed by operating the device under a predictable and reasonable conditions, however using an optical instrument to view the laser beam whether is diverged or not is potentially hazardous, therefore do not attempt to use an optical instrument to view the laser beam directly;
- When the laser safety light is flashing, which indicates at least one module is transmitting an optical signal, please check all modules working status, because the module which is transmitting the signal might not be the one currently using.

4.3 Electrical Safety Information

- Ventilation should be guaranteed around the device;
- Operating the device under the environment with highly inflammable gas will cause a significant safety incident;
- To avoid lightning strike, do not attempt to operate the device during the thunderstorm, particularly when any part of the device surface *(Cover, panels, etc.)* has been damaged.
- Damage will be occurred if the input voltage or current of power source has exceeds the maximum voltage or current limitation, *(Specific information for input requirement can be seen in Section 3.2 Adapter and Battery)*;
- If the device needs to be powered off completely, please make sure the adapter has been unplugged, and removes the batteries;
- Replacement of any components or modules must be conducted under complete power off condition;

- Capacitors in the device may be still under the charged condition even if the device has been disconnected from its power supply;
- Only the person who is authorised by the firm can open the device without power off to do the test, maintenance, and repair, and emergency workers must be present.

5. Installation of the Device

5.1 Turn the Device On or Off

Power on/off button: ⏻, Table 5.1 describes sepcific instruction of turnning the device on or off.

Table 5.1 Turn On or Off Instruction

Function	Description
Turn on	Press on/off button to turn on the device,
Sleep	• Press on/off button for 5 seconds until the device beeps once; • Then release the on/off button, the device will be hibernated; • Then press on/off button once, the device will be awaked; *(Note: The device only can be hibernated when all applications have been terminated),*
Turn off	Press on/off button for 10 seconds until device is powered off.

5.2 Installing or Upgrading the Applications

All essential applications have been preinstalled and configured at the factory. Also, extra applications will be installed or existing applications will be required to upgrade, when new test modules have been purchased and installed, or newest version of the application has been purchased. Table 5.2 describes the hardware requirements for applications installing or upgrading.

Table 5.2 Application Installing or Upgrading Hardware Requirements

Name	Quantity
CD for Installation	1
Computer with USB Port	1
IVR-6123 Handheld OTDR Test Set	1
USB Memory Drive or USB Cable	1 or 1

Applications can be installed or upgraded by the following steps:

• Turn on the computer and insert the installation CD into the CD-ROM drive;

• Copy ‘Setup. exe’ into the USB memory stick;

• Plug the USB memory stick into IVR-6123 Handheld OTDR Test Set;

• Select ‘System’ from main menu and enter ‘Explore’, then enter USB memory folder;

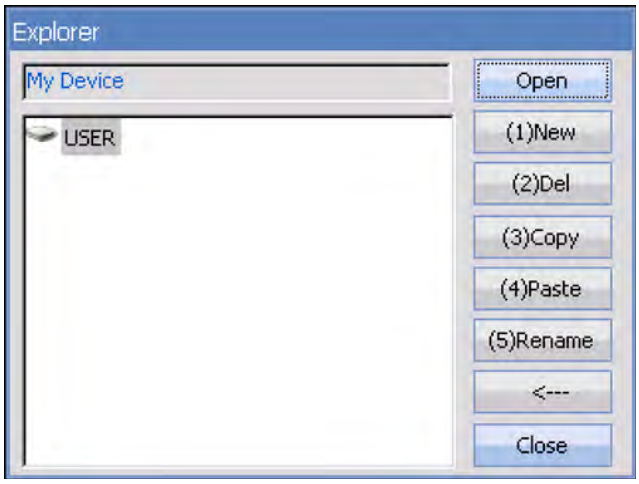


Figure 5.1 Explore

• Run ‘IVR-6123_OTDR _V1.0.0.1_SETUP.exe’ software;

• Click ‘Setup’ button.

5.3 Installing a USB Keyboard or Mouse

USB keyboard and mouse are supported by IVR-6123 Network Test Platform, please follow the following steps to install a keyboard or mouse:

• Plug the keyboard or mouse into the USB A type port which is placed on the right side of the device;

• Keyboard or mouse will be detected and recognised automatically by the system. *(Note: It is not necessary to turn off the device before connecting the keyboard or mouse. The system will detect automatically. Even a keyboard is connected, the touch screen keyboard will still be displayed when operating under system.)*

5.4 Installing Optical Fibre

To guarantee the accuracy of test result, please follow the following instruction to install the optical fibre:

• Please check the optical fibre which will be installed into the device has proper connector firstly. Unmatchable connector will damage ferrule;

• Then do the fibre end’s clearance: use cotton bud with alcohol to wipe the optical fibre end gently

and softly, and use compressed air to dry it completely, then check the end visually and make sure it clean; *(Note: INTERVRE will not be responsible for damage which occurred from improper port's clearance or operation.)*

- Unscrew the dust cap of the interface connector;
- Plug the optical fibre's connector into the device's interface carefully, please ensure the optical fibre's end has not been touched with the outside of interface and other place. If the connector is protrude type, please make sure the device's interface is concave type, can fit the connector;
- Push the connector into the device's interface, and ensure the optical fibre has been fully connected with the device. If the connector has screw sleeves, please tighten it up by screwing the screw. However, do not over screw which could damage the fibre and device. *(Note: If the optical fibre has not been installed properly, serious signal loss and light reflection will occur.)*

6. Main Interface

6.1 Function Select

IVR-6123 has 2 operational interface: OTDR and iOTA. Select and double click the icon to start an interface. If 'Auto start' has been selected, the operational interface will be as same as previous when turn on the device next time.

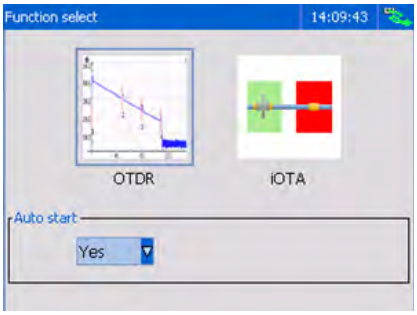


Figure 6.1 Function Select

6.2 OTDR Interface

OTDR interface is comprised by 4 parts: Status bar; Curve window; Event information; and Main menu.

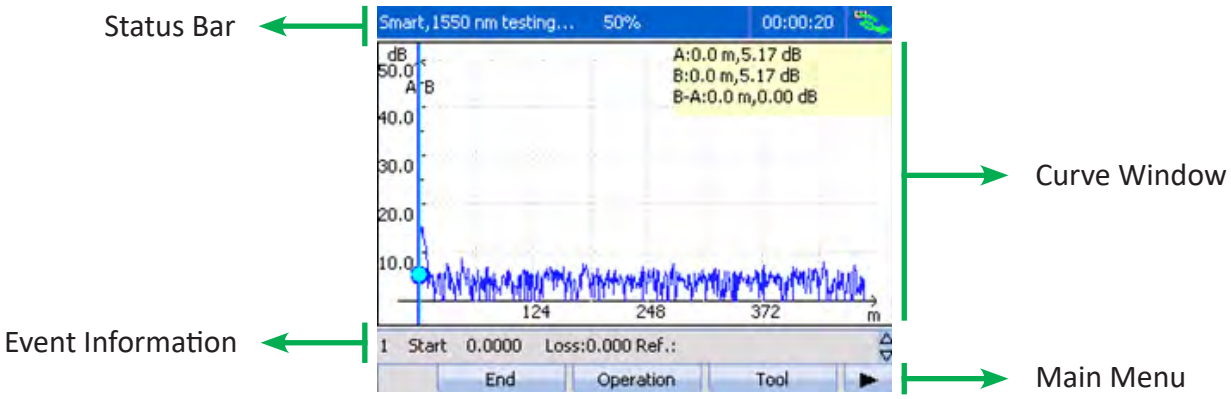


Figure 6.2 OTDR Interface

6.2.1 Status Bar

The status bar displays the current test mode, test status, test time, and battery status

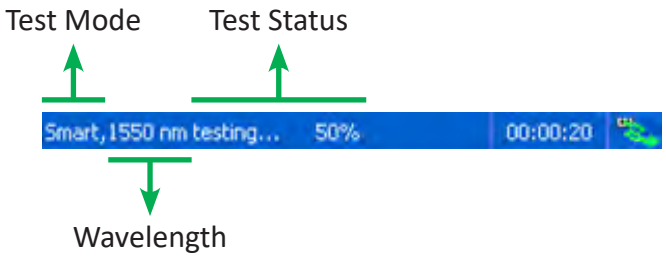


Figure 6.3 Status Bar

6.2.2 Curve Window

Figure 6.4 shows the diagram of Curve Window. The test curve will be showed in curve Window.

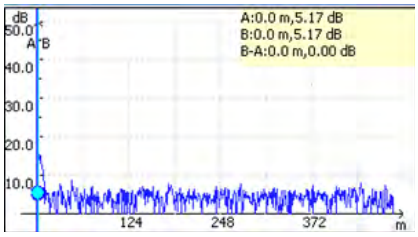


Figure 6.4 Curve Window Diagram

6.2.3 Event Information Bar

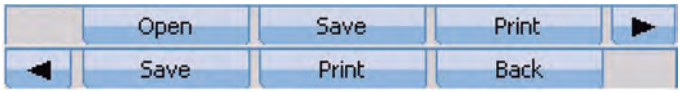
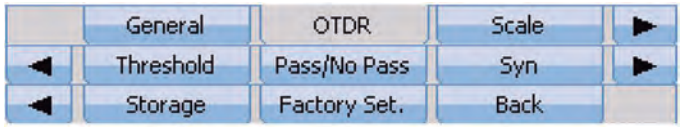
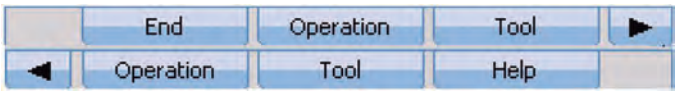
Event information displays the event's location; loss; reflection. By pressing ▲ and ▼ button to view other events. *(Note: Detail event information can been viewed in Section 7.4 Result).*

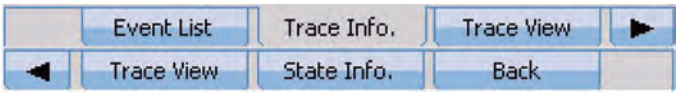
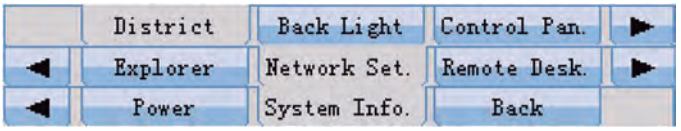
Figure 6.5 Event Information

6.2.4 OTDR Main Menu

Main Menu is on the bottom of Curve Window, and is comprised by 'Files'; 'Setting'; 'Begin'; 'Start iOTA'; 'Operation'; 'Result'; 'Tool'; 'System'; and 'Help', these 9 sub menus. Specific functions of each sub menu are demonstrated in Table 6.1.

Table 6.1 OTDR Main Menu Functions List

Sub Menu	Function
Files	• Open: Open the curve; • Save: Save the current curve; • Print: Print the current curve; • Back: Back to main menu;  Figure 6.6 File
Setting	• See Section 7.1 Parameters Setting  Figure 6.7 Settings
Begin	• Begin: Start test; • End: End test; • Operation: See Operation; • Tool: See Tool; • Help: See Help;  Figure 6.8 Begin
Start iOTA	• Click to Strat iOTA interface; Figure 6.9 iOTA
Operation	• Switch AB line: Switch A or B line; • Unlock/Lock AB line: Unlock or lock A or B line; • Analyse: Click to analyse the curve and display the event points; • Hide/Show event: Show/hide the event points on the curve; • Revert scale: Restore the display scale; • Switch Trace: Switch to other curve; • Delete Trace: Delete the current curve; • Back: Back to main menu; Figure 6.10 Operation

Sub Menu	Function
Result	• See Section 7.4 Result;  Figure 6.11 Result
Tool	• See Section 7.5 Tool; Figure 6.12 Tool
System	• See Section 7.6 System Setting;  Figure 6.13 System
Help	• About: Show corporation and version information (Figure 4.12 About); • Help (F4): Show help information; • Back: Back to main menu. Figure 6.14 Help

6.3 iOTA Interface

iOTA interface is comprised by 3 parts: Status bar; Result display window; and Main menu.

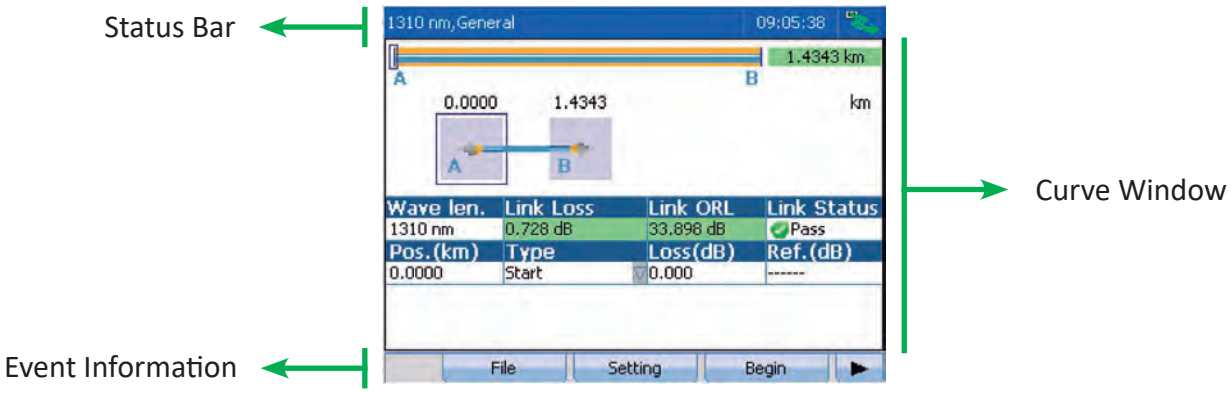


Figure 6.15 iOTA Interface

6.3.1 Status Bar

See the Section 6.2.1 Status Bar.

6.3.2 Result Display Window

The Figure 6.16 shows the diagram of result display window of iOTA interface. After test is completed, the test result will be showed on the window.

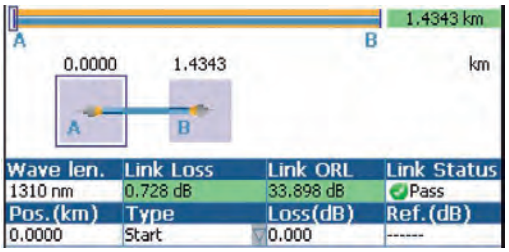
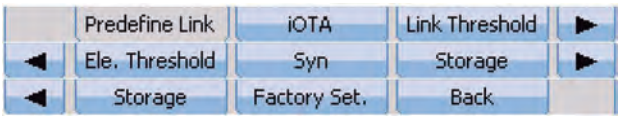
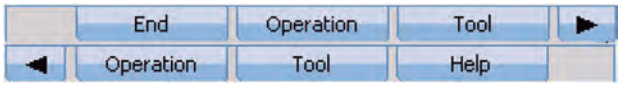
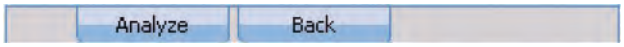


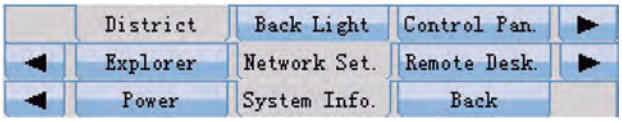
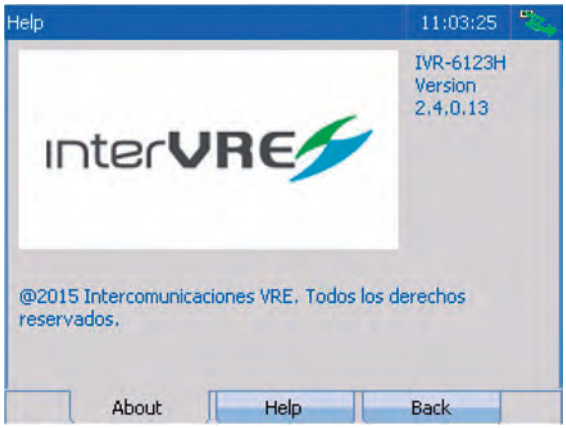
Figure 6.16 Result Display Window Diagram

6.3.3 iOTA Main Menu

Main Menu is on the bottom of Result Display Window, and is comprised by ‘Files’; ‘Setting’; ‘Begin’; ‘Start OTDR’; ‘Operation’; ‘Tool’; ‘System’; and ‘Help’, these 9 sub menus. Specific functions of each sub menu are demonstrated in Table 6.2.

Table 6.2 iOTA Main Menu Function List

Sub Menu	Function
Files	• Open: Load the curve and test result which has been saved before; • Save: Save the current curve; • Open config: Load the test configuration file which has been saved before; • Save config: Save the current test configuration; • Print: Print the current curve; • Back: Back to main menu; Figure 6.17 File
Setting	• • See Section 8.1 Parameters Setting;  Figure 6.18 Setting
Begin	• Begin: Start test; • End: End test; • Operation: See Operation; • Tool: See Tool; • Help: See Help;  Figure 6.19 Begin
Start OTDR	• Click to Strat OTDR interface; Figure 6.20 OTDR
Operation	• Analyse: Click to analyse and display the test results;  Figure 6.21 Operation
Tool	• See Section 7.5 Tool; Figure 6.22 Tool

Sub Menu	Function
System	• See Section 7.6 System Setting;  Figure 6.23 System
Help	• About: Show corporation and version information (Figure 4.12 About); • Help (F4): Show help information; • Back: Back to main menu.  Figure 6.24 Help

7. Test under OTDR Interface

7.1 Parameters Setting

Conduct an OTDR test needs to do environmental parameters configuration firstly which includes general setting; OTDR setting; scale setting; threshold setting; pass/no pass setting; synchronise setting; storage setting; and factory setting.

7.1.1 General

OTDR general setting includes grid display setting; line position display setting; result display setting; fibre span display setting; resolution setting; and span start setting.

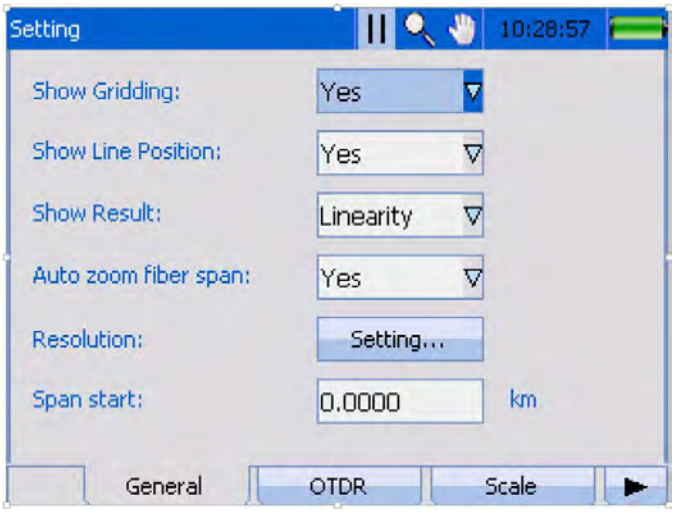


Figure 7.1 General Setting

- Show gridding: Select this option to show the grid;
- Show line position: Select this option to show the line position;
- Show result: Select test result to display between the A and B line, support,
  - *Loss,*
  - *Reflectance,*
  - *Linearity,*
  - *Attenuation,*
  - *Return loss,*
  - *Or, not display;*
- Auto zoom fibre span: Select this option to enable auto zoom fibre span function;
- Resolution setting: Click 'Setting' button to configure curve window resolution;
  - *Parameters selection: Set loss, attenuation, reflection index, return loss, and span length;*
  - *Resolution setting: Adjust resolution by clicking '-' or '+' buttons or typing value directly.*

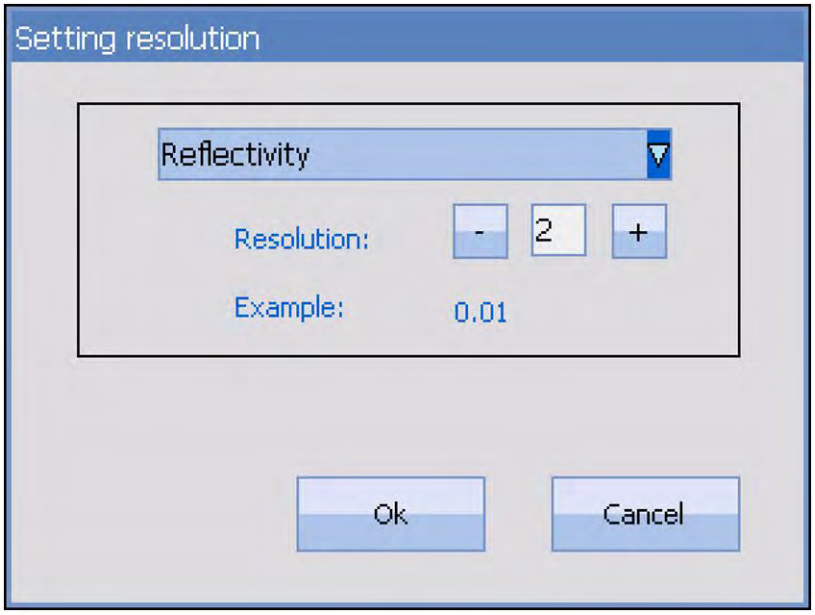


Figure 7.2 Setting Resolution

- Span start: Set value for span start point.

7.1.2 OTDR

OTDR analysis setting includes port setting; wavelength setting; span setting; pulse setting; time setting; refraction setting; test type setting; and analyse setting.

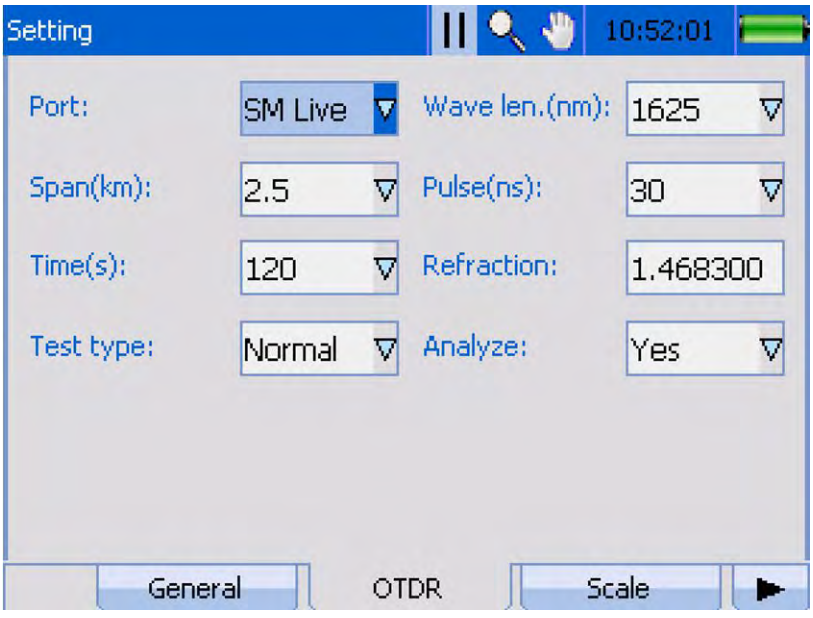


Figure 7.3 Analysis Setting

- Port: Select test port, support,
  - *SM,*
  - *SM Live;*
- Wavelength: Select test wavelength, support,

  SM Port: *SM Live;*
  - *1310 mm,*
  - *1490 mm,*
  - *1550 mm,*
  - *All,*
  - *1625 mm*
- Span (km): Select distance range of optical fibre, support,
  - *0.5 km,*
  - *2.5 km,*
  - *5 km,*
  - *15 km,*
  - *40 km,*
  - *80 km,*
  - *120 km,*
  - *160 km,*
  - *200 km,*
  - *240 km;*
- Pulse (ns): Select pulse width, support,
  - *3 ns,*
  - *5 ns,*
  - *10 ns,*
  - *30 ns,*
  - *50 ns,*
  - *100 ns,*
  - *275 ns,*
  - *500 ns,*
  - *1000 ns;*

(Note: Longer optical fibre requires wider pulse, but result resolution will be reduced. Narrower pulse provides higher result resolution, but shorter test distance range. Also, not all pulse width options are compatible with all distance range options.)

- Time (s): Select sampling duration, support,
  - *1s,*
  - *5s,*
  - *10s,*
  - *30s,*
  - *45s,*
  - *60s,*
  - *90s,*
  - *120s,*
  - *180s,*
  - *300s,*
  - *Real-time,*

(Note: Normally, longer sampling time will generate a cleaner curve, especially for longer optical fibre, because more noise will be averaged and eliminated. Also SNR and the ability of OTDR to detect small events will be improved by longer sampling time. In Real-time mode, sampling time will be 0.5s, and refresh the curve immediately, and allow to plug in or out the optical fibre during the test process.)

- Refraction: Set refractive index;

(Note: Normally, refractive index is provided by the optical fibre or cable manufacturers. The device has set default values of refractive index for different wavelength types. Refractive index should be checked before test.)

- Test type: Select test type, support,
  - *Quick,*
  - *Normal,*
  - *Precision (More sampling points, higher test precision);*

- Analyse: Select this option, programme will conduct event analysis automatically after data collection has been done, and show the event points on the curve.

7.1.3 Scale

Scale setting includes beginning setting; and scale setting.

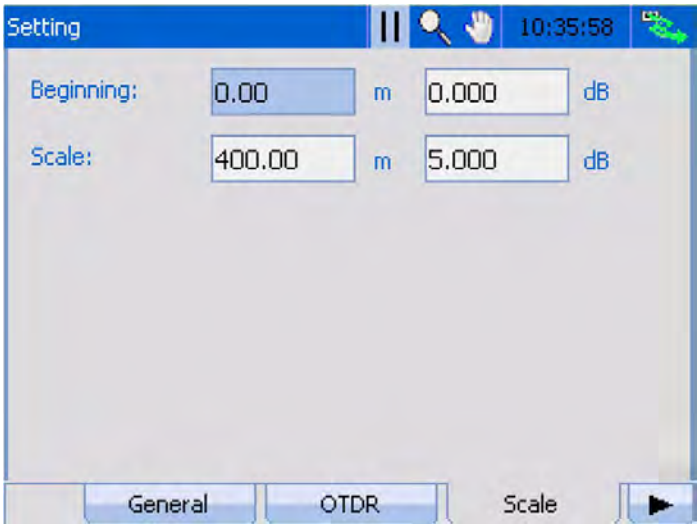


Figure 7.4 Scale

- Beginning: Set origin values of X axis and Y axis,
  - *Origin X (m): Indicate and set the origin value of X axis of current curve;*
  - *Origin Y (dB): Indicate and set the origin value of Y axis of current curve.*
- Scale: Set scale values of X axis and Y axis,
  - *Scale X (m/km): Indicate and set the scale value of X axis of current curve;*
  - *Scale Y (dB): Indicate and set the scale value of Y axis of current curve.*

7.1.4 Threshold

Threshold setting includes event threshold setting; reflect threshold setting; end threshold setting; and scatter coefficient setting.

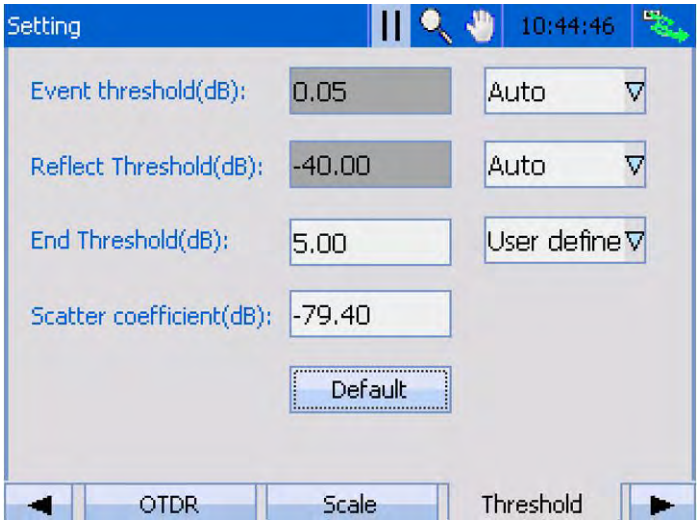


Figure 7.5 Threshold

- Event threshold (dB): Set value for event threshold, support auto and user define;
- Reflect threshold (dB): Set value for reflection threshold, support auto and user define;
- End threshold (dB): Set value for fibre end threshold, support auto and user define;
- Scatter coefficient (dB): Set value for scatter coefficient value; *(Note: Scatter coefficient value is provided by fibre manufacturer.)*
- Default: Click to restore all settings.

7.1.5 Pass/No Pass

Pass/No Pass setting includes wavelength setting; event loss setting; area attenuation setting; reflectance index setting; total loss setting; and total length setting.

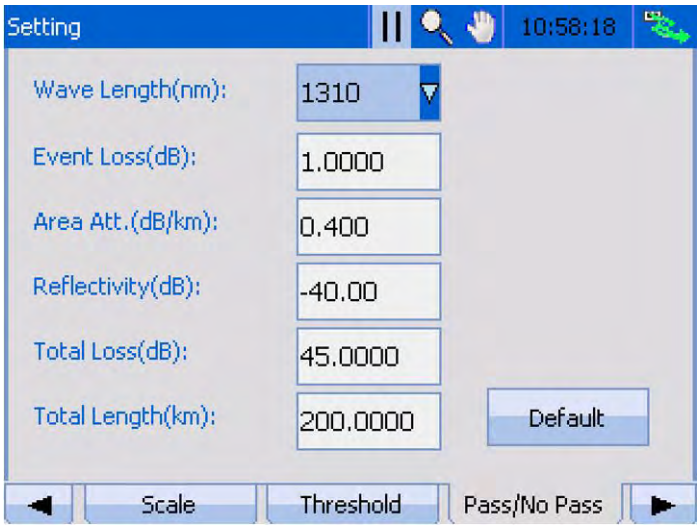


Figure 7.6 Pass/No Pass

- Wavelength (nm): Select different wavelength, support:
  - *1300,*
  - *1310,*
  - *1383,*
  - *1490,*
  - *1550,*
  - *1625,*
  - *1650,*
- Event loss (dB): Set pass or not pass value for event loss;
- Area attenuation (dB/km): Set pass or not pass value for area attenuation;
- Reflectivity (dB): Set pass or not pass value for reflectance index;
- Total loss (dB): Set pass or not pass value for total loss;
- Total length (km): Set pass or not pass value for total length.
- Default setting: Click to restore all values.

7.1.6 Synchronisation

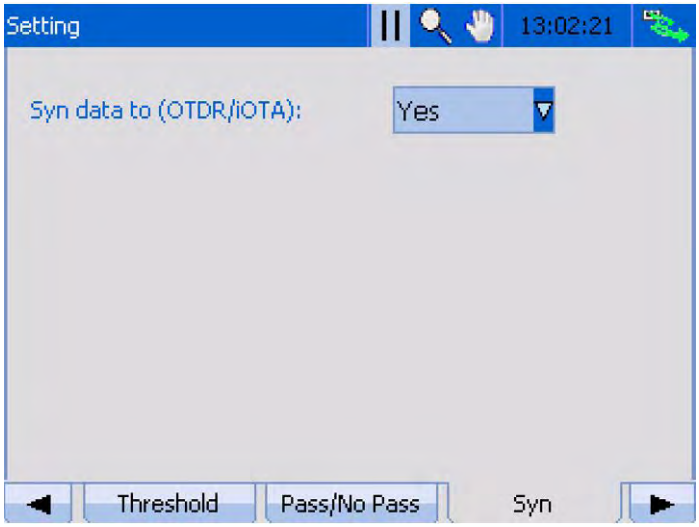


Figure 7.7 Synchronisation

- Syn data to (OTDR/iOTA): Select to synchronise the data between OTDR and iOTA interfaces.

7.1.7 Storage

Storage setting includes file prefix; file postfix; file name; and auto save.

Figure 7.8 Storage

- File prefix/postfix: Set file prefix and postfix;
- File name: Show the file name, for example, file prefix is 'Fiber' and file postfix is '002', then file name will be 'Fiber_002.sor' automatically;
- Auto save: Select this option, file can be saved automatically;
- Default value: Click to restore all values.

7.1.8 Factory Setting

Click to restore all setting back to factory setting.

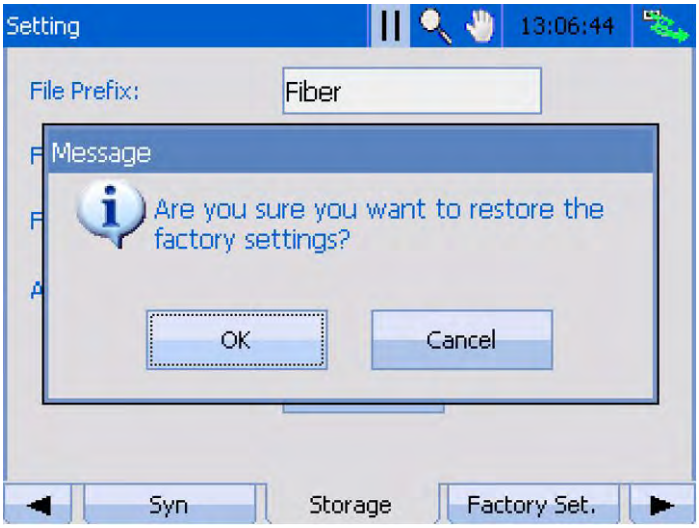


Figure 7.9 Factory Setting

7.2 Examination Modes

The device supports following 3 test modes, which are:

- Auto mode: Under this mode, all test parameters will be set automatically, test will be done automatically, and a test report will be generated automatically as well;
- Manual mode: Conduct OTDR test manually, all test parameters will be set by user manually;
- Real time mode: Under this mode, the curve will be updated consecutively in order to check any emergency. *(Note: Keep pressing 'Test' button on the panel can switch test modes between manual and real time rapidly. Press 'Test' button momentarily will start or stop the test process.)*

7.2.1 Auto Test Mode

Please follow the following steps to complete auto test:

- Clean connectors properly (Follow the procedure demonstrates in Section 5.4: Installing Optical Fibre);
- Plug an optical fibre into the OTDR port;

(Note: Please follow the Section 5.4: Installing Optical Fibre to do clearance and install a fibre. Also please ensure the optical fibre has been installed in a proper port (SM or SM Live), which is depended on the wavelength intended to use. Also before the conduct OTDR test, the device will detect whether the optical fibre has signal from the load or not, and remind the engineer whether to continue the test in order to protect the end device. The device has protection circular, optical fibre with signal from load can be plugged into the device directly. The device will be damaged by high intensity optical signal.)

- Press 'AUTO' button to start test;

(Note: All of test parameters will be set automatically by system, cannot be modified manually.)

- After the test has been done, select 'File' from main menu, and select 'Save' to save the test curve and results or press button *(Figure 6.6 File)*.

7.2.2 Manual Test Mode

Please follow the following steps to complete manual test:

- Clean connectors properly, and plug an optical fibre into the OTDR port *(All procedures and instructions are same with auto test mode);*
- Select 'OTDR' from 'Setting' sub menu, and set test parameters manually, such as wavelength, pulse width, and sampling time, etc. *(Section 7.1.2: OTDR);*
- Click 'TEST' button to conduct the test;
- After the test has been done, select 'File' from main menu, and select 'Save' to save the test curve and results or press button *(Figure 6.6 File).*

7.2.3 Real-time Test Mode

Real-time test mode can be activated under the any test mode. Please follow the following steps to complete real-time test:

- Clean connectors properly, and plug an optical fibre into the OTDR port *(All procedures and instructions are same with auto test mode);*
- Select 'OTDR' from 'Setting' sub menu, and set test parameters manually, such as wavelength, pulse width, and reflection index, etc., then select 'Real-time' from sampling time *(Section 7.1.2: OTDR);*
- Click 'TEST' button to conduct the test;
- After the test has been done, select 'File' from main menu, and select 'Save' to save the test curve and results or press button *(Figure 6.6 File).*

7.3 Curve and Event Analysis

After test has been done, please select 'Operation' from main menu and click 'Analyse' to analyse the curve.

7.3.1 View Event Information

Event information can be viewed from display window *(Figure 6.4 Curve Window Diagram)* and Event Information Bar both *(Figure 6.5 Event Information Bar).* Or select 'Result' from main menu, and then enter 'Event List' to view event information *(Figure 7.10 Event List)*. Or click what button to view event information.

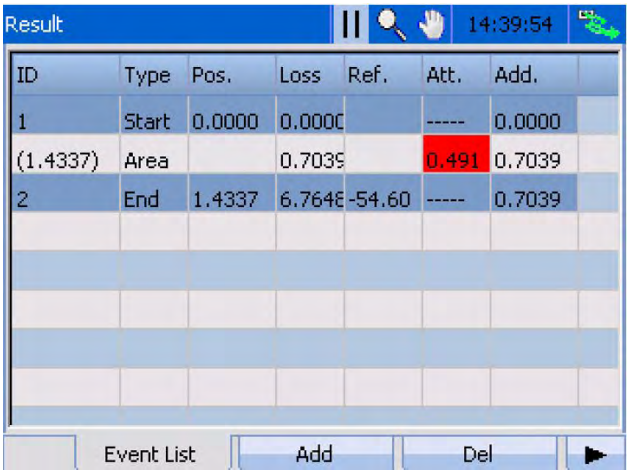


Figure 7.10 Event List

7.3.2 Zoom Curves

Curve's display scale can be changed by 3 methods:

- Select from , use button to zoom the curve horizontally, use what button to zoom the curve vertically *(Section 2.1.3: Buttons)*;
- Or, use the fingers to select the area which wants to be zoomed on the screen;
- Or, select 'Scale' from 'Setting', and set the vlaue of scale to zoom the curve *(Section 7.1.3: Scale)*.

7.3.3 Use A&B Lines

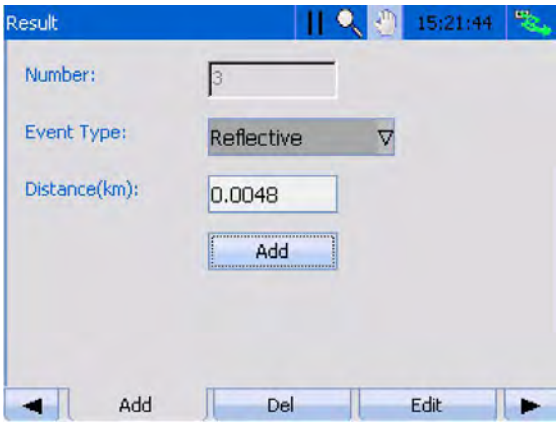
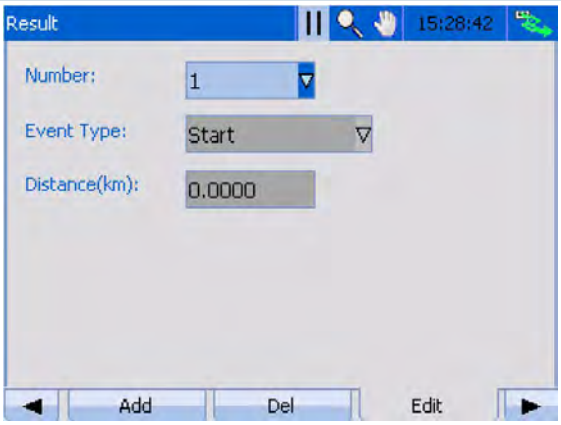
A&B auxiliary lines can be used for viewing event location and relative optical loss value from A point to B point. A&B lines can be moved by:

- Mouse or finger directly;
- Or, select from , use button to move the A or B line right or left, button to view event list (Section 2.1.3: Button). *(Note: Select 'Operation' from main menu, and click 'Switch AB lines' to switch AB lines, and if AB lines disappeared, please click 'Revert Scale' to restore.)*

7.3.4 Add, Edit and Delete Event and Event Types

The programme allows test engineer to add, edit, and delete an event. Any event can be categorised into 5 types, which are: start; reflective; non-reflective; end; and other. Table 7.1 and Table 7.2 demonstrates specific operation methods of event management and detail description of event types respectively.

Table 7.1 Add, Edit, and Delete an Event

Management	Description	Operation Methods
Add	If a known fusion point is existed in a given position, but because its optical loss value is less than the event threshold or merge into the noise, the analysis will not detect it. This kind event can be added into the event list manually. *(Note: This operation will add a point and its number on insert position of the curve but will not affect the curve.)*	• Select 'Result' from main menu *(Figure 6.11 Result)*, then select 'Event List', and click 'Add' button; • Edit event type, and it occurred position; • Click 'OK', then an event has been added
	 Figure 7.11 Add an Event	
Edit	The events existed in the event list also can be edited.	• Select 'Result' from main menu (Figure 6.11 Result), then select 'Event List', and click 'Edit' button; • Input event type and position it occurred; • Click 'OK', then an event has been edited.
	 Figure 7.12 Edit an Event	

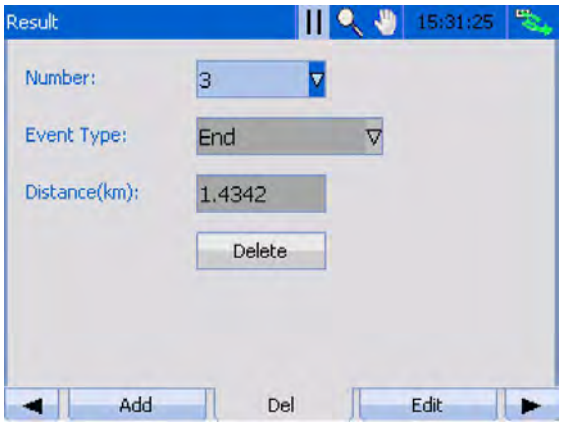
<table>
<tr><th>Management</th><th>Description</th><th>Operation Methods</th></tr>
<tr><td rowspan="2">Delete</td><td>The event existed in the event list can be deleted as well.</td><td>• Select ‘Result’ from main menu (Figure 6.11 Result), then select ‘Event List’, and click ‘Delete’ button.</td></tr>
<tr><td colspan="2"> 

Figure 7.13 Delete an Event</td></tr>
<tr><td>Start-of-Fibre Event</td><td colspan="2">It is an event points the beginning of the fibre. Normally, in default situation, Start event will be the first event occurred on the fibre (Usually it is the first connector of OTDR itself). Also other specific event can be set as the first event manually.</td></tr>
<tr><td>Reflective Event</td><td colspan="2">Normally, this kind of event has following features:
• Significant portion of optical energy which is initially launched from source has been reflected back;
• A peak appears on the curve.
Usually it is caused by:
• Fusion point existed in fibre or connector;
• Bad fusion point;
• Or fracture point.
(Note: Normally, reflective event needs to set thresholds for loss value and reflective index. When the event loss is exceed reflective event thresholds, the system will flag this event is reflective fault. Sometimes, reflection peak could be cut off partly because of its peak value is exceed the detector’s maximum detect value, therefore event dead-zone or the minimum distance required to conduct a test or attenuation between two events could be expanded.)</td></tr>
</table>

Management	Description	Operation Methods
Non-reflective Event	Normally, this kind of event has following features: • *Backscattering signal level has been attenuated suddenly;* • *A breakpoint appears on the curve.* Usually it is caused by: • *Good fusion point;* • *Bend in macro scale;* • *Or bend in micro scale.* *(Note: Normally, non-reflective event needs to set a loss value threshold, but do not need to set reflective index threshold. When the event loss is exceed non-reflective event threshold, the system will flag this event is non-reflective fault.)*	
End-of-Fibre Event	It is an event points the end of the fibre. Normally, in default situation, End event will be the last event occurred on the fibre. Also other event can be set as the first event manually.	
Other	Some events do not belong to the previous 4 types.	

7.3.5 Obtain Test Result

The device can test event position and relative loss value; event loss; attenuation; reflection index; return loss; and linearity. Table 7.3 describes definitions of each test results and operation methods to realise.

Table 7.3 Test Result Descriptions and Operation Methods

Results	Descriptions	Operation Method
Event Position (km)	Position that event occurred	Event position will be calculated and displayed in display window, Event Information bar *(Figure 6.5 Event Information Bar)*, or Event list *(Figure 7.14 Event List)*
Relative Loss Value (dB)	Relative optical loss value between A point and B point.	• Move A line to the end of the linear area before the event occurred area; • Move B line to the start of the linear area after the event occurred area; • Select 'General' from 'Setting' sub menu and select 'Loss' from 'Show result' box *(Figure 7.1 General);* • The event loss will be showed on the curve window

Results	Descriptions	Operation Method
Event Loss (dB)	It is calculated by measuring signal level reduction during Rayleigh back-scattering. It can be caused by: • *Reflective event* • *Non-reflective event*	• Move A line to any point of the curve; • Move B line to any point of the curve; • Select 'General' from 'Setting' sub menu and select 'Attenuation' from 'Show result' box *(Figure 7.1 General);* • The attenuation will be showed on the curve window
Attenuation (dB/km)	It is Rayleigh backscattering signal level attenuation. Its calculation is that divide optical loss value between A point and B point by distance between A point and B. *(Note: Attenuation test cannot be done when an event existed between A point and B point.)*	• Move A line to any point of the curve; • Move B line to any point of the curve; • Select 'General' from 'Setting' sub menu and select 'Attenuation' from 'Show result' box (Figure 7.1 General); • The attenuation will be showed on the curve window.
Reflection Index	It is ratio of reflected light with incident light. *(Note: Reflection index of all reflective events which have been merged as a reflective fault can be measure during this procedure as well.)*	• Move A line to any point of the curve; • Move B line to the peak of the reflective event; • Select 'General' from 'Setting' sub menu and select 'Reflectance' from 'Show result' box *(Figure 7.1 General);* • Reflection index will be showed on the curve window
Return Loss	It refers to the total effect of multiple reflective events and scattering events. *(Note: Return loss must be calculated by single-mode OTDR.)*	• Move A line to the end of the linear area before the event occurred area; • Move B line to the start of the linear area after the event occurred area; • Select 'General' from 'Setting' sub menu and select 'Return Loss' from 'Show result' box (Figure 7.1 General); • Return loss will be showed on the curve window
Linearity	To obtain linearity result, follow the operation method	• Move A line to the end of the linear area before the event occurred area; • Move B line to the start of the linear area after the event occurred area; • Select 'General' from 'Setting' sub menu and select 'Linearity' from 'Show result' box *(Figure 7.1 General);* • Linearity will be showed on the curve window.

7.4 Result

Result sub menu from main menu includes event list, trace information, and trace overview these 3 functions. Specific description of each function is showed in Table 7.4.

Table 7.4 Description of Event List, Trace Information, Trace Overview

Sub Menu	Description
Event List	• Event list: Display number, event type, position loss, reference, and attenuation; • Event manage: Add, edit, delete, and analyse *(Section 7.3.4: Add, Edit, and Delete Event and Event Types)*
Trace Information	• Curve information: Display current curve date, time, wavelength, test range, pulse width, sample time, fibre length, span loss, average loss, high resolution, refraction, scatter coef, event threshold, and end threshold;

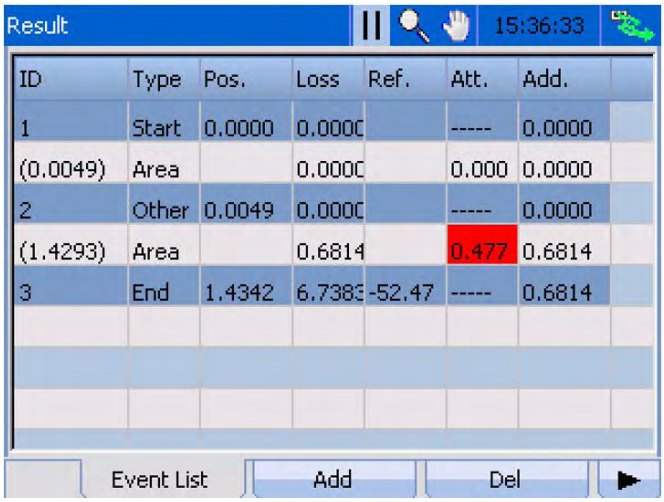


Figure 7.14 Event List

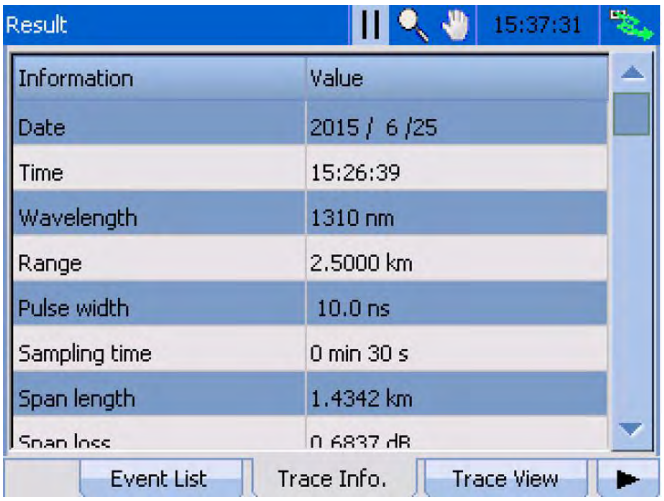
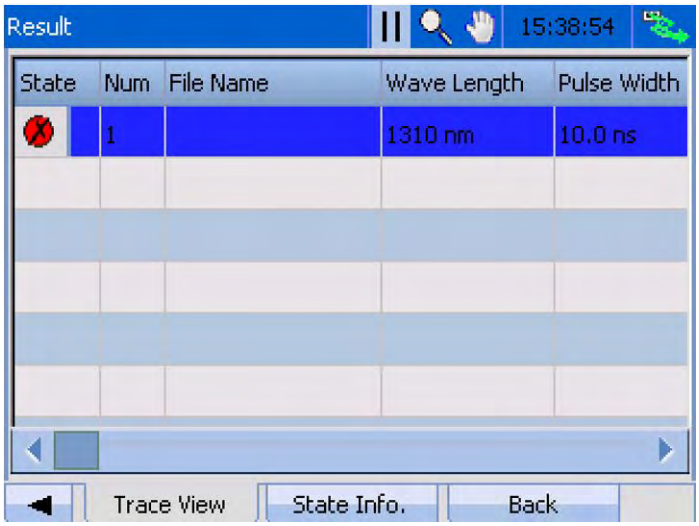
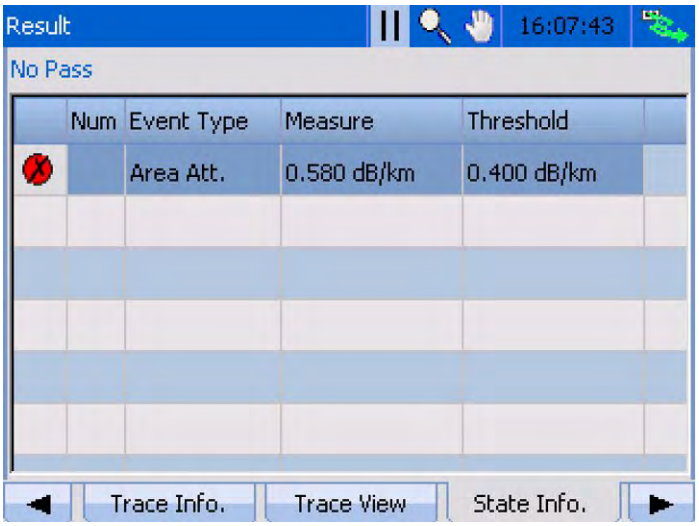


Figure 7.15 Curve Information

Sub Menu	Description
Trace Overview	• Curve information: display all opened curve information, including pass/ no pass status, number, file name, wavelength, pulse width, average loss, total loss, average event, max event and total length;  Figure 7.16 Curve Overview
State Information	• State Information: display number, event type, measure, and threshold information.  Figure 7.17 State Information

7.5 Tool

Tool has light source function and VFL function.

7.5.1 Light Source

Use light source measurement needs to follow the following steps:

- Select 'Tool' from main menu and enter 'Light Source';
- Plug the test fibre into the port *(Please follow the Section 5.4: Installing Optical Fibre);*
- Select 'Wavelength', support,
  - *1310mm,* *1490mm,* *1550mm,* *1625mm;*
- Select 'Waveform', support,
  - *CW,* *270Hz,* *330Hz,*
  - *1kHz,* *2kHz.*

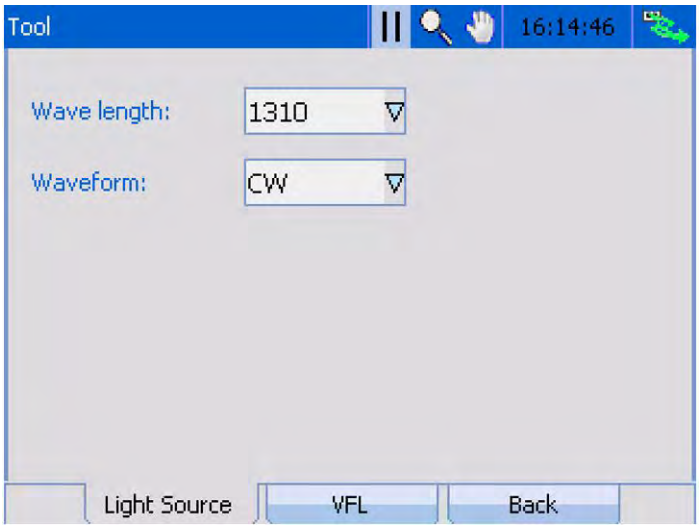


Figure 7.18 Light Source

7.5.2 VFL

Use VFL measurement needs to follow the following steps:

- Select 'Tool' from main menu and enter 'VFL';
- Plug the test fibre into VFL port *(Please follow the Section 5.4: Installing Optical Fibre);*
- Select 'Waveform'.

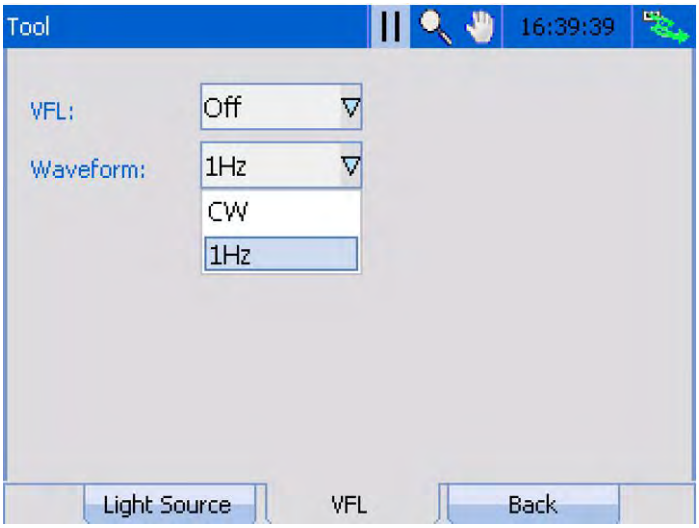


Figure 7.19 VFL

7.6 System Setting

The system setting of the device includes 'District'; 'Back Light'; 'Control Panel'; 'Explorer'; 'Network Setting'; 'Network Tool'; 'Remote Desk'; 'Power'; and 'System Information'. Table 7.5 describe the system setting of the device.

Table 7.5 System Setting

Sub Menu	Function

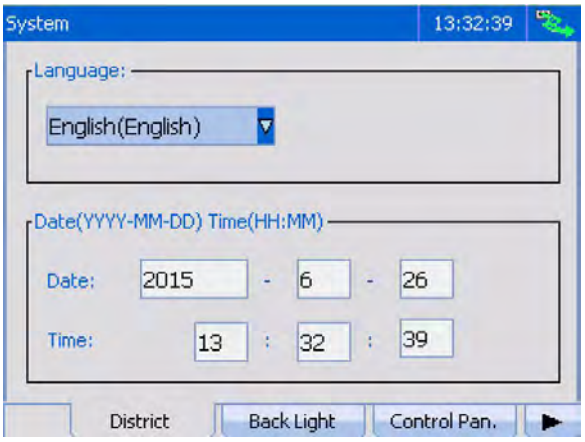
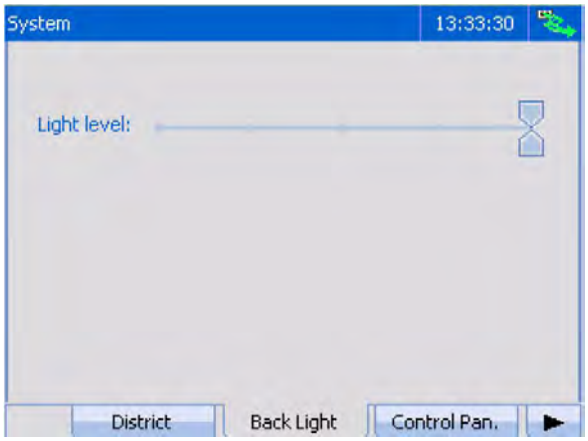
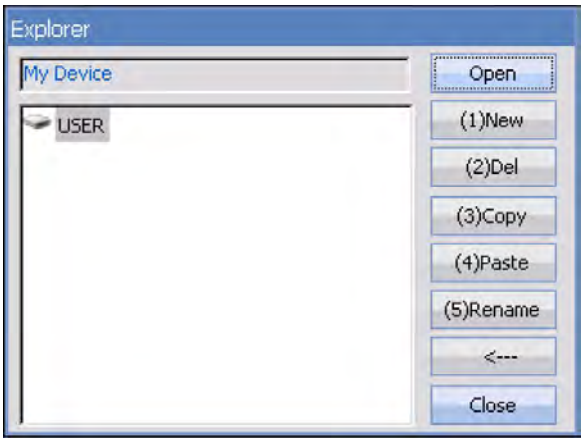
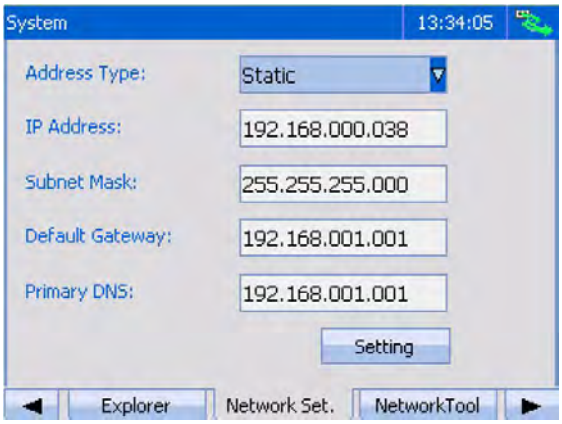
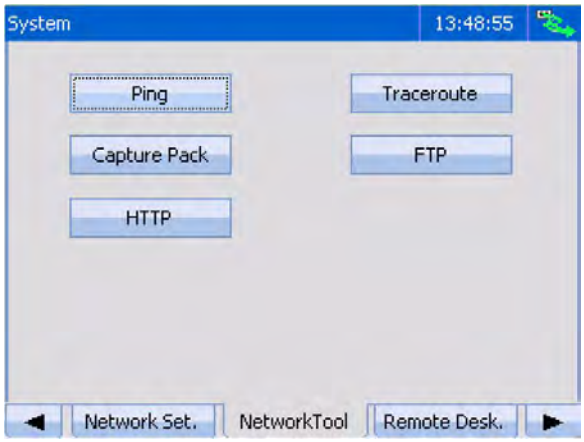
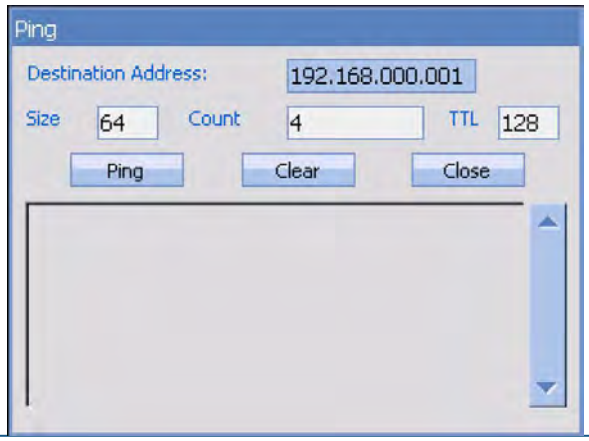
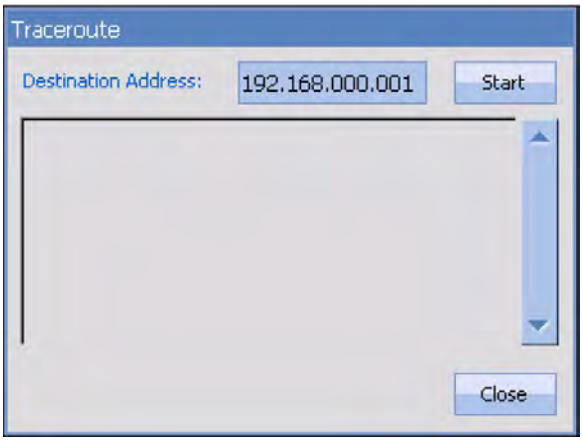
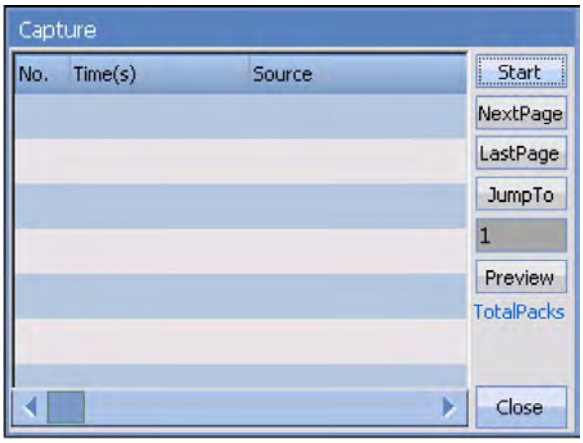
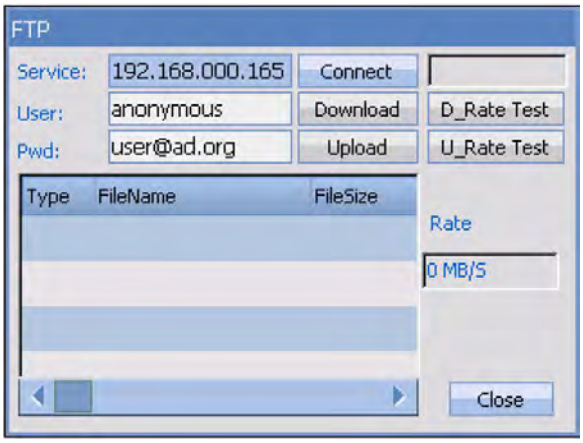
District	• 'Language': Select language, support,
	  • *Chinese,*
	  • *English;*
	• 'Date': Set date;
	• 'Time': Set time;
	 

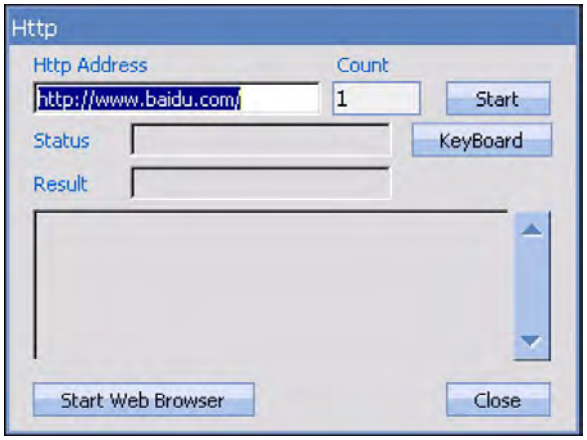
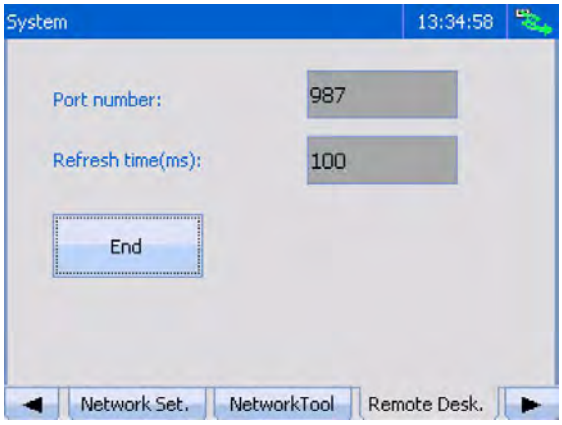
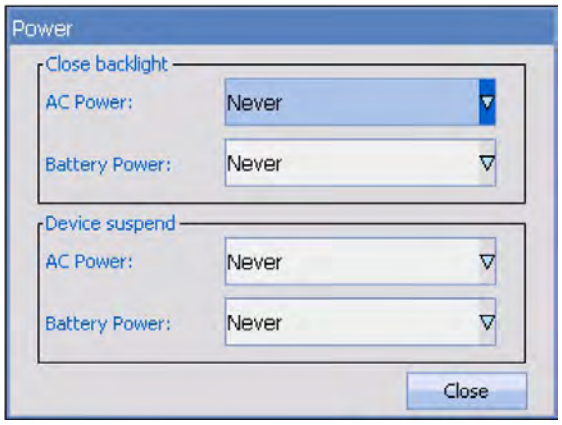
Figure 7.20 District

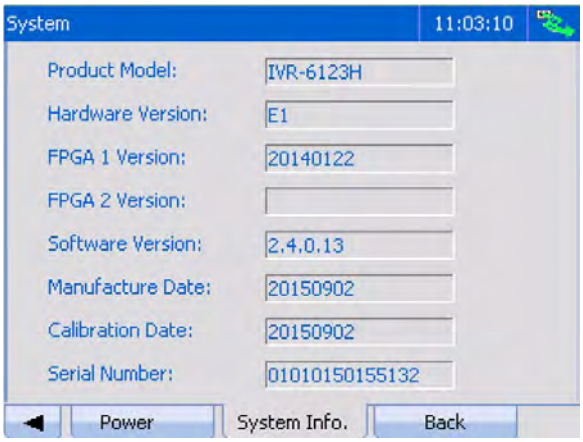
Sub Menu	Function
Back Light	• 'Back Light': Set brightness for back light;  Figure 7.21 Back Light
Control Panel	• Explorer: Show all files information in system;  Figure 7.23 Explorer

Network Setting	• 'Address Type': Select IP address type, support,
	  • *Static,*
	  • *DHCP;*
	• 'IP Address': Set IP address;
	• 'Subnet Mask': Set subnet mask;
	• 'Default Gateway': Set default gateway;
	• 'Primary DNS': Set primary DNS;
	• 'Setting': Click to make the setting into effect;

Sub Menu	Function
Network Setting	 Figure 7.24 Network Setting
Network Tool	• Ping: Set destination address, Size, Count, and TTL, then ping; • Trace Route: Set destination address, and click to start trace route; • Capture Pack: Connect the device with internet and click to start package capture; • FTP: Set server IP address, user name and password, then do FTP test; • HTTP: Input website address and count, then do HTTP test.  Figure 7.25 Network Tool  Figure 7.26 Ping

Sub Menu	Function
Network Tool	 Figure 7.27 Trace Route  Figure 7.28 Capture  Figure 7.29 FTP

Sub Menu	Function
Network Tool	 Figure 7.30 HTTP
Remote Desktop	• 'Port number': Set remote control port number; • 'Refresh time'(ms): Set remote control refresh time; • 'Strat/End': Click to strat or end remote control;  Figure 7.31 Remote Desktop
Power	• 'Power': Set backlight and device automatic turn off time;  Figure 7.32 Power

Sub Menu	Function
System Information	• ‘System information’: Display system information;  Figure 7.33 System Information

8. Test under iOTA

8.1 Parameters Setting

8.1.1 Predefine Link

Predefine link allow the test engineer to define the types of first optical splitter and second optical splitter.

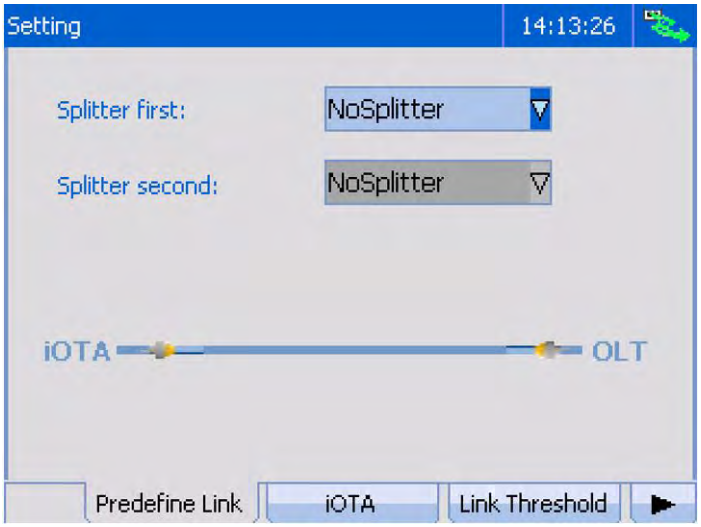


Figure 8.1 Predefine Link

- Splitter first: Choose the type of the first optical splitter, support,
  - *No Splitter,*
  - *Splitter 1:?,*
  - *Splitter 1:2,*
  - *Splitter 1:4,*
  - *Splitter 1:8,*
  - *Splitter 1:16,*
  - *Splitter 1:32,*
  - *Splitter 1:64,*
  - *Splitter 1:128;*

- Splitter second: Choose the type of the second optical splitter, support,
  - *No Splitter,*
  - *Splitter 1:?,*
  - *Splitter 1:2,*
  - *Splitter 1:4,*
  - *Splitter 1:8,*
  - *Splitter 1:16,*
  - *Splitter 1:32,*
  - *Splitter 1:64,*
  - *Splitter 1:128;*

8.1.2 iOTA

iOTA setting includes wavelength; refraction; and scatter coefficient.

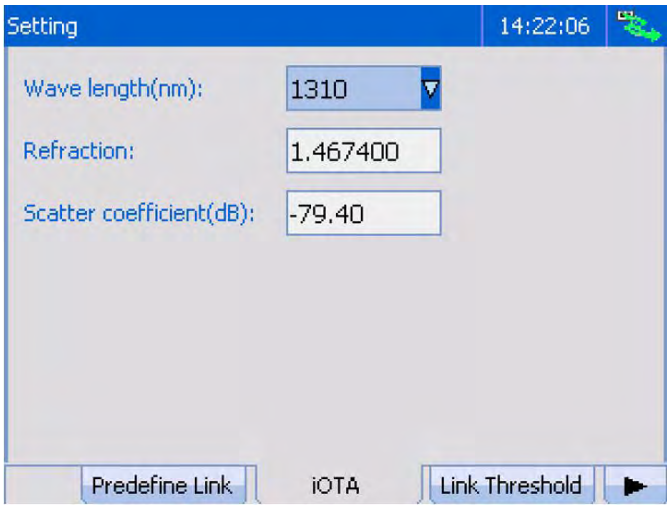


Figure 8.2 iOTA

- Wavelength (nm): Set wavelength for testing, support,
  - *1310,*
  - *1490,*
  - *1550,*
  - *1625;*
- Refraction: Set refractive index;

(Note: Normally, refractive index is provided by the optical fibre or cable manufacturers. The device has set default values of refractive index for different wavelength types. Refractive index should be checked before test.)

- Scatter coefficient (dB): Set value for scatter coefficient value;

(Note: Scatter coefficient value is provided by fibre manufacturer.)

8.1.3 Link Threshold

Link threshold setting includes link length setting; wavelength setting; link loss setting; and link ORL setting.

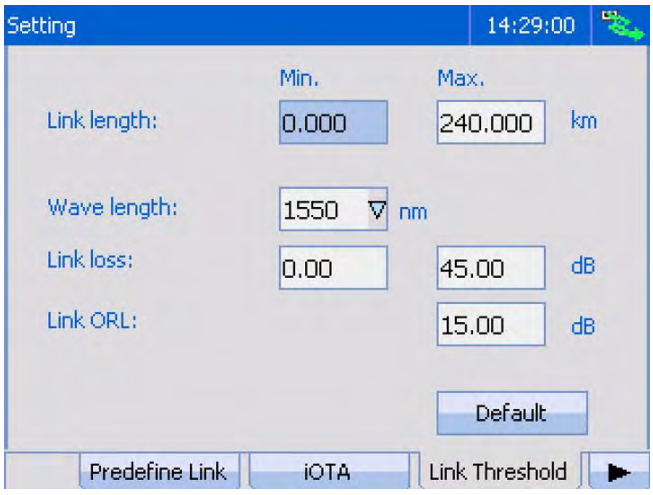


Figure 8.3 Link Threshold

- Link length (km): Set the minimum and maximum values for link length;
- Wavelength (nm): Select wavelength for setting threshold, support,
  - *1300,* *1310,* *1383,* *1490,*
  - *1550,* *1625,* *1650;*
- Link loss (dB): Set the minimum and maximum estimated values for link loss;
- Link ORL (dB): Set the minimum and maximum estimated values for link return loss;
- Default: Click to restore all settings.

8.1.4 Element Threshold

Element threshold setting includes pass/fail setting; wavelength setting; splice loss setting; connector loss setting; reflect setting; splitter ratio setting; and splitter loss setting.

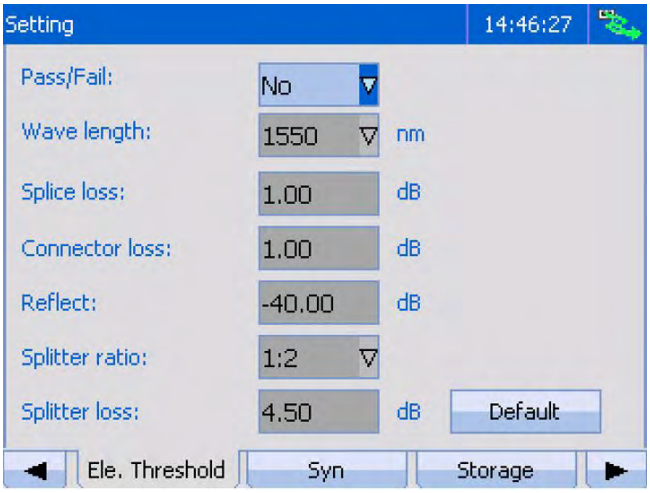


Figure 8.4 Element Threshold

- Pass/Fail: Select 'YES' to enable Pass/Fail function;
- Wavelength (nm): select wavelength for setting element threshold, support,
  - *1300,* *1310,* *1383,* *1490,*
  - *1550,* *1625,* *1650;*
- Splice loss (dB): Set value for splice loss, default value is 1dB;
- Connector loss (dB): Set value for connector loss, default value is 1.0dB;
- Reflect (dB): Set value for reflectance index, default value is -40dB;

- Splitter ratio: Set splitter ratio, support,
  - *Splitter 1:2,*
  - *Splitter 1:4,*
  - *Splitter 1:8,*
  - *Splitter 1:16,*
  - *Splitter 1:32,*
  - *Splitter 1:64,*
  - *Splitter 1:128;*

- Splitter loss (dB): Set value for splitter loss, default value is 4.50dB;

- Default: Click to restore all settings.

8.1.5 Synchronisation

See Section 7.1.6 Synchronisation.

8.1.6 Storage

See Section 7.1.7 Storage.

8.1.7 Factory Setting

See Section 7.1.8 Factory Setting.

8.2 Test Result

Click Begin to start the test. After the test has been done completely, the result will be showed on the screen. Then click the element icon to view its detail information, such as type; link loss; distance, etc. If the element icon is red, which means the element is not passed; otherwise green means pass.

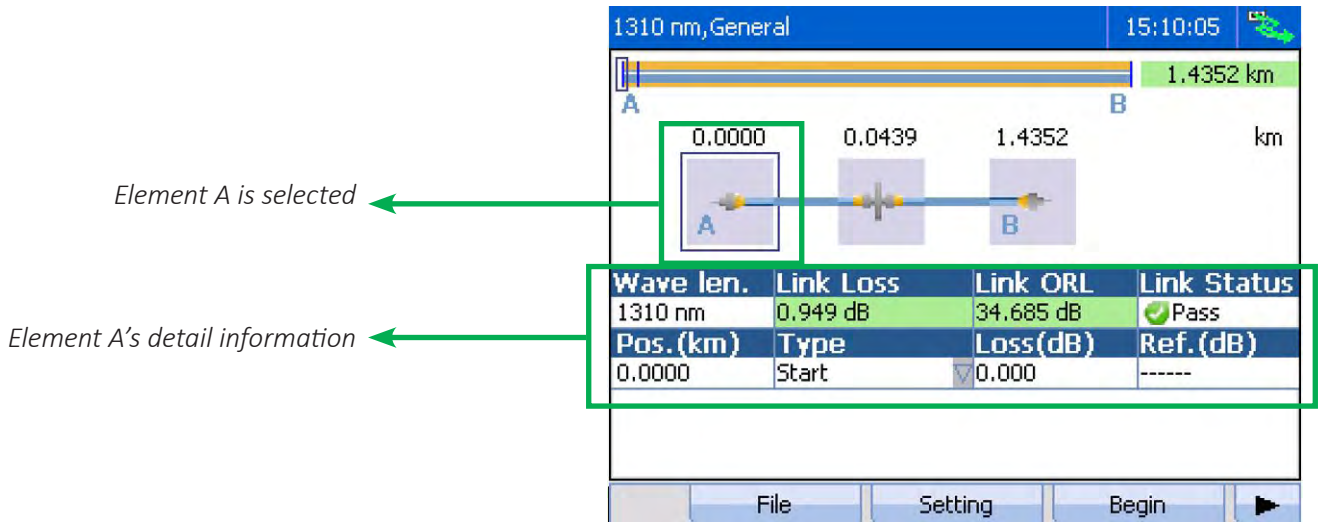


Figure 8.5 Test Result

9. Maintenance

9.1 General Maintenance Instruction

Please follow the following instruction to maintain the device in order to long term operation with high accuracy and precision.

- Clean optical connectors every time before use;
- Avoid dust, dirt, and ash;
- Use slightly wet cloth to clean the device shell;
- Store the device under clean and dry environment and avoid direct sunshine;
- Avoid the high humidity and great temperature fluctuations environment;
- Avoid the fiercely vibration and impact;
- If any liquid has been spurted to the device or inside the device, please shut down the device immediately, and dry the device completely.

9.2 Transportation

Transportation environmental requirements must be strictly followed the Environmental Guidelines *(Section 3.1: Environmental Guidelines)*. Improper and inappropriate operation has relatively high probability to cause permanent damage to the device. Follow the following instruction could minimise the possibility of damage occurrence:

- Use the device's original package to pack the device during transportation;
- Avoid to transport the device under the high humidity and great temperature fluctuations environment;
- Avoid direct sunshine and the fiercely vibration and impact.

10. Troubleshooting

10.1 Common Problems Solutions

Table 10.1 describes some common problems and solutions.

Table 10.1 Common Problems and Solutions

Problems	Cause	Solution
Device start failure	Battery power has been consumed entirely.	• Charge the battery; • Replace the battery which has been fully charged; • Plug in an AC/DC adapter.
	External power supply has not been connected.	Connect the external power supply with the device.
	External power supply has not been plugged in the proper socket.	Check the external power supply power has been plugged in socket properly.
	Battery compartment cover has not been locked or placed properly.	Check battery compartment cover has been locked properly, please replace a new one if it has been broken.
Screen display failure	Battery power has been consumed entirely, and the device has been shut down.	• Charge the battery; • Replace the battery which has been fully charged; • Plug in an AC/DC adapter.
Device' operation time reduce	Battery needs to be replaced.	Replace the battery.
	Battery is not fully charged.	Charge the battery.
'Non-resolved fibre end' message displayed	The fibre length is exceed the maximum test range of OTDR.	Ensure the test fibre length is shorter than the maximum test range of OTDR.
'Live fibre error' message displayed	Unknown light has been detected from OTDR port during the sampling procedure.	• Disconnect the optical fibre from the port; • Start another sampling procedure but do not connect any fibre; • If the error message still appears, when the fibre has not been connected with OTDR, please contact INTERVRE technical support (Section 10.2: Technical Support).

10.2 Technical Support Contact

If any other problems occurs, please contact INTERVRE technical support or customer service immediately with product name, serial number *(which can be found in product identification label)*, and a short description of the problem, which can make our technical supporters to solve your problems as soon as possible. Contact detail is demonstrated in below:

Technical Support
Tel: +52 55 45931368
Email: jesica.garcia@intervre.com / heber.vallejo@intervre.com

10.3 Transportation

Transportation environmental requirements must be strictly followed the Environmental Guidelines *(Section 3.1: Environmental Guidelines)*. Improper and inappropriate operation has relatively high probability to cause permanent damage to the device. Follow the following instruction could minimise the possibility of damage occurrence:

- Use the device's original package to pack the device during transportation;
- Avoid to transport the device under the high humidity and great temperature fluctuation environment;
- Avoid direct sunlight;
- Avoid the fiercely vibration and impact.

II. Warranty

11.1 Warranty Statement

INTERVRE guarantees this device will be warranted for 3 years from the date of initial shipment against the defects caused by material or manufacture.

During the warranty period, INTERVRE has authority to repair, replace, or issues credit for any defective products. Free examination and adjustment service for the defective products which need to be repaired, or the products which have an inaccurate default calibration problem also will be provided during the warranty period. However, if the device was delivered back to the factory for examining an inaccurate default calibration problem, but eventually the examination result shows all the measurements meet the requirements which have been published in public, standard calibration fee will be charged by INTERVRE even the product is in the warranty period.

The warranty will invalid if:

- Device has been opened or repaired by unauthorised person or non-INTERVRE employees;
- Warranty sticker has been removed, or case has been opened without permission;
- Device's serial number has been modified, erased, or removed;
- Device has been damaged by misuse, or accident.

11.2 Disclaimer

INTERVRE shall have no liability for any loss or damage resulting from the usage of the product, any performance failure of other items which is connected with the product, misuse or unauthorised modification of the product and its accessories and software. Also INTERVRE shall have no liability for any loss or damage caused by force majeure or nature related to.

INTERVRE reserves all the right to change and modify the product design and structure.
INTERVRE shall have no liability to modify any components of the products to meet the customer requirements after the products have been purchased. Accessories, including but not limited to fuse, LED indicators, batteries and universal interfaces (EUI) used with INTERVRE products are not covered by this warranty.

The warranty excludes the any loss or damage resulting from improper or inappropriate usage or installation, normal tear and wear, accident, negligence, fire, water, lightning strike or other force majeure of nature, which are beyond INTERVRE's responsibility.

11.3 Service and Repairs

INTERVRE commits to provide product repair service for 5 years after the date of the product has been purchased. Following instruction may be helpful, if the device required a technical support or repair service:

- Please call INTERVRE's technical support group *(Section 10.2: Technical Support Contact)*, type of service which is the device required will be determined by INTERVRE's technical support employees;
- If the device must be returned to INTERVRE or an authorised service centre, INTERVRE's technical support employees will issue a Return Merchandise Authorisation (RMA) number and provide an address for returning;
- If possible, back up the device data before sending it back for repairing;
- Pack the device use its original package, please attach a detail report of defect and situation has been observed;
- Please deliver the device to the address which is provided by INTERVRE's technical support group, and RMA number must be attached on the parcel otherwise the parcels will be rejected by INTERVRE *(Section 11.1: Warrant Statement)*.

The device will be delivered back to customers immediately when repair or maintenance has been done, and a report with fully detail repair or maintenance information will be attached with the device as well. If the device is not in the warranty period, a receipt of the cost of the repair or maintenance service will be invoiced and attached to the report. If the device is in the warranty period, service fee will not be charged to the customers including the delivery fee for returning the device back, but delivery insurance will be at customer's expense.

- *Intervre reserves the right to alter and amend the design, characteristics and specifications without notice or obligation.*

Service and Support

Sales Contact and Technical Support

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Email: jesica.garcia@intervre.com / heber.vallejo@intervre.com

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Post Code: 07870
Tel: +52 55 84374485 / +52 55 45931368
Web: www.intervre.com

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