



# Precision Rated Optics

Work with a PRO!

## PRO-6350

## OTDR



## Operation Guide

### ***Notices***

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### ***ISO9001 Certification***

Produced to ISO9001 International Quality System Standard as part of Precision Rated Optics, is objective of continually increasing customer satisfaction through improved process control.

### ***Safety Instructions***

During each stage of operation of this instrument, please always observe the following safety instructions. Not taking any safety precautions or following the instructions will violate the safety standards of design, manufacturing and application of these instruments. In no case will Precision Rated Optics bear the responsibilities for consequences incurred by violation of the following instructions.

### ***General***

This product is a Safety Class 1 instrument. The protective features of this product may be impaired if it is used in a manner not specified in the operation instrument.

### ***Environmental Conditions***

It is designed to operate at a maximum relative humidity of 95% and at altitudes of up to 2000 meters. Refer to the specifications tables.

### ***Before Applying Power***

Verify that the product is set to match the available line voltage, the correct fuse is installed, and all safety precautions are taken. Note the PRO-6350's external markings described under Symbols.

### ***Do Not Operate in an Explosive Atmosphere***

Do not operate PRO-6350 in the presence of flammable gases or fumes.

### ***Do Not Remove the PRO-6350 Cover***

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified service personnel. Instrument that appears damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

### ***Safety Terms Used in This Manual***

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personnel injury. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or the entire product. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

The NOTE sign information that may be beneficial during the use and maintenance of the PRO-6350.

### ***Laser Safety Announcements***

#### ***Warning***

The PRO-6350 is a laser instrument. Users should avoid looking directly into the optic output.

- Always avoid looking directly into the optical output port, when the PRO-6350 is working. And the use of microscope or magnifier should also be avoided, for the use of such devices can focus a highly intense beam onto the retina, which may result in permanent eye damage.
- Always replace protective dust cap on the probe port when the PRO-6350 is not being used.
- Always avoid looking directly at unconnected end of optic fiber in testing and make the unconnected end pointing at a non-reflective object if available.

### ***Electric Safety Announcements***



If need to assure instrument thorough outage, please pull up power line and take the battery out.

#### ***Warning***

- AC/DC adapter should be used only indoors.
- The ambient air of the PRO-6350 place should be free flow.
- Any using of electric tools near inflammable gas or smog will be a big safety threat.
- In order to avoid electric shock, please don't use instrument if there is damage on any outside surface part (top cover, panel, etc)
- Only qualified professional staff can do electrified adjustment, maintenance and repair to the operating instrument.
- Even if the PRO-6350 power is cut off; the capacity in the PRO-6350 might be electrified for some time after that.

### ***Agreement and Statement***

**Button or menu:** The operating units in GUI that can be clicked by stylus, indicated by letters in square brackets, e.g. [Setup] and [Start].

**Key:** The function key on front panel, indicated by letter or icon in quotation marks, e.g. “” (POWER) and “” (BACKLIGHT).

**Option label:** Indicated by letters in brace, e.g. {Event} and {Trace Parameter}.

**Label and subordinate specific options:** Indicated by letters in angle brackets and square brackets, e.g. <Mode> [Average], which stands for averaging mode option; <Wavelength> [1310nm], which stands for 1310nm wavelength option.

**Mode or module:** Indicated by letters in quotation marks, e.g. “OTDR” and “OCI”.

**Conversation:** Indicated by letter in quotation marks e.g. “Confirm” and “Cancel”.

## Table of Contents

<b>Specifications .....</b>	<b>11</b>
<b>1 General Information .....</b>	<b>12</b>
1.1 Scope of this Manual .....	12
1.2 Introduction .....	12
1.3 Product Appearance.....	13
1.4 Front Panel Indicators Introduction.....	14
1.5 Front Panel Keys Instruction .....	14
1.6 Operating Parts Instructions .....	15
1.7 Instrument Interfaces Instructions .....	16
1.8 GUI Icons Instruction.....	18
1.9 Power Instruction.....	19
1.10 Use of Rechargeable Battery .....	19
<b>2 Basic Operation .....</b>	<b>20</b>
2.1 Foreword.....	20
2.2 Power On/Off .....	20
2.3 Enter and Exit Power Saving Mode .....	20
2.4 Adjust LCD Brightness .....	21
2.5 Start Application.....	21
2.6 Install USB Keyboard/Mouse.....	22
2.7 Printer Configuration.....	22
<b>3 Common Settings and Special Settings.....</b>	<b>24</b>
3.1 Main Setting Menu .....	24
3.2 Select language.....	24
3.3 Automatic Power Saving Setting.....	24
3.4 Recalibrate Touch Screen.....	25
3.5 Serious Deviation of Touch Screen.....	25
3.6 Date and Time Settings .....	25
3.7 Other Parameters Configuration.....	26
3.8 Load Default.....	26
<b>4 Basic Information of OTDR Module .....</b>	<b>27</b>
4.1 Principle of OTDR Module .....	27

4.2	Measurement Application of OTDR .....	27
4.3	Basic Definition and Classification of Events.....	27
4.3.1	Reflection Events.....	28
4.3.2	Non-reflection Events.....	28
4.4	Optic Fiber Link and Event Types .....	28
<b>5</b>	<b>Instruction of OTDR Modules of The PRO-6350.....</b>	<b>29</b>
5.1	Main Features of OTDR Module.....	29
5.2	Measurement Mode of OTDR module.....	29
5.2.1	Auto Mode and Manual Mode.....	29
5.2.2	Averaging Mode and Realtime Mode .....	29
5.2.3	In-service Mode and Normal Mode.....	29
5.3	OTDR Interface .....	30
5.4	Icons Instruction in OTDR Interface .....	31
5.5	Trace Processing.....	32
5.6	Available OTDR Module .....	32
<b>6</b>	<b>Prepare to Use OTDR .....</b>	<b>33</b>
6.1	Connectors Instruction.....	33
6.2	Cleaning and Connecting to Optical Fiber .....	33
<b>7.</b>	<b>Test with OTDR.....</b>	<b>34</b>
7.1	OTDR Quick Test.....	34
7.2	Trace Processing.....	35
7.3	Unsaved Traces .....	35
7.4	Save Trace .....	35
7.5	Auto Naming .....	36
7.6	Open Saved Trace.....	37
7.7	Trace Viewing and Analysis Operation.....	37
7.8	Information and Function Windows.....	37
7.8.1	Switch Information and Function Windows.....	38
7.8.2	Events info reference .....	38
7.8.3	Reanalyze .....	38
7.9	Upload Trace to PC .....	39
7.10	Get help on OTDR.....	39

<b>8</b>	<b>Testing Optical Fiber in Auto Mode</b> .....	<b>40</b>
8.1	Instruction of Auto Testing Mode .....	40
8.2	The procedures of auto testing mode.....	40
<b>9</b>	<b>Testing the optical fiber in Manual mode</b> .....	<b>41</b>
9.1	Common using parameters for OTDR testing.....	41
9.2	OTDR test parameters Configuration.....	41
9.3	OTDR display and other Configuration .....	42
9.4	Real time and average test mode .....	42
9.5	Range Configuration .....	43
9.6	Pulse Width Configuration .....	43
9.7	Averaging Time Configuration .....	43
9.8	Laser Wavelength Configuration.....	43
9.9	IOR Setting.....	44
9.10	Scatter Coefficient (Back Scatter) Setting.....	44
9.11	Non-reflection Threshold (Splice Loss Detecting Threshold) Setting .....	44
9.12	Reflection Threshold (Reflection Detecting Threshold) Setting .....	44
9.13	End Threshold (Optical Fiber End Detecting Threshold) Setting .....	44
9.14	Load Default.....	44
<b>10</b>	<b>Use OTDR Test FTTx-PON Network Optical</b> .....	<b>45</b>
10.1	Use PON Optimized OTDR Instrument.....	45
10.2	Select the Proper Distance Range.....	45
10.3	End Threshold (Optical Fiber End Detecting Threshold).....	45
10.4	Test parameter recommendation value.....	45
<b>11</b>	<b>Trace Analysis and Event Operation</b> .....	<b>46</b>
11.1	Open Trace File .....	46
11.2	Simultaneous Display Multi Traces .....	47
11.3	Close Trace File.....	47
11.4	Trace Display and Operating Instruction.....	47
11.5	Switch And Move Markers.....	48
11.6	Switch And Move the Marked Point .....	48
11.7	Fast Move the Markers Outside the Window .....	48
11.8	Lock AB Markers .....	49

11.9	Zoom the Trace.....	49
11.10	Cross Frame to Zoom the Trace .....	49
11.11	Use Zoom Toolbar to Zoom the Trace .....	49
11.11.1	Revert the Whole Trace View .....	50
11.11.2	Zoom In Trace Horizontally .....	50
11.11.3	Zoom Out Trace Horizontally .....	50
11.11.4	Zoom In Trace Vertically .....	50
11.11.5	Zoom out Trace Vertically .....	50
11.12	Remember the Zoom Status Automatically.....	50
11.13	Move the Magnified Trace Window .....	50
11.14	Operation of Event Options.....	51
11.14.1	Display the Event on the Trace and Locate Event In Even Sheet .....	52
11.14.2	Add Event.....	52
11.14.3	Modify the Event.....	53
11.14.4	Delete event.....	53
11.15	Analysis Detecting Threshold Configuration.....	54
11.16	Reanalyze the Trace.....	55
11.17	Analyze the Optical Fiber in Specific Optical Fiber Link.....	55
11.18	Set Trace Display Parameter .....	55
11.19	Set the Length Unit.....	56
11.20	Display or Switch the Trace .....	56
11.21	Check Current Trace Parameters .....	57
<b>12</b>	<b>Manual Trace Analysis .....</b>	<b>58</b>
12.1	Use Markers.....	58
12.2	Event Location and Loss Information .....	58
12.3	Measure Insertion Loss (2-point and 5-point method) .....	58
12.4	Measure Attenuation (2-point and LSA method) .....	61
12.5	Measure Reflectance.....	62
<b>13</b>	<b>Trace File Management .....</b>	<b>64</b>
13.1	Save Trace in Different Formats .....	64
13.2	Copy, Move, Rename and Delete Trace.....	64
13.3	Check Disk Space.....	65



<b>14</b>	<b>Print OTDR Report.....</b>	<b>66</b>
14.1	Trace Information.....	66
14.2	Check and Edit Trace Information .....	66
14.3	Print OTDR Report.....	67
<b>15</b>	<b>OTDR Module Built-in Stabilized Laser Source LS100 .....</b>	<b>70</b>
<b>16</b>	<b>OTDR Module Built-in Optical Power Meter PM100 .....</b>	<b>72</b>
<b>17</b>	<b>VFL Application.....</b>	<b>74</b>
<b>18</b>	<b>OCI (Optical Connector Inspector) of MCI100.....</b>	<b>75</b>
18.1	Inspect the Optical Connector .....	75
18.2	Adjust the Image' Brightness and Contrast.....	76
18.3	Focus Control .....	76
18.4	Zoom Image.....	76
18.5	Capture Image .....	77
18.6	View the Saved Image.....	77
<b>19</b>	<b>File Management .....</b>	<b>78</b>
19.1	Transfer Files or Folders between the PRO-6350 and USB Storage Device .....	78
19.2	Transfer Files or Folders between the PRO-6350 and PC.....	78
19.3	Delete Saved Files .....	79
<b>20</b>	<b>Maintenance and Calibration.....</b>	<b>80</b>
20.1	Cleaning of Optical Interfaces.....	80
20.2	Necessity of Cleaning.....	80
20.3	Safety Instructions before Cleaning .....	80
20.4	Cleaning Tools.....	80
20.5	Cleaning Procedure .....	81
20.6	Battery Charging Instructions.....	81
20.7	Battery Instruction .....	81
20.8	Charge Battery.....	81
20.9	Battery Calibration .....	81
20.10	Change Battery .....	82
20.11	Calibration Requirements .....	82
20.12	Shipment.....	82
<b>21</b>	<b>Troubleshooting.....</b>	<b>83</b>

21.1 Common Problems and Solutions .....83

21.2 Trace Measurement Problems and Solutions .....84

**22 Warranty .....85**

22.1 Terms of Warranty .....85

22.2 Exclusion .....85

22.3 Warranty Registration .....85

22.4 Returning Instruments .....85

22.5 Contacting Customer Service .....85

## Specifications

<b>Display</b>	7" TFT-LCD Touchscreen
<b>Connectivity</b>	USBx2; 10/100Mbit/s RJ-45x1
<b>Memory</b>	2GB
<b>Power Supply</b>	Rechargeable Li-Ion Battery/AC Adapter
<b>Battery Life</b>	10 hours continuous operation
<b>Operating Temp.</b>	-4°F ~ 122°F (-20°C ~ 50°C)
<b>Storage Temp.</b>	-40°F ~ 140°F (-40°C ~ 60°C)
<b>Environmental Conditions</b>	0 ~ 95% RH (Humidity, Non-Condensing)
<b>Weight &amp; Dimensions (HxWxD)</b>	11.4" x 6.8" x 2.9" / 4.6 lb (290 x 175 x 75mm / 2.1kg) (Battery Included)
<b>OTDR with VFL</b>	
<b>Selectable Range</b>	SM: 1.3, 2.5, 5, 10, 20, 40, 80, 160, 240Km; MM: 1.3, 2.5, 5, 10, 20, 40Km
<b>Pulse Width</b>	SM: 5ns, 10ns, 30ns, 100ns, 300ns, 1μs, 2.5μs, 10μs, 20μs; MM: 5ns, 10ns, 30ns, 1μs, 2.5μs
<b>Visual Light Source</b>	Output Power: ≥ -3dBm; MOD Frequency: 1 Hz; Detection Range: 5Km
<b>Event Dead Zone (m)</b>	0.8
<b>Attenuation Dead Zone (m)</b>	4.5
<b>Optical Power Meter</b>	
<b>CAL Wavelength</b>	850, 1300, 1310, 1490, 1550, 1625, 1650nm (±20nm)
<b>Power Range (dBm)</b>	-70 ~ +6 (-60 ~ +6 @ 850nm)
<b>Accuracy</b>	± 5% ±0.01nW (±0.5dB@850nm)
<b>Detector Type</b>	InGaAs
<b>MOD Identification</b>	270, 1K, 2K Hz
<b>Resolution</b>	0.01dB
<b>Connectors</b>	FC (Interchangeable SC, ST and LC)

<b>Stabilized Light Source</b>	
<b>Wavelengths</b>	Same as OTDR's
<b>Emitter Types</b>	FP-LD@1310, 1490, 1550nm; DFB-LD@1625nm
<b>Output Mode</b>	CW, 270Hz, 1KHZ, 2KHz
<b>Spectrum Width</b>	≤ 5nm
<b>Output Power</b>	≥ -7dBm
<b>Power Stability</b>	± 0.05dB/15min; ± 0.10dB/8hr
<b>Connectors</b>	FC/UPC (Interchangeable SC, ST)
<b>Video Inspection Probe</b>	
<b>Field of View</b>	400μm x 300μm
<b>Resolution</b>	≤ 1.5μm
<b>Focusing</b>	Manual Focus
<b>Hand-Probe Dimensions</b>	Ø32mm x 175mm

## 1 General Information

### 1.1 Scope of this Manual

Thank you for purchasing a PRO instrument. Please read this manual carefully before using any of the PRO series fiber-optic instruments. Always observe the warnings and cautions appearing throughout this manual.

This manual contains the necessary information for proper operation and maintenance of the PRO-6350, troubleshooting instructions as well as information regarding obtaining services.

### 1.2 Introduction

The PRO-6350 series is a compact multi-functional platform. It is convenient and accurate for auto/manual testing, multi-wavelength testing, integrated intelligent and multi-functional analysis.

The PRO-6350 is easy to handle with large color LCD touch screen and smart user-interface. Windows CE system, large built-in and extended memory enable convenient test data storage, access and transfer to PC via USB for further analysis and reporting. Management software on the PC can be further analysis of the data.

#### ***Product has the following characteristics:***

- 7 inch color LCD touch screen of sharp display, 4-level adjustable brightness;
- Convenient and flexible handling: Touch-screen, keypad and external USB mouse/keyboard;
- Large-capacity data storage;
- USB data interface (Host and Client), Supports a variety of data backup;
- Directly connected particular model USB printer
- PC software for test data analysis and reporting;
- Auto screensaver feature for power saving;
- AC/DC dual power supply;
- Optimized power management: 10 hours continuous operation.

#### ***Optional Built-in Functional Modules***

- OTDR function module, detail specification for later chapters
- LS100: Stabilized Laser Source Module (as OTDR)
- PM100: Optical Power Meter Module
- MCI100: Optical Connector Inspector Module, detail specification for later chapters
- RC100: Remote Control Module
- LM100: Link Image Module

### 1.3 Product Appearance



Fig. 1.1 Front View

#### Top View

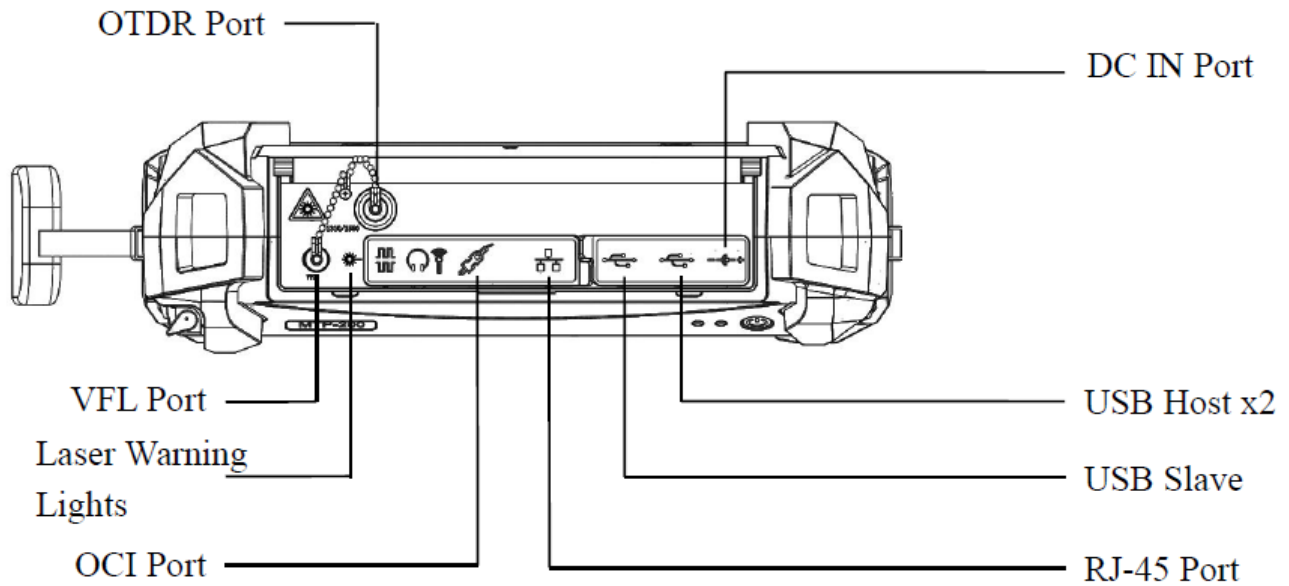











Fig. 1.2 Front View




## 1.4 Front Panel Indicators Introduction

Icon	Status	Meaning
 Power On/Off	Off	System off
	Green, constant	System on
	Red, blinking	Low battery, charging needed
 Charging Indicator	Red, constant	Charging, with power adapter
	Green, constant	Charging complete, with power adapter
	Off	Power adapter unplugged or connection is poor
 Laser Indicator	Red, blinking	Laser on
	Off	Laser off

Tab. 1.1 Front Panel Indicators Introduction

## 1.5 Front Panel Keys Instruction

Name	Function
	Press to start, press again to stop.
Start/Stop	Launch selected module in main interface.
Esc	Back
	Move up or extended function to be defined, please refer to Help of current interface.
	Move down or extended function to be defined, please refer to Help of current interface.
	Move left or extended function to be defined, please refer to Help of current interface
	Move right or extended function to be defined, please refer to Help of current interface.
OK	Confirm button to confirm certain operations, please refer to Help of current interface
Nav	Enter Help of current interface.
Del	In character input box editing, provide backward delete functions
Num0~9	In the digital input box for editing, digital input function
 LIGHT	LCD brightness adjustment. 4-level brightness, press to toggle between different levels

	Call the soft keyboard
	Call the save window key
 Power	<p>Power on/off</p> <p>Press to power on system when system is off.</p> <p>When system is on, press and hold 1 second to enter screensaver mode for power saving; press and hold 3 seconds to power off system.</p> <p>In screensaver mode, press any key and hold 1 second to restore normal status (Or by clicking anywhere on touch screen with stylus, clicking mouse left key)</p>

## 1.6 Operating Parts Instructions

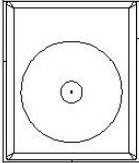

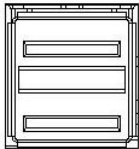

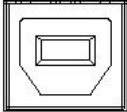

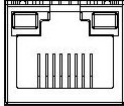




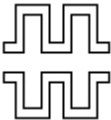

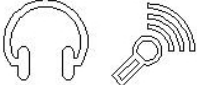
Name	Operation	Description
<b>Stylus</b>	Click	Select certain module or menu
	Double click	Mainly used in file explorer window.
	Draw frame	<ol style="list-style-type: none"> <li>1. Batch files selection in File Explorer.</li> <li>2. Zoom in/out selected part of displayed trace</li> </ol>
	Click and hold	<ol style="list-style-type: none"> <li>1. Open menu or select in File Explorer.</li> <li>2. Select object in other windows.</li> </ol>
<b>Mouse (Optional)</b>	Left click	Similar to stylus, more convenient for desktop application
	Left double click	
	Left key draw frame	
	Right click	

### NOTE

- Stylus shouldn't touch the screen with too little force, otherwise it might operate irregularly.
- Stylus shouldn't touch the screen with too much force, otherwise might damage the LCD and touch screen.
- Please apply adequate force with stylus on the touch screen.
- Only use the PRO-6350 stylus, do not use other device. A sharp object like ball pen tip may smear or damage the touch screen.

## 1.7 Instrument Interfaces Instructions

### *Interfaces on Platform Top (Left to right)*

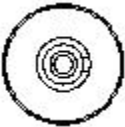
Name	Appearance	Icon	Description
<b>Power</b>			Power adapter input
<b>Audio Output</b>			Connection to USB devices, e.g. printer, mouse, keyboard and USB interface testing devices (Driver needed)
<b>USB Slave</b>			Connection to PC for data transfer
<b>RJ45 Port</b>			10/100Mbps Ethernet port
<b>OCI Port</b>			Connection to the OCI (Optical Connector Inspector)
<b>Serial Interface</b>			For system adjustment (Not open to user)
<b>Audio Port</b>			Audio output/input

Tab. 1.4 interfaces on Platform Top



### Optical Ports

The PRO-6350 is equipped with FC/PC connectors (Interchangeable SC, ST and LC)

Name	Appearance	Icon	Description
Optical Port		OTDR	Normal OTDR port
		VFL	Visible Red Laser port
		OLT	PON Power Meter downstream input
		ONT	PON Power Meter upstream input
		SLS	Stabilized Light Source port
		OPM	Multi-wavelength Optical Power Meter port

Tab. 1.5 Optical Ports

#### NOTE

The amount of connectors depends on module configuration, not all modules are equipped with above mentioned optical ports.









#### WARNING

The PRO-6350 is a laser instrument. Users should avoid looking directly into the optic output. The use of microscope or magnifier should also be avoided, for the use of such devices can focus a highly intense beam onto the retina, which may result in permanent eye damage.

**Laser Radiation:** To avoid serious eye injury, never look directly into the optical outputs of fiber optic network equipment, test equipment, patch cords, or test jumpers.

- Always avoid looking directly into the optical output port, when the PRO-6350 is working.
- Always replace protective dust cap on the detector port when the PRO-6350 is not being used.
- Always avoid looking directly at unconnected end of optic fiber in testing and make the unconnected end pointing at a non-reflective object if available.

### 1.8 GUI Icons Instruction

Icon	Status	Operation	Description
	Appear		Power adapter plugged
	Green part change		Showing battery power level with percentage behind.
	Appear		Battery unplugged or connection is poor.
		Click	Start selected function
		Click	Enter Setup interface, including Interface style, Language and System setting etc.
		Click	Enter Help of current interface
		Click	Enter “About” interface
		Click	System off

Tab. 1.6 GUI Icons Instruction

## 1.9 Power Instruction

*The PRO-6350 uses following power supplies:*

- AC adapter (Connect to standard outlet – Indoor use only)
- Li-ion rechargeable battery (Auto power supply when AC adapter is unplugged)
- Battery dock cover must be closed properly when the PRO-6350 is working.
- AC adapter and battery power supply can be switched without affecting operation
- After AC/DC power adapter is connected, built in Li-ion battery will be automatically charged.

When only using Li-ion battery as power supply, following situations may cause the PRO-6350 to automatically power off or dysfunction

- The battery power indicator displayed on LCD screen will turn red (Low battery) when the battery power is insufficient and the PRO-6350 may automatically power off.
- If unused for a long time the PRO-6350 may not power on properly, please connect power adapter and recharge the battery.

## 1.10 Use of Rechargeable Battery

- Battery for the PRO-6350 is Lithium rechargeable battery.
- 3.5 hours for full charge
- When the PRO-6350 is charged by AC/DC power adapter, charging indicator on the front panel will turn red and turn green after charge is complete.
- When the PRO-6350 is powered on and being charged, LCD will also indicate charging status.



75%: Showing battery power level with percentage behind, 75% indicates the current battery power is 75% of the total battery power.

- Battery unplugged or connection is poor.
- Power adapter plugged.

### **NOTE**

The PRO-6350 battery is rechargeable Li-ion battery. If unused for a long time, please charge the battery to 50%-70% before using.

### **Caution**

Keep the battery away from fire and intense heat; do not open or short circuit the battery.


## 2 Basic Operation

### 2.1 Foreword


This part introduces the basic operation on the PRO-6350. Please read this manual carefully for optimal operation. Should you encounter any problems during operation, you are welcome to contact the technical staff of our company or representatives.

### 2.2 Power On/Off

#### *Power on:*

Press  button and hold 1 second till the LED power indicator is on.

#### *Power off:*

Press  button and hold 3 seconds till the LED power indicator is off.

#### **NOTE**

Power off PRO-6350 will completely shut down the platform and modules. When power on, PRO-6350 will restart.

### 2.3 Enter and Exit Power Saving Mode

When power is on, user can set the PRO-6350 to power saving mode and return to normal status. In power saving mode, the LCD backlight will turn off.

#### *Two ways to enter power saving mode:*



- Press (Power) button once to turn off LCD backlight, LED power indicator will stay on.
- When power is on, the PRO-6350 will automatically enter power saving mode after its idle time exceeds pre-set value.

#### *Exit power saving mode:*

- Press (Power) button , LCD backlight will turn on;
- Or press any key on the front panel;
- Or click the touch screen with stylus;
- Or click mouse.

## 2.4 Adjust LCD Brightness

The LCD lightness is 4-level adjustable.

Press  button to toggle between different levels. When it is the minimum level and press the  button, it will be the maximum brightness.

## 2.5 Start Application

When the PRO-6350 is powered on, system will load the main program of the PRO-6350 OTDR (Application software package) and enter main interface, as shown in Fig. 2.1.

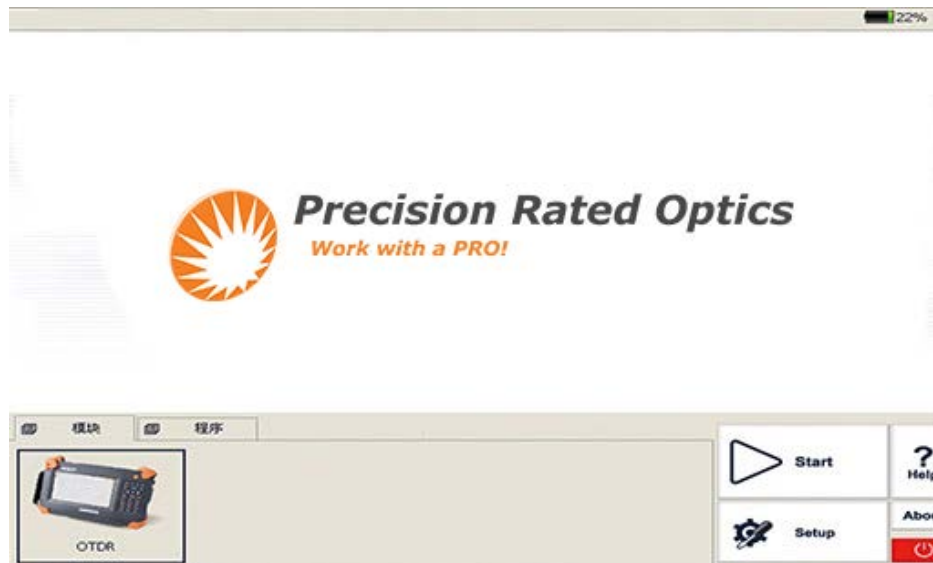


Fig. 2.1 Main Interface

### **Launch OTDR program:**

- 1) Select “Modules” label and then “OTDR Module” in main menu, the part will be highlighted.
- 2) Then click [Start] to start program.

### **Launch Multifunctional module or optical connector inspector module application program:**

- 1) Select “Modules” label, then “multifunctional module or “optical connector inspector module”.
- 2) Then click [Start] to start the program.  
(Note: Double click the module label to start the application)

### **NOTE**

Application program is available only when relative function is purchased.

## 2.6 Install USB Keyboard/Mouse

When you need to input numbers and letters etc, there will be a soft keyboard displayed on the screen, user can use stylus to input, or user can use keyboard with USB port or USB mouse to do the input.

### ***Install USB keyboard or mouse on the PRO-6350***


Connect keyboard or mouse to the USB port, the port is on the top of the PRO-6350.

- No need to close the PRO-6350 before connecting the keyboard and mouse. Software will recognize the keyboard or mouse.
- The soft keyboard will still be displayed on the screen even the keyboard is connected.
- System will recognize the mouse or keyboard and use them immediately.

## 2.7 Printer Configuration

Must configure a printer before printing the trace or report.

### **Procedure:**

- 1) Turn on printer power
- 2) Use USB cable to connect the PRO-6350 and printer
- 3) Enter OTDR interface
- 4) Click the  on the lower right corner, enter Print interface, as Fig. 2.2 shown below

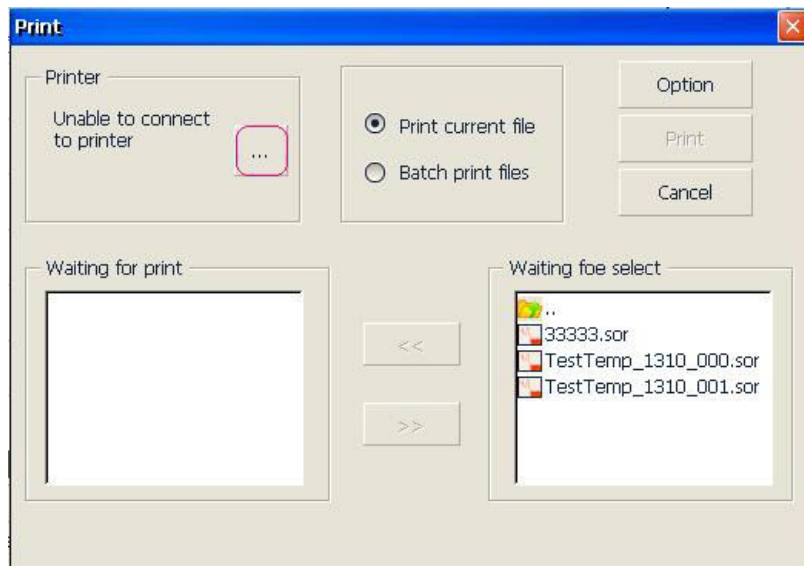


Fig. 2.2 Printer and setting interface

- 5) In Printer area, until now there is no default printer. Click [  ], it will appear window as shown below:

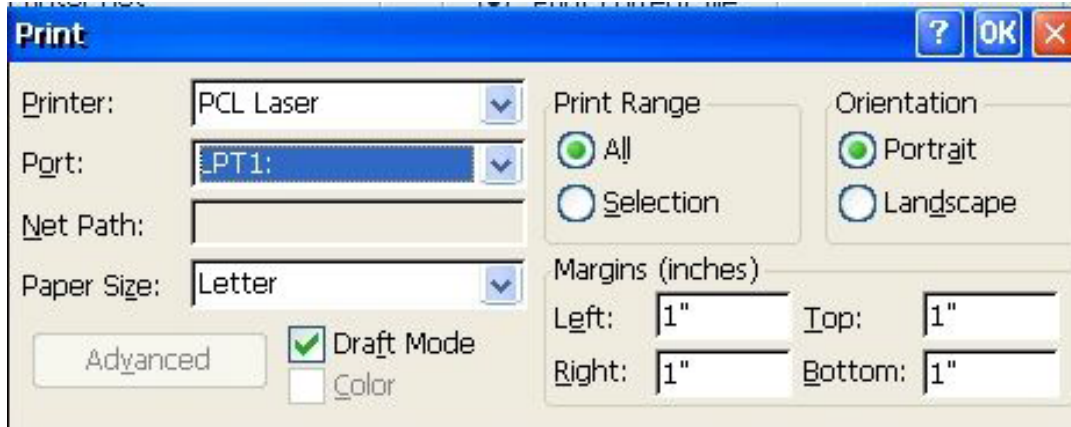


Fig. 2.3 Printer setting interface

- 6) In the printer list, choose the desired printer; chose “LPT1:” in the port list. Other options can remain as default.
- 7) After right selection, click “OK” to finish the printer configuration.

#### **NOTE**

- The PRO-6350 will only support a USB port printer with PCL language. The current printers that passed the test are HP LaserJet 1022 and HP Laser P2015d.
- If the printer is not connected properly, disconnect the USB cable and reconnect the printer.
- No need to shut down the PRO-6350 when connecting the printer.

## 3 Common Settings and Special Settings

### 3.1 Main Setting Menu

In setting menu, user can set up many settings, including interface style, language, power saving, system setting, touch screen calibration and etc.

#### ***Enter main setting menu:***

When power is on, press the [Setup] button to enter the setting menu, as shown below:

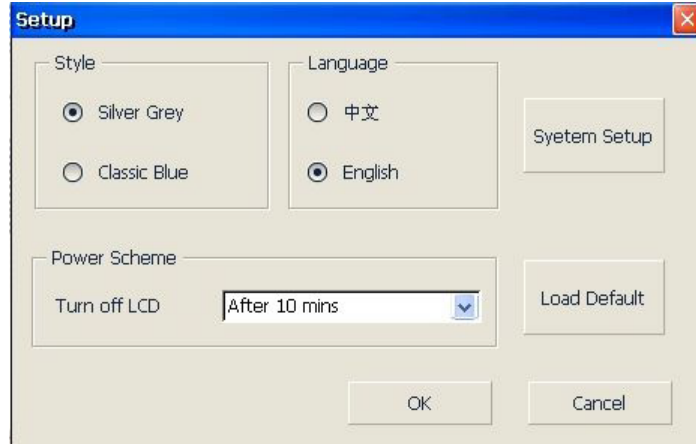


Fig 3.1 Main Setting Menu

### 3.2 Select language

Switching language:

- 1) Click [Setup] to enter into setting menu.
- 2) In language area, choose the requiring language.
- 3) Press “OK” to confirm modification

### 3.3 Automatic Power Saving Setting

The feature is designed to save the battery power. When power is on, the PRO-6350 will automatically enter power saving mode after its idle time exceeds pre-set value.

#### ***Setting Power Saving Mode:***

- 1) Click [Setup] to enter into setting menu.
- 2) In power saving area of setup menu, choose preferred option in “Turn off LCD”.
- 3) Press “OK”, Exit setup menu and opening power saving mode.

#### ***NOTE***

Power saving mode is on by default, and LCD backlight turn off automatically in 10 minutes.



### 3.4 Recalibrate Touch Screen

If touch screen is not responding properly, you should recalibrate it.

#### **Recalibrate touch screen:**

- 1) Click [Setup] to enter into setting menu.
- 2) In setup menu, click [System Setup].
- 3) Double-click [Stylus] icon.
- 4) Click [Calibration] label and operate following the instructions.

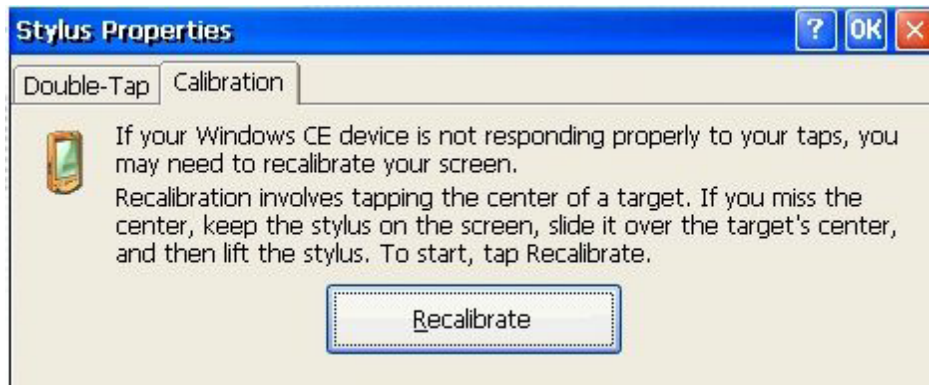



Fig. 3.2 Recalibrate touch screen

- 5) When system shows “Press enter button to accept new setup”, click the touch screen with stylus to complete new setting

**Note:** Under the main menu interface, user can press “” key and enter the calibration interface. After calibrating, click the touch screen with stylus and exit the calibration interface to complete the calibration.

#### **NOTE**

Touch screen can be calibrated as many times as necessary, until you are satisfied with the results.

### 3.5 Serious Deviation of Touch Screen

When deviation of touch screen is serious, it is difficult to calibrate only using stylus. You can use USB mouse to enter into calibration window, and continuing to calibrate with pen.

### 3.6 Date and Time Settings

The current date and time show on the right top of interface. When save the testing results, the files contain date and time.

**NOTE**

- The equipment has special battery to keep the precision of date and time.
- Don't open the equipment to change battery.
- Modifying time zone, date and time may affect some setting and operation of Windows CE, please modify these settings.

**Set time and date:**

- 1) On starting interface, click [Setup] to enter [system setting], then choose [Date/Time].
- 2) Modify the setting.
- 3) Click application to confirm modification.
- 4) Exit setting interface, return to control panel.

### 3.7 Other Parameters Configuration

In System setting (Control panel) to setup other parameters (Please refer to files about Microsoft Windows CE which is not included in this manual).

**NOTE**

It's suggested to keep system settings unchanged unless it's necessary.

### 3.8 Load Default

This function is used to set system settings to factory default. Those parameters include: Interface style, language, power saving and OTDR features.

**Load default:**

- 1) In main interface, click [Setup].
- 2) In setting menu, click [Load Default], system promotes a warning message: "Restore factory settings?"
- 3) Click "Yes" to continue, click "No" to cancel.

**NOTE**

Unless it's necessary, please do not load default because it will erase your existing settings

## 4 Basic Information of OTDR Module

### 4.1 Principle of OTDR Module

OTDR (Optical Time Domain Reflectometer) is a measurement instrument for identifying optic fiber transmission features. It is mainly used to measure attenuation of a whole optic fiber chain and provide attenuation details relating to length, namely detect, locate and measure any event in optic fiber chain (Events refer to faults caused by splicing, connectors and bending). Its non-destructive, one-end connection and rapid measurement features have made the OTDR module an indispensable tool for the testing application of optic fiber manufacture, construction and maintenance.

The faults and heterogeneity of optic fiber itself cause Rayleigh scattering of light pulse transmitted in optic fiber. Part of light pulse is scattered in the reverse direction, and this is called Rayleigh backward scattering, which actually provides attenuation details relating to length.

Information relating to distance is obtained through time information (That's the reason why there is "Time Domain" in the name of OTDR). Fresnel reflection occurs at the boundary between two media of different IOR (For example, connections of faults, connectors, or optic fiber end). This reflection is used to locate the discontinuous points on optic fiber. The magnitude of reflection depends on the difference between IOR and the smoothness of boundary.

OTDR sends out a light pulse into the connected optic fiber, and receive reflections of events and backward scattering power of pulse in time. Locus will be displayed on LCD. The Y-axis is dB value of backward scattering power, and the X-axis is the distance.

### 4.2 Measurement Application of OTDR

OTDR displays power relating to distance of returning signals. This information can be used to identify the main properties of an optic fiber chain, such as the optic transmission characteristic of fiber, connector and etc.

Full auto trace analysis will recognize the following measurements:

- Event location (Distance), end or rupture of optic fiber chain
- Attenuation coefficient of fiber
- Loss of a single event (e.g. one optic tie-in), or total loss from upper end to end
- Range of a single event like reflection of connectors (Or grade of reflection)
- Auto measurement of cumulative loss of a single event
- Events list: event type, loss, reflection and distance.

### 4.3 Basic Definition and Classification of Events

Events refer to any abnormal points causing attenuation or sudden change of scattering power besides the normal scattering of optic fiber, which include all kinds of losses like bending, connections and ruptures.

Event points displayed on LCD are abnormal points that cause traces to deviate from straight line.

Events can be classified as reflective events and non-reflective events.

**4.3.1 Reflective Events**

When some pulse energy is scattered, reflective events happen. When a reflective event occurs, peak shows on trace, as shown below:

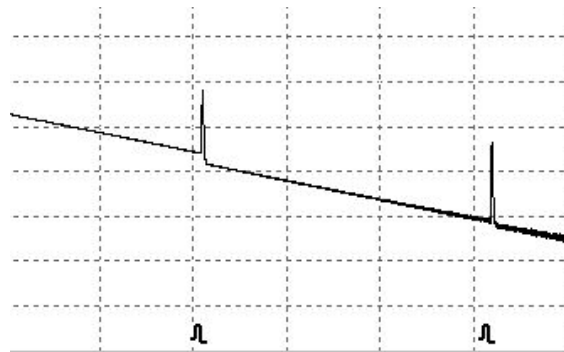


Fig.4.1 Reflection Event

**4.3.2 Non-reflective Events**

Non-reflective events happen at certain points where there is some optic loss but no light scattering. When non-reflective events occur, a power decline shows on trace, see below:

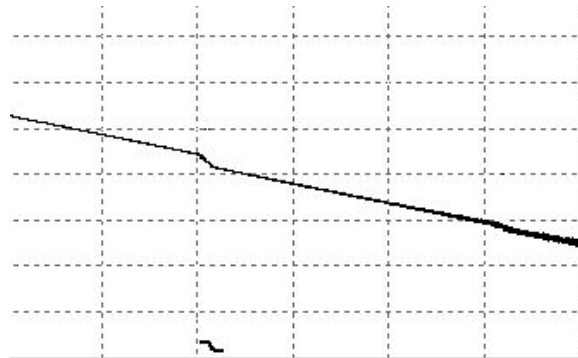


Fig.4.2 Non-reflection Event

**4.4 Optic Fiber Link and Event Types**

Optic fiber link and event type:

Event Type	Description
┆	Beginning of optic fiber link
┆L	Reflective event
┆L	Non-reflective event
┆	End of optic fiber link

**NOTE**

End of optic fiber can be identified through scanning the first loss event that is greater than end threshold.

## 5 Instruction of OTDR Modules of PRO-6350

### 5.1 Main Features of OTDR Module

- High dynamic range and short dead zones.
- Complete sampling under low noise, accomplishes accurate low loss locating.
- Resolution is accurate to 10cm.
- Multiple test models, convenient to meet the requirement of any test condition.

#### **CAUTION**

Make sure that the optical fiber or cable is not in use and there is no laser beam in the fiber before testing via OTDR. Otherwise, it may result in imprecise test trace or even permanent damage for the OTDR.

### 5.2 Measurement Mode of OTDR module

For convenience of customers use, OTDR offers many kinds of measurement modes. These modes can be used with combination.

#### 5.2.1 Auto Mode and Manual Mode

**Auto mode:** Calculate the length of fiber, setting Sampling parameters, getting and showing the trace, analyze the events.

**Manual Mode:** Advanced Mode which user can control all OTDR parameters to test.

#### 5.2.2 Averaging Mode and Real-time Mode

**Real-time Mode:** OTDR will take real-time measurement and refresh the trace. In real-time mode, unless the user stops measurement, it will continue down the length of the fiber.

**Averaging Mode:** Under Averaging mode, OTDR will average the data within the measurement time which is set by user. Once the time is passed it will stop automatically and display the result.

#### **NOTE**

Generally, we suggest averaging mode.

#### 5.2.3 In-service Mode and Normal Mode

**In-service Mode:** Measure live fiber, which use 1625nm to test. This mode doesn't affect the normal working wavelength in the fiber under test.

**Normal Mode:** Use other wavelengths except 1625nm (such as 1310nm, 1490nm, 1550nm and etc.) Make sure there is no laser transmitting in the fiber under test before testing.

**CAUTION**

When using the In-service mode, the fiber must be connected to the correct port of 1625nm. If it is connected to another port it may result in inaccurate test trace or even permanent damage for the OTDR.

**NOTE**

- In-service mode is available only when OTDR is set to 1625nm wavelength.
- When OTDR is on In-service mode, other wavelengths (such as 1310nm, 1490nm, 1550nm etc.) are not available.
- Above modes can be used with combination, but some modes are not available in certain conditions.

**5.3 OTDR Interface**

When power is on, it will show the main menu automatically. In main menu, select “OTDR module”, click [Start] button to enter OTDR user interface, as follows:

The screenshot displays the OTDR software interface. At the top, it shows the device name 'OTDR', the date and time '2010/06/07 01:25 pm', and a battery level of 90%. The main area is a graph with 'dB' on the y-axis (0.00 to 50.00) and distance on the x-axis (0.0 to 165.0 km). A red trace shows a signal that starts at approximately 40 dB and decreases linearly to about 20 dB at 165 km, with several sharp peaks (spikes) along the way. Below the graph is a control panel with several sections: 'Measure Pa' (with a 'Close Trace' button), 'Events', 'Markers', 'Trace Para.', 'Trace Info.', and 'VFL'. The 'Trace Para.' section includes a table for selecting parameters:

Mode	Wavelength	Distance (km)	Pulse	Time (s)
<input checked="" type="checkbox"/>	1310 nm	240	Auto	1.3
<input type="checkbox"/>	1490 nm	160	2.5	2.5
<input type="checkbox"/>	1550 nm	80	5	10

Below this table are three rotary dials for 'Pulse' (20us, 10us, 2.5us, 1us, 300ns) and 'Time (s)' (180, 120, 90, 60, 45). At the bottom right are buttons for 'Start', 'Help', 'Open', 'Save', 'Setup', and 'Back'. Red arrows from external labels point to these UI elements.

Info and Function Area










Navigation Window

Navigation Window

Trace Display Area Quick Help Area

Common Operation Buttons

## 5.4 Icons Instruction in OTDR Interface

	Start testing
	Stop testing
	Parameter settings
	Save trace file
	Open trace file
	Print trace file
	Zoom in trace horizontally
	Zoom out trace horizontally
	Zoom in trace vertically
	Zoom out trace vertically
	Full-trace view
	A/B marker switch
	Move marker or marking point left/right
	Toggle between marking points
	Close trace
	Return to previous menu
	Return to previous menu

### **NOTE**

Not all icons are displayed in one interface; they can be seen in different functional interfaces.

## 5.5 Trace Processing

The “OTDR Trace Manager” software in the PRO-6350 Suite is for trace review and analysis on PC after acquisition without connecting to the PRO-6350.

### *Trace processing includes:*

- Trace editing (Single trace, multi traces)
- Printing (Single trace printing, batch printing)
- Trace reanalysis
- Trace format conversion

Bi-directional averaging program (for single mode fibers only) is available in advanced versions to increase loss testing accuracy by averaging the measured loss values of each event from both directions.

## 5.6 Available OTDR Module

OTDR module details are in the appendix, including wavelength, dynamic range, dead zone and etc.



## 6 Prepare to Use OTDR

### 6.1 Connectors Instruction

The optical ports equipped on the PRO-6350 are SC/PC. (Interchangeable FC and ST also available)

### 6.2 Cleaning and Connecting to Optical Fiber

To insure measurement accuracy, please clean and connect fiber properly before testing.

Connecting fiber to OTDR port is tool-free.

- Please refer to “Maintenance and Calibration” for optical port and connector cleaning.
- Clean connectors and check if fiber connector type is SC/PC
- Connect fiber to OTDR port.

#### **NOTE**

Improperly connected fiber may cause serious loss and reflection.

#### **WARNING**

Please refer to Safety Instructions of this manual before testing to ensure personal safety.

#### **CAUTION**

- When testing with OTDR, unless connected to specific optical port, please make sure there is no working laser in the fiber under test or it may cause incorrect result and even permanent damage to test instrument.
- Please do not screw connectors too tight or it may damage fiber and optical port.

## 7. Test with OTDR

### 7.1 OTDR Quick Test

- 1) Check the connection between the fiber and the OTDR optical port and make sure it's secure.
- 2) Click [Start] icon or press button to start testing.
- 3) Click [Stop] icon or press button to stop testing.

Fig 7.1 shows the OTDR interface after trace acquisition:

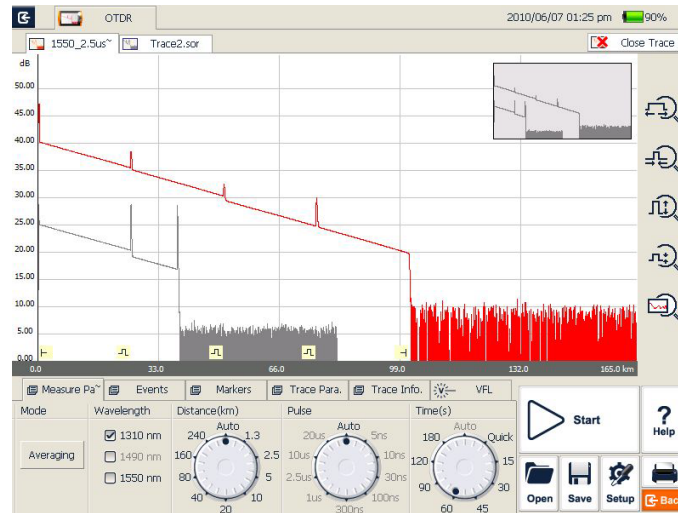


Fig. 7.1 OTDR Trace Acquisition Interface

#### NOTE

- Click the [Start] button with stylus or mouse.
- During testing, the average trace shows in the trace display area and refreshes at certain intervals. The trace shown after testing is complete, is the final trace.
- User can stop testing any time. Application will show all the information when test stops.
- After test is finished or interrupted by user, system will perform automatic analysis which takes about 5 seconds or longer before user can start a new test.
- In Averaging mode, the interface will show the remaining time of the test.
- In Real-time mode, test will keep going until user stops it.

## 7.2 Trace Processing

After test and automatic analysis is complete, event types will be displayed below the trace area; user can review all events information in events list which is on {Events} label. After test and automatic analysis is complete, user can save traces. Please refer to the “Save Trace”.

After test and automatic analysis is complete, user can view the trace details and manually analyze. Please refer to “Trace Viewing and Analysis Operation”. After test and automatic analysis is complete, user can start a new test after trace acquisition.

### **NOTE**

Application will prompt user to save unsaved trace before starting new test.

## 7.3 Unsaved Traces

Unsaved traces will be titled as “\*U\_xxxx” (xxxx stands for the current testing wavelength) which is displayed on the left upper corner of trace display area.


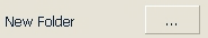
### **NOTE**

The traces whose file names start with star mark “\*” are unsaved traces or modified traces. Please refer to later contents of this manual for more information about OTDR trace modification.

## 7.4 Save Trace

When test is finished, user can save the trace with parameters information. The content includes trace parameters and etc.

### **Procedure:**

- 1) Click [Save] on the right lower corner of main interface and save dialog window will pop up.
- 2) File format: User can choose file format as “.sor” or “.jpg”.
- 3) User can click  button on the top of save file dialog to choose saving directory or click  to create new folder.
- 4) User can edit the name of the file to be saved; the file name consists of letters and numbers which can be input by soft keyboard.
- 5) File saving: In save dialog window, click [Save] button to save file.
- 6) Click [Cancel] to cancel file saving.

Save dialog window and options are shown below in Fig 7.2:

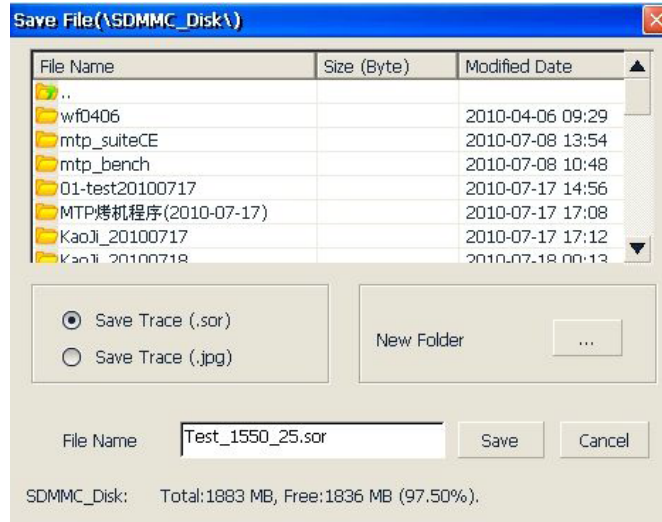


Fig. 7.2 Save dialog window

### Operation Notes:

- Title bar will show the current folder path, as shown in Fig 7.2: “\SDMMC\_DISK\Traces\”.
- System will automatically enter newly created folder.
- After file is saved, file name will be displayed on left upper corner of trace display area. Please note only the first 10 characters of the file name will be displayed and the rest are abbreviated as a “~” mark.

### NOTE

- The file name can be set automatically by the system, and the name prefix can be modified.
- Enable/disable auto naming by checking/unchecking [Auto naming] in OTDR Setup.
- User can modify the prefix of the name in the <Storage> [File Name] in OTDR Setup. Only when the [Auto naming] is enable, the name prefix can be in effect.
- If the name of the file to be saved already exists, system will promote a warning message.

## 7.5 Auto Naming

System supports auto naming when saving traces.

### Procedure:

- 1) Enable/disable auto naming by checking/unchecking “Auto Naming” in OTDR Setup.
- 2) User can edit auto naming rule by modifying file name prefix, input the prefix in “File Name” field. Please note the prefix is only effective when “Auto Naming” option is checked.

### NOTE

The file name in auto naming mode consists of: Prefix+Wavelength+Number, the number will increase automatically when user save traces.

## 7.6 Open Saved Trace

Click [Open] button on the right lower corner in OTDR interface to open saved trace

- 1) In single trace display mode, when opening a new trace, the currently-displayed trace will be closed.
- 2) In Multi-trace display mode, user can open and display up to four traces at the same time.

### NOTE

- Enable/disable Multi-trace display mode in OTDR Setup by checking/unchecking “Multi-trace” in Display Option.
- User can open and view “.jpg” format trace through “File Explorer” on {Program} label in the PRO-6350 main interface. “.jpg” format trace can be also loaded to PC for viewing.



## 7.7 Trace Viewing and Analysis Operation

User can zoom in/out trace, utilizing markers and marking points for trace characterization including loss, attenuation, reflection and etc. All of their operation can be performed by mouse or stylus.



### Zoom in/out trace:

- In trace display area, draw selection frame from left upper corner to right lower corner to zoom in trace.
- Draw selection frame from right lower corner to left upper corner to zoom out trace.

### Show A/B marker:

- Click {Markers} label in OTDR main interface and markers or marker labels will show in trace display area. Move marker quickly:
- Select and hold the marker, drag it left or right to move quickly.
- Or click [  ] [  ] button on {Markers} label to move active marker left or right.

### Switch A/B markers:

- Click [  ] or [  ] button to switch A/B markers on {Markers} label.
- Or click the marker to select in trace display area with stylus or mouse.


### NOTE

- When holding and moving marker with stylus, please apply adequate force or the operation may not be successful.
- Marker operation and re-analysis are not applicable to “.jpg” format trace.
- For more information, please refer to “Trace Analysis and Event Operation”.

## 7.8 Information and Function Windows

Information and function windows are located at the bottom of OTDR interface.

**Information includes:** Event list, measurement parameters, markers information (A/B marker, marking points and etc.), trace parameters and trace information. Information and function windows description:

Label	Function
<b>Meas. Para.</b>	Measurement parameters: Mode, Wavelength, Range, Pulse Width, Averaging Time and etc.
<b>Events</b>	Add event, modify event, delete event and analyze event.
<b>Markers</b>	A/B switch, move, lock, loss and reflection analysis.
<b>Trace Para.</b>	Trace testing parameters
<b>Trace Info.</b>	Cable and fiber information viewing and editing.
 <b>Source</b>	OTDR module built-in visible light source.

Tab. 7.1 Information and Function Windows Description

Note: For detail information, please refer to “Trace Analysis and Event Operation”.

### 7.8.1 Switch Information and Function Windows

Click the labels of information and function windows to switch.

### 7.8.2 Events info reference

Click {Events} information window changes into events information.

Click [▲] and [▼] in scroll bars to look over events information.

### 7.8.3 Reanalyze

If not satisfied with threshold, change threshold, then reanalyze the trace by this function to get satisfactory trace.

#### ***Reanalyze the trace:***

- 1) If possible, look over or reset threshold.
- 2) In {Events}, click [Analyze], system will reanalyze the trace.
- 3) When the analysis finished, events list will show the new results.

#### **NOTE**

- Reanalyzing trace may cause added events to be deleted, events revised are resumed, and events deleted come back etc.
- For more operation on events, please refer to “Trace Analysis and Event Operation”.

## 7.9 Upload Trace to PC

On computer, user can manage the trace file easily.

### *Copy or move the trace to computer:*

- 1) User can copy the saved trace to computer via USB by PC software
- 2) Or user can copy and move the saved trace to computer by mobile hard disk drive/ USB flash disk

For more operation, please refer to “Manage files and data”

## 7.10 Get help on OTDR

Click [Help] or “?” (HELP) to get detailed help, click “” (BACK) to exit.

## 8 Testing Optical Fiber in Auto Mode

### 8.1 Instruction of Auto Testing Mode

When you don't know the optical fiber length, you can simply use the auto testing function to get the trace and analyze.

After the auto mode started, OTDR will automatically estimate the optical fiber length, set sampling parameter, get trace and display the event list and etc.

Under Auto Mode, user can set follow parameters directly.

- The wavelength to be used for testing( at least one wavelength)
- Testing time span

#### **NOTE**


After Auto mode is started, according to the situation of optical fiber link which is connected the equipment, application program will estimate the optimum setting automatically and it will need around 5s. If the testing was cut off, any data won't be displayed.

#### **CAUTION**

Except the specific light port (light port used for online testing), do not connect the optical fiber which load signal to the OTDR port, any external signal over -30dBm will affect the OTDR sampling and cause permanent damage to the OTDR.

### 8.2 The procedures of auto testing mode

#### **Test and get trace in Auto mode:**

- 1) Connect the optical fiber to the right OTDR light port.
- 2) Set parameter: set the "Range" to "AUTO".
- 3) Set testing time span.
- 4) Start testing: Use stylus click [Start] or press down the "" (Start/Stop) on front panel.
- 5) After test, user can save the trace, check the trace, re-analyze the trace and etc. As to the detailed operation way, please refer to relevant section.

#### **NOTE**

- When testing automatically, Range is "AUTO".
- When setting the parameter, if the optical fiber parameter is not clear, user can directly use the default value, but it may cause a bigger testing error.



## 9 Testing the optical fiber in Manual mode

In Manual mode user can set various test parameters more precisely. If the parameters are known, the user can set them precisely and obtain more accurate results. Correct parameter setting is essential to accurate optical fiber measurement. Therefore, when testing manually, the user must set parameters according to requirements.

### 9.1 Common using parameters for OTDR testing

Following testing parameters are displayed on {Meas. Para.} option card on the OTDR interface.

Parameter	Definition
<b>Range</b>	Distance range of the testing
<b>Pulse Width</b>	The width of laser pulse launched to optical fiber by OTDR
<b>Averaging Time</b>	Testing time, choose the proper testing time
<b>Wavelength</b>	Laser wavelength, testing laser wavelength selecting
<b>Mode</b>	Testing mode, testing mode selecting

Tab. 9.1 OTDR common use parameters sheet

### 9.2 OTDR test parameters Configuration

Testing parameters in this section should be set in “OTDR Setting”, click [Setup] on the OTDR surface to enter.

These testing parameters include: Optical fiber general setting, analysis parameters setting and etc.

Parameter	Definition
<b>IOR</b>	IOR of optic fiber which affects the transmission speed of laser. Need to set separately according to working wavelength.
<b>Scatter Coefficient</b>	Also called backscatter, which affects backward scatter power of laser in fiber.
<b>Non Reflection Threshold</b>	Also called splice loss detecting threshold. Non reflective event with insertion loss greater than this threshold will be displayed on trace.
<b>Reflection Threshold</b>	Also called reflectivity. Reflective events with insertion loss greater than this threshold will be displayed on trace.
<b>End Threshold</b>	Also called optical fiber end detecting threshold. The first event with insertion loss greater than this threshold is identified as the end of fiber, and all following events will be ignored on trace.
<b>Default</b>	Revert to the factory settings

Tab. 9.2 OTDR test parameters setting sheet

### 9.3 OTDR display and other Configuration

Includes setting the save method, testing display area and etc. Parameters set in this section won't affect the testing result.

Setting	Content
<b>Auto naming</b>	If selected, the trace files saving will adopt auto naming, the content in file name editing frame will be used as prefix of auto naming; if not selected, the auto naming won't be used, need to enter file name.
<b>Display grid line</b>	If selected, the grid line will be displayed when trace is displayed, otherwise not it will not displayed.
<b>Support multi traces</b>	If selected, then support multi trace testing and display, otherwise only the single trace result will be displayed.
<b>Navigator window</b>	If selected, there will be a trace navigator window on the upper right on the trace window. Meanwhile, you can check or magnify the windows position. If not selected, you will not be able to see the navigator window. The system default is "navigator window" selected.
<b>Display the zoom toolbar</b>	If selected, there will be a zoom toolbar on the right side of the trace window; if not selected, there will be no zoom toolbar but a bigger trace display zone.
<b>Length unit</b>	Set the length unit displayed.

### 9.4 Real time and average test mode

Under sampling and accumulating condition, test mode has real time and average mode.

- 1) In real-time mode, the instrument tests the external optical fiber connection in real time and refreshes the display of the trace being tested real time. When the instrument is in real-time mode, the user may click [Stop] or press "▶/■" (Start/Stop) on front panel, to stop the test or resume the test.
- 2) In average mode, the instrument tests and averages the testing data according to the time user chooses. If the test time is equal or greater than test time user set, the result will be displayed after the time is reached.

#### *Operating instructions*

- Real-time mode and average mode are controlled by [Real time/Average] in {test setting}<test mode>.
- If the "Average" button is highlighted, the instrument is in Average Mode; When the "Real-time" button is highlighted, the instrument is in Real-Time Mode.
- You can toggle the buttons to change between modes.

## 9.5 Range Configuration

By default, the Range setting is to select relative scope according to the optical fiber real length; it will guarantee the test accuracy.

Range options: Auto, 1.3km, 2.5km, 5km, 10km, 20km, 40km, 80km, 160km, 240km.

### **Operation:**

Click on the right range settings.

### **NOTE**

- “Auto” is Auto test mode of OTDR; select this function, the PRO-6350 will select a proper test range intelligently and the proper pulse width to test.
- Default value is “Auto”.

## 9.6 Pulse Width Configuration

Pulse width selection affects the trace result and resolution. Selecting a smaller pulse width can achieve a higher distance resolution and smaller dead zone; On the other hand, a wider pulse width can achieve higher dynamic, test longer optical fiber, but it will affect the resolution and dead zone. The user must select between dynamic and dead zone.

### **Operation:**

Click the pulse width number in pulse width parameter zone.

### **NOTE**

- Default value: Auto
- When the distance range is “Auto”, the pulse width will be “Auto”.
- There will be different pulse width options according to different distance range.

## 9.7 Averaging Time Configuration

Test times affects the test trace SNR, the longer test time, the higher SNR and get a bigger dynamic; so, when testing long distances and far away events, you will need to select longer test time.

### **Operation:**

Click the time span number in time span zone.

### **NOTE**

- Averaging time: Auto, Quick, 15s, 30s, 45s, 60s, 90s, 120s, 180s.
- The default value is 60s

## 9.8 Laser Wavelength Configuration

Select certain single wavelength or multi select up to the entire wavelength.

**Operation:**

Click wavelength in wavelength parameter zone to achieve test wavelength for single selection or multi selection. The effective wavelength will be different according to modules purchased.

## 9.9 IOR Setting

IOR is a key factor affecting the speed of laser transmission in optic fiber; and in this case, IOR configuration has direct impact on the accuracy of measurement. Generally speaking, the IOR parameter is provided by optic fiber manufacturer, and it can be set to the accuracy of four digits after decimal point between 1.0000 and 1.9999.

## 9.10 Scatter Coefficient (Backscatter) Setting

Scatter coefficient determines the value of backward scatter power. The configuration affects the calculation of reflection value.

**NOTE**

Configuration zone is -10 to -70dB

## 9.11 Non-reflective Threshold (Splice Loss Detecting Threshold) Setting

This configuration has direct impact on the listing of insertion loss events. Only insertion loss events that are greater than this threshold will be listed. The value configuration zone is 0.00 to 5.00dB

**NOTE**

The default value is 0.20dB.

## 9.12 Reflective Threshold (Reflective Detecting Threshold) Setting

This configuration has direct impact on reflective events listing. Only reflective events that are greater than this threshold will be listed. The value configuration zone is -10dB to -65dB.

**NOTE**

The default value is -52.00dB

## 9.13 End Threshold (Optical Fiber End Detecting Threshold) Setting

This threshold is the end threshold of optic fiber. If the end threshold equals 3.0dB, then the first event with insertion loss greater than 3dB will be considered as the end of the optic fiber.

The value configuration zone is 0.0dB to 20.0dB.

**NOTE**

The default value is 3.00dB.

## 9.14 Load Default

In OTDR Setup surface, there are 3 “default” buttons, corresponding to IOR, scatter coefficient (backscatter), non-reflective threshold (splice loss detecting threshold), reflective threshold (reflective detecting threshold) and end threshold (optical fiber end detecting threshold).

## 10 Use OTDR Test FTTx-PON Network Optical

### *Fiber Link*

Testing for FTTx-PON networks differs from point-to-point in that optical splitters exist in the network. In order to use this instrument to test FTTx-PON networks, you will need to know the following items.

### 10.1 Use PON Optimized OTDR Instrument

Some models optimized specific to FTTx-PON network optical fiber link, can get fairly ideal results.

In order to get ideal results, you need to set the correct distance range, end threshold (optical fiber end detecting threshold), reflective threshold (reflective detecting threshold) and etc.

### 10.2 Select the Proper Distance Range

With optical splitters present in the FTTx-PON network, there will be a large attenuation event of >10dB; auto test may not be able to accurately represent this network configuration. We suggest manually setting the parameters of distance, pulse width and duration according to the perceived optical fiber link length.

### 10.3 End Threshold (Optical Fiber End Detecting Threshold)

With optical splitters present in the FTTx-PON network, there will be a large attenuation event of >10dB.

The default end threshold configuration of 3.0dB will trigger a false fiber endpoint. Therefore, you will need to set the end threshold to equal to the “End threshold configuration reference value” below (see Tab. 10.1).

### 10.4 Test parameter recommendation value

Splitter type	Loss reference value	End threshold configuration reference value	Recommended test pulse width
1:8	$\geq 9\text{dB}$	12dB	100ns, 300ns
1:16	$\geq 12\text{dB}$	15dB	100ns, 300ns
1:32	$\geq 15\text{dB}$	18dB	300ns, 1us
1:64	$\geq 18\text{dB}$	21dB	300ns, 1us

Tab. 10.1 Recommended parameter values for PON network optical fiber link

## 11 Trace Analysis and Event Operation

### 11.1 Open Trace File

Open trace file:

- 1) Press down [Open] in button column in OTDR surface.
- 2) Select the file need to be opened in the files dialog box.

If necessary, change the file position to search saved files.

If necessary, click the scrollbar on the right side, check the listed files.

- 3) Click [Open] and the file opened.

If click [Cancel], the file can't be opened and quit dialog box.

- 4) The file name displayed on the surface top left.

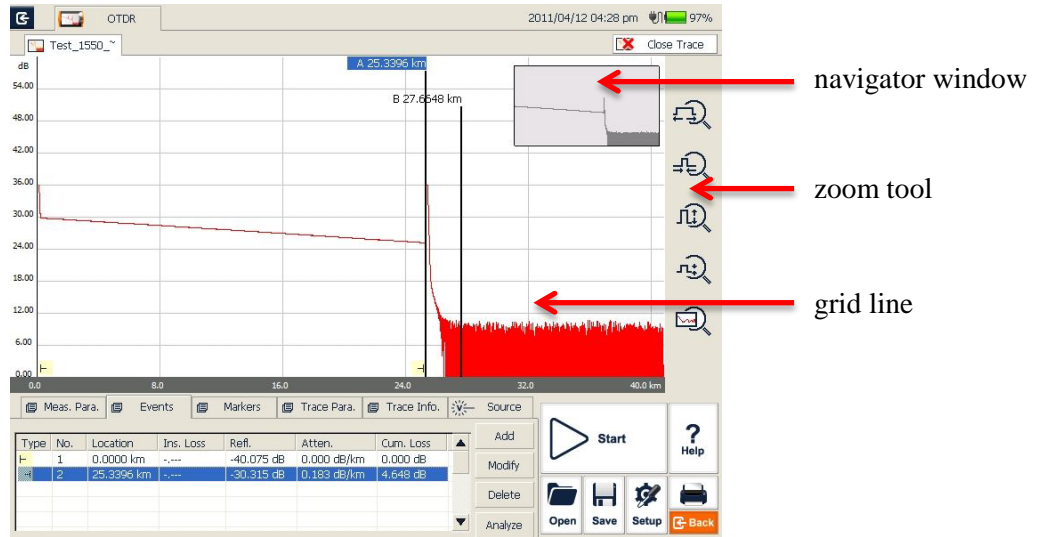


Fig. 11.1 Trace file opened

#### NOTE

- Check or open “.jpg” format trace file, please use the “File Explorer” in {Program}.
- Bidirectional traces cannot be opened on this instrument. If needed, use the bidirectional analysis program provided by MTP-Suite which installed on computer.

## 11.2 Simultaneous Display Multi Traces

In order to compare trace files, open the multi trace display.

When multi trace is open, the current trace is red, the icon in front of the file name is red, other icons are grey.

### ***Open multi traces setting:***

In OTDR [Setup], in the test options, select “Support multi traces”. Four traces can be opened simultaneously.

## 11.3 Close Trace File

### ***Close trace file:***

Click [Close trace] button on the upper right corner of the interface to close the trace file.

### ***NOTE***

While in single trace mode (non multi trace mode), opening a new trace will close the opened trace automatically; this will reduce the operating steps and make it easier to use.

## 11.4 Trace Display and Operating Instruction

After trace opened, application program will display the trace and analysis result in the trace window. The events on the trace will be marked by small icons, these events are marked and display below the trace.

X axis shows the relative distance from the testing point.

The number on the Y axis shows the reflection power value (relative power) and its range.

Once the trace is shown, the trace display parameters can be revised (like grid line and zoom window screen). Please refer to the paragraphs of “trace display parameters configuration”

### ***NOTE***

The content of trace window changes according to options changing. Some items of the trace can be seen at all times, but other items may be displayed when they are selected.

### ***Event Options:***

In {Event} options, there are various parameters of events listing, including event type, number, position, insert loss, reflection loss, attenuation and accumulation and etc.

When you switch to {Event}, application program will display a marker on the tracing graph.

When an event in event list is selected, the marker will move to that event position and indicate.

When in multi trace mode, event options only display current trace.

### ***Markers Options:***







When switch to {Markers} options, application program display two Markers A and B, or include some gauge points. Particular cases depend on the function button in the button area.

Move these Markers along the trace to calculate loss, attenuation, reflection and etc.

Can use the buttons in Markers area to relocate all Markers and also can drag them in trace display window.

## 11.5 Switch and Move Markers

There are many ways to switch and move Markers. Users can choose one method or combine them to increase efficiency.

- In trace displaying area, use stylus or mouse to select A/B Markers or label above Markers, then press and drag A/B to move the trace service area to the target position.
- In the buttons area on the bottom of surface, click [] or [] to switch between A and B.
- After you select Markers, continuously click [] or [] to move Markers.
- After you select marked point, click [], [], towards left or right to move the Markers.




### NOTE

- For easier use, the position of Markers will be remembered the next time you power on the PRO-6350
- There is a marked point when you precede the loss or reflection analysis.

## 11.6 Switch and Move the Marked Point

When you perform loss or reflection analysis, there will be a marked point used for auxiliary test near the selected Markers.

There are various ways to switch, move the marked point, user can use one of them or use the combination to increase efficiency.

- Use the stylus or mouse to select marked point in the trace displaying area, then press on and drag the marked point move in the trace service area to the target position.
- In the buttons area on the interface, click [] to switch circulated between the marked points under current Markers.
- After you select the point, continuously click [] or [] can move the point.

### NOTE

The points under each Marker in the process of movement:

- Marked points on the left side can't cross the Markers to the right side
- Marked points on the right side can't cross the Markers to the left side

## 11.7 Quickly Move the Markers Outside of the Window

When magnifying the trace, Markers may be positioned outside of the window.

When the Markers on the left side are outside the window, there will be a sign on the left margin of the window: A← or B←

When the Markers on the right side are outside the window, there will be a sign on the right margin of the window: →A or →B

Drag the signs above mentioned can move the Markers in to current window.



## 11.8 Lock AB Markers

In the surface of {Markers}, press down [A-B], A and B Markers will be locked. After AB Markers locked, when moving one Marker, the other one will move with it and the distance maintains the same.

For some special tests, this function may be more convenient.

### **NOTE**

When one Marker moves to the trace boundary, the distance between AB won't maintain. It will revert when it's not on the trace boundary.

## 11.9 Zoom the Trace

In order to check the event or detail in the trace, you will need to magnify the trace.

System provides two ways to magnify the trace for easier use for the user:

- 1) Magnify the trace by cross frame, operation is smooth and fast
- 2) Use the zoom toolbar on the right side

### **NOTE**

- After magnifying the operation, Markers may disappear from the current trace window
- Method 2, it needs to open the option of “display zoom toolbar”

## 11.10 Cross Frame to Zoom the Trace

In the trace display area, magnify the traces by cross frame from upper left to lower right. In the trace display area, contract the trace from upper right to lower left. Repeat above operation mentioned to magnify or contract the trace continuously.

### **NOTE**

- Do not cross to the outside of the trace display area, otherwise the operation won't respond.
- The trace does not have unlimited magnification.
- The trace can't be contracted more after contracted to 1:1 size.
- Application program will maintain the zoom situation for further test and check of similar trace.


## 11.11 Use Zoom Toolbar to Zoom the Trace

On the right side of trace window, there is a zoom toolbar vertical ranked. You can use the zoom toolbar to magnify the trace to check the event detail on the trace.


### **NOTE**

- Press the magnify button for the first time, trace window will display the trace in the middle.
- After the trace is magnified, in order to move trace window, click the place outside the magnified area, trace window will move around this place. You can also use the direction key on the front panel to move the trace.


### 11.11.1 Revert the Whole Trace View

Click [  ] to revert the whole trace view.

### 11.11.2 Zoom In Trace Horizontally

Click [  ] to zoom in the trace horizontally.

### 11.11.3 Zoom Out Trace Horizontally

This function is to zoom out trace horizontally. Click  to zoom out trace.

### 11.11.4 Zoom In Trace Vertically

Click [  ] to Zoom in trace vertically.

### 11.11.5 Zoom out Trace Vertically

Click [  ] to Zoom out trace vertically.

## 11.12 Remember the Zoom Status Automatically

In the process of testing or opening trace, the magnified proportion and position will be remembered temporarily. When testing under the same distance once again, the magnified status of the window remains the same for continuous test.

### **NOTE**

- When user turns off the PRO-6350, the zoom info won't be retained. Turn on PRO-6350 again; trace window will revert to whole trace status.
- When user changes wavelength, pulse width and time, as long as the distance is not changed, auto memory of zoom status will be effective.
- When user changes the distance, trace window will revert to whole trace status.

## 11.13 Move the Magnified Trace Window

After the trace is magnified, the trace window will only display part of the trace. There are two ways to move the trace window:

- 1) Use stylus or mouse to operate in navigation window.
- 2) Use 4 direction keys on the front panel to operate.

### ***To move magnified trace window in the navigation window***

In the navigation window, you can see the position of current window on the whole magnified trace. Click some place outside the magnified area in the navigation window, trace window will move to the place correspondingly.

### **NOTE**

In navigation window, if the shadow region is clicked (display scope of magnified window), the operation will be invalid.

### Use direction keys to move trace window

As to the magnified trace, press down the direction keys on the front panel, the trace window will move correspondingly.

- Click “▲”, the trace window move upward
- Click “▼”, the trace window move downward
- Click “◀”, the trace window move towards the left
- Click “▶”, the trace window move towards the right.

### NOTE

When the whole trace is displayed, the trace window can't be moved.

## 11.14 Operation of Event Options

The Events sheet lists all the events tested on the trace. Events can be defined as points where optical transmission change occurred. Events are constituted as loss when caused by transmission, splice, connector or crack. If event was not in the certain threshold, it was a defect event.

Type	No.	Location	Ins. Loss	Refl.	Atten.	Cum. Loss	
+	1	0.0000 km	-.-	-40.075 dB	0.000 dB/km	0.000 dB	▲
+	2	25.3396 km	-.-	-30.315 dB	0.183 dB/km	4.648 dB	▼

Fig. 11.2 Events options

For every event in the sheet, the following info is displayed:

- Type: Different indicator used for different event types. As to the detailed indicator instruction, please refer to the previous paragraphs.
- Number: Event number (one continuous number designated by OTDR application program).
- Position: Distance between OTDR and event or event and starting point of optical fiber link.
- Insert Loss: The loss of every event by unit of dB (calculated by application program).
- Reflection value: Calculated value for each event.
- Attenuation: The attenuation for each optical fiber length (loss/distance).
- Accumulation: The accumulating loss from the link starting point to the end of the link.

### NOTE

Accumulating loss calculates the events listed in the event sheet and doesn't calculate the hidden events. About the more accurate link loss, please refer to the loss result displayed in {Markers}.

**11.14.1 Display the Event on the Trace and Locate Event In Even Sheet**

Through scrolling the event sheet, user can check the relative info about all events tested on the trace. When an event is selected, Markers will appear on the trace which is above the event.

- When the trace is under magnification, the event and its Markers may not be in the current window.
- It is better to locate the event under a whole trace status and then magnify to see the detail.

**11.14.2 Add Event**

User can insert event into event sheet at any time manually. For example, when there is a splice point on some given position, but it is hidden in the noise or the splice loss lower than the minimum value of non-reflection detecting threshold, then the analysis didn't test that point, this operation will be quite useful. User can manually add this event to the event sheet. This will add a number on the insertion position but won't modify the trace.

**NOTE**

Important Hint: When reanalyzing the trace; the inserted event will be removed.

- 1) Press[Add] on {Event} label;

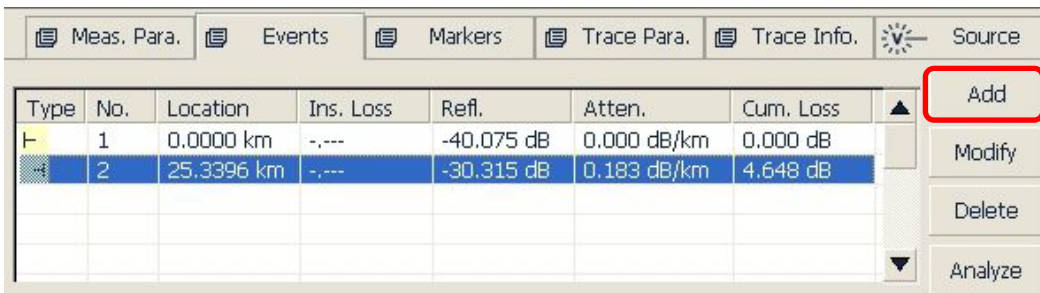


Fig. 11.3 Add event

- 2) Fill in the event information in the add event dialog window.

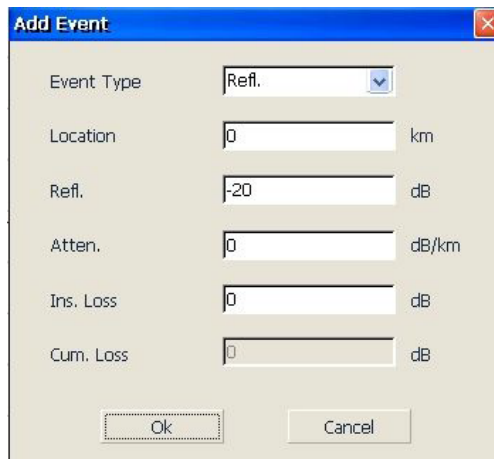


Fig. 11.4 Add Event Dialog Window

- 3) Press [Enter] to save and back to main window after edit finished, the event will appear in the event list. If pressed [Cancel], it will quit without saving.

**NOTE**

There are reflection events and non-reflection events for inserted events.

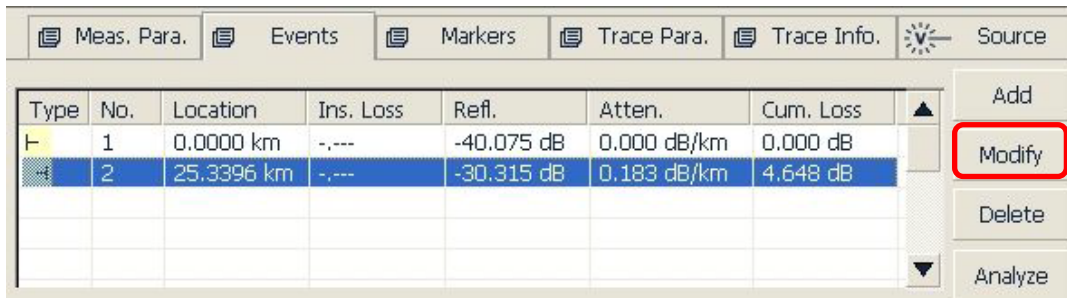
### 11.14.3 Modify the Event

User can modify the event in the event sheet manually. For example, when there is an event analysis result unmatched the observed result, user can modify it through this function.

- Event modification won't modify the result of the trace.
- When reanalyzing the trace, events will be re-marked, modified events will revert to original value.

#### Modify event

- 1) Press [Modify] after selecting an event in events options.



Type	No.	Location	Ins. Loss	Refl.	Atten.	Cum. Loss
H	1	0.0000 km	-,---	-40.075 dB	0.000 dB/km	0.000 dB
H	2	25.3396 km	-,---	-30.315 dB	0.183 dB/km	4.648 dB

Fig. 11.5 Modify events

- 2) To modify the event information in the event modification popups.

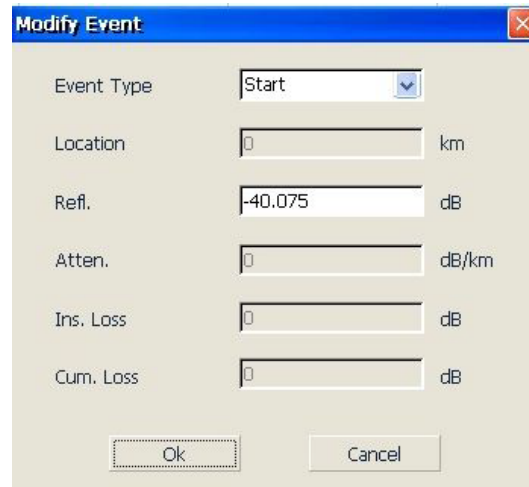


Fig. 11.6 Modify Event

- 3) Press [Enter] to save and back to main window after editing finished, the event will appear in the event list. If pressed [Cancel], it will quit without save.

### 11.14.4 Delete event

Except following events, almost all of the events can be deleted from event sheet.

- Analysis finished
- Starting point of the link
- End point of the link

**NOTE**

Important hint: The only way to recover the deleted items is to reanalyze the trace, like analyzing new traces. Please refer to the part “analyze or reanalyze trace”.

Delete event

- 1) Select the event need to be deleted
- 2) Click the {Delete} on the right side
- 3) Press “Yes” when the program hint or press “No” don’t delete event and go back to main interface.

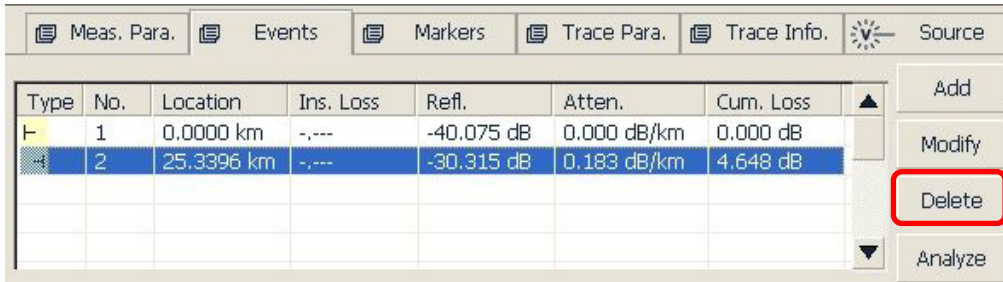


Fig. 11.7 Delete Event

**11.15 Analysis Detecting Threshold Configuration**

In order to optimize the event detection, user can set follow analysis detecting threshold:

- Change non-reflective threshold (splice loss threshold): It can display or hide small non-reflective event.
- Change the reflective threshold (Reflective threshold): It can hide the fake reflective event caused by noise, turn the harmless reflective event to loss event or check the event which may cause damage to network and other optical fiber equipment.
- Change the finish threshold (optical fiber end threshold): It can analyze the important loss event (like breakpoint) and stop the event analysis after that event.

**NOTE**

“Auto” mode and “Manual” mode can use these thresholds.

**Set analysis detecting threshold**

- 1) Press [Setup] in the button area located in the lower right area to enter setting surface.
- 2) Set these parameters in the parameters analysis part. In the relative edit frame, enter value needed or press [Default] revert the default value.

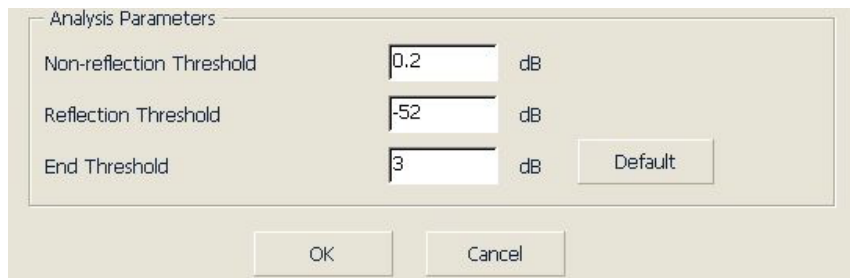


Fig. 11.8 Parameters analysis edit frame

- 3) Press [OK] to save setting and then quit setting surface; If press [Cancel], it will quit without setting saved.

**NOTE**

Analysis detecting threshold just set will used for trace tested after the set and reanalysis of the trace.

### 11.16 Reanalyze the Trace

User can reanalyze the trace. Reanalyze the trace has follow effects:

- Create new event sheet for trace.
- Reanalyze the trace got by the software of latest version.
- Re-found the original event sheet (if the event sheet has been modified).

**NOTE**

Application program will analyze the newest tested trace. User can check the analytic result in the event options.

***Reanalyze the trace:***

- 1) In the [Event] options, press [Analysis], it will reanalyze the whole trace;
- 2) After analysis finished, the new analytic result will be listed in the event sheet.

**NOTE**

- If necessary, change the analysis detecting threshold first and then to continue the analysis.
- The analytic result may be inconsistent to the previous result if was affected by instrument features or detecting threshold.

### 11.17 Analyze the Optical Fiber in Specific Optical Fiber Link

As to the PON optical fiber link which has splitter, you need to set the proper finish threshold (optical fiber end detecting threshold) to analyze the end event which through the splitter. Please refer to the sheet “Recommended parameters value of PON network optical fiber link”. Please change the analysis detecting threshold first and then to analyze. This will analyze some events after splitter correctly.

### 11.18 Set Trace Display Parameter

User can modify following trace display options before or after the test and trace opened:

- Grid line: It can display or hide the grid line displayed on the Fig background; it will display the grid line under default status.
- Navigation window: It can display or hide the window which used for whole trace survey on the upper right position of the trace window.
- Length unit: it can select the length unit will be used in the whole application program.

Before the trace is opened, you can change following trace display options:

- Multi traces: Control whether to open multi traces at the same time
- Zoom toolbar: It can display or hide the zoom icon area which on the right side; will get maximized trace display area after hide the zoom toolbar. The zoom toolbar is displayed under default status.

For the first time entering OTDR functions surface, the help information for simple operation is displayed in the trace area and the navigation window and grid line are not visible. Only after test or after the trace opened can see the grid line and navigation window.

**To set the trace display parameters:**

- 1) To press [Setup] in the button bar located on the lower right of the OTDR menu.
- 2) In the options of test display area, select and modify the display options.
- 3) Press [Application] and make change, then quit the setting dialog box; or press [Cancel] to quit the setting dialog box without setting save.

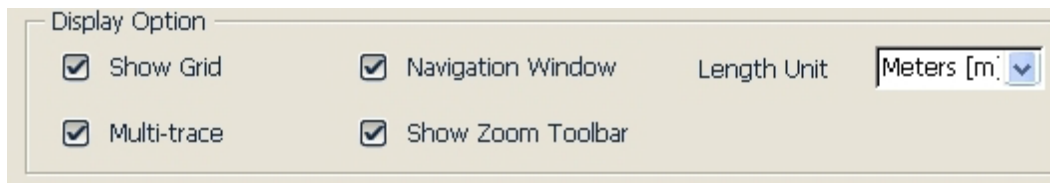


Fig. 11.9 Options of test display area

**NOTE**

To hide or display the zoom toolbar you must turn off all the traces opened. Otherwise the setting won't go into effect.

### 11.19 Set the Length Unit

In the OTDR parameters setting dialog box, select the length unit in the test display area options. The unit can be meter, feet or mile.

**NOTE**

- The default length unit is meter.
- Some certain values such as pulse width, wavelength and etc. won't change along with the distance. Pulse indicated by second, wavelength indicated by nm.
- When select m as length unit, system will display km in some place.
- When select ft as length unit, system will display kft in some place.
- When select mi as length unit, system will display kmi in some place.

### 11.20 Display or Switch the Trace

In the OTDR test application program, in multi trace mode, there are two ways to switch the displayed trace:

- 1) To hide or display the trace: click the file name label on the upper left.
- 2) Or click the [✘ close trace] on the surface upper right to close current trace.



## 11.21 Check Current Trace Parameters

Check current trace information on {Trace Info.} label.

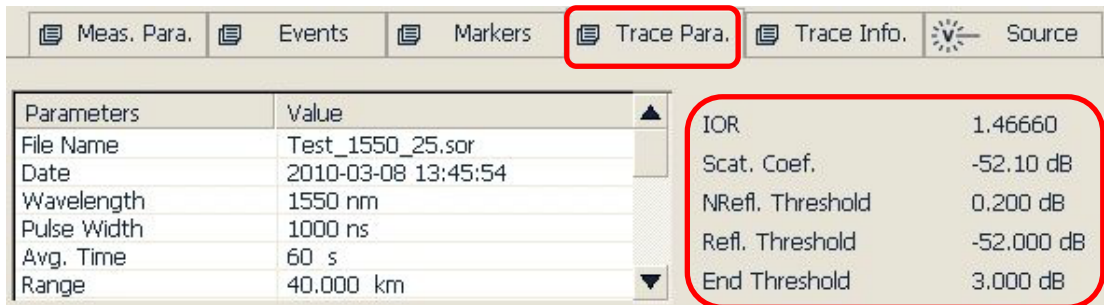


Fig. 11.10 Check the trace parameters

### ***The content displayed is shown below:***

File name, save date and time, test wavelength, test pulse width, test time, test distance, total loss, average loss.

- File name: The name of current trace.
- Date: Date and time of test.
- Wavelength: Laser wavelength used for test.
- Pulse width: Laser pulse width used for sampling.
- Averaging time: Continuous sampling time.
- Range: Distance used for test.
- Link length: The length of optical fiber link calculated after test.
- Link loss: The total loss of the link starting point to the link end.
- Link attenuation: Average loss of the total link, indicated as function of distance.
- Event quantity: Total events number got from current trace analysis which is according to test parameters

### ***The content displayed on the right:***

IOR, back scatter, splice threshold, reflection threshold, end detecting threshold.

- IOR: Indicates the trace IOR (also called group coefficient). If you modify this parameter, it will adjust the trace distance test.
- Backscatter: Rayleigh back scatter parameter setting of the displayed trace.
- Non-reflective threshold: Check the current setting of small non reflective event during the trace analyzing.
- Reflection threshold: Check the current setting of small reflection event during the trace analyzing.
- End threshold: Check the current setting of the loss of important events (will affect the transmission performance during the trace analyzing)

### ***NOTE***

Trace parameter options only displays the selected trace even if multi traces are opened. Please switch to the trace if you want to display the parameters of other traces. The trace selected is in red.

## 12 Manual Trace Analysis

User can use markers and zoom tools to measure splice loss, attenuation and reflection, or use markers to locate event position and relative power level.

### 12.1 Use Markers

Click {Markers} label in OTDR main interface to activate markers.

### 12.2 Event Location and Loss Information

OTDR application automatically calculates event location and displays the location in events list. User can manually check event location and distance between events. Loss information can be also displayed. The X-axis represents distance and Y-axis represents relative power.



Fig. 12.1 Event location and loss information

To acquire event location and loss information

- 1) Click {Markers} label in OTDR main interface.
- 2) Place marker A or B to at the beginning of the event, the marker label will show distance.
- 3) Fig 12.1 shows the insertion loss of current marker and A-B loss.

### 12.3 Measure Insertion Loss (2-point and 5-point method)

Insertion loss (unit: dB) is calculated by measuring the signal level of Rayleigh backscatter (RBS) and the magnitude of reduction. Insertion loss can be created by reflective and non-reflective events.

In real-time the system calculates the loss between Marker A and B, and also calculates the insertion loss at Marker A or B. Insertion loss is calculated in 5-point method.

**2-point method (A-B Loss):**

Insertion loss is calculated as shown in Fig. 12.2.

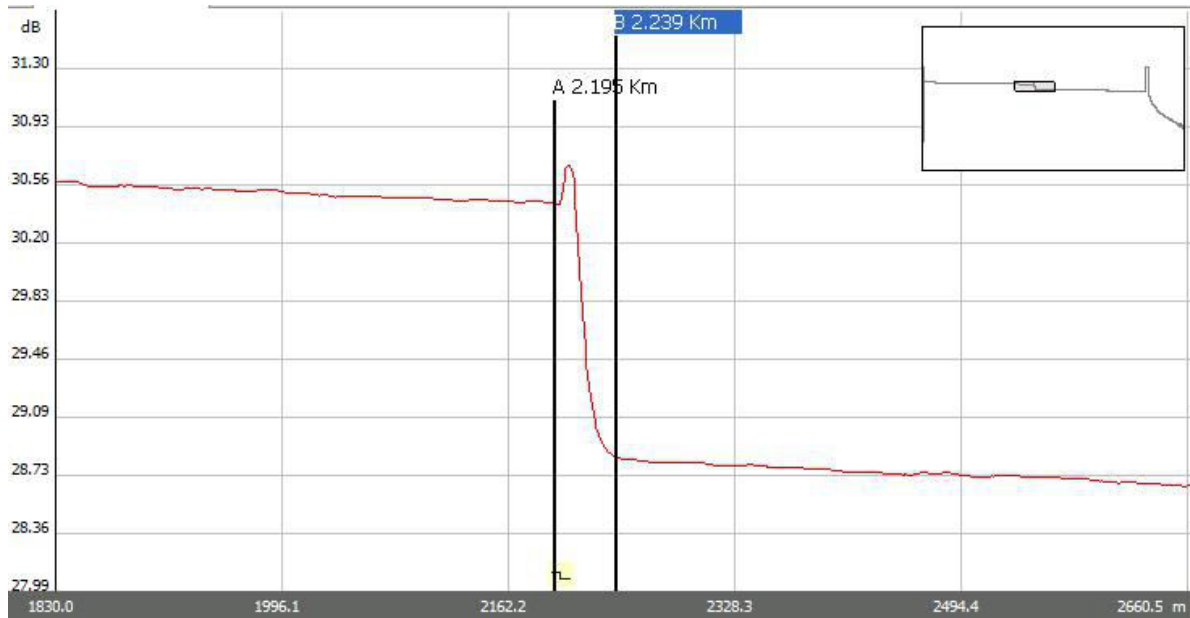


Fig. 12.2 2-point Loss

2-point method is suitable for measuring splice loss but not applicable to measuring reflective events.

**NOTE**

- “A-B Loss” is for quick loss measurement of certain segment of the fiber marked between Marker A and B.
- “A-B Loss” is not applicable to measuring reflection events.

**5-point method to measure event loss:**

Event loss is measured by 5-point method. When the [Loss] button in “Markers” Label is not pressed, the marking points used by 5-point method will not display; however, the system use 5-point method by default.

When applying the 5-point method manually, the marker and its related 4 marking points divide the trace around the event into 2 areas: the left to the active marker and the right to the marker, the 2 marking points on the left and the 2 on the right both form a straight line, move the two lines close to the event center and the power difference between the two lines is the event insertion loss.

It also applies to the measurement of point A's or B's insertion loss.

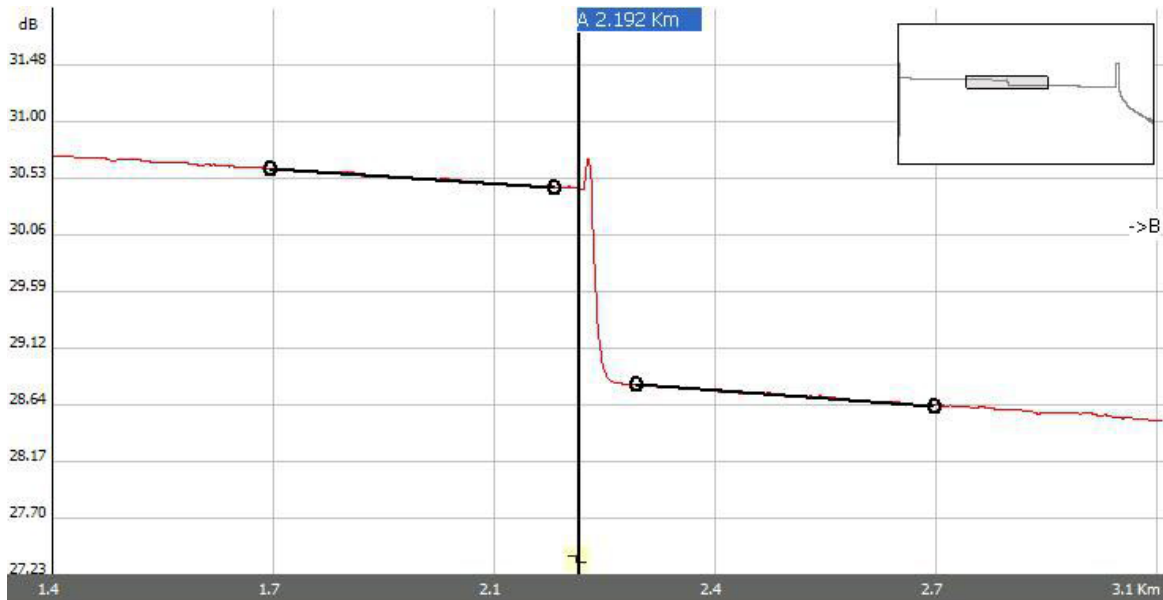


Fig.12.3 5-point method

When [Loss] button is pressed, the PRO-6350 will show the marking points to measure the event loss. When Marker A is selected, the screen will display the 4 marking points related to Marker A. When Marker B is selected, the screen will display the 4 marking points related to Marker B. The Markers and marking points can move separately.

***The procedure to apply 5-point method:***

- 1) In the main interface of the PRO-6350 OTDR module, click “Markers” label;
- 2) Press [Loss] button, Marker A, Marker B and their related marking points will be displayed on the trace;
- 3) Zoom the trace to view the event clearly, move Marker A to the end of linear part of the trace before the event;
- 4) Move the first marking point to the beginning of the linear part of the trace before the event;
- 5) Move the second marking point to the end of the linear part of the trace before the event;
- 6) Move the third marking point to the beginning of the linear part of the trace after the event;
- 7) Move the fourth marking point to the end of the linear part of the trace after the event;

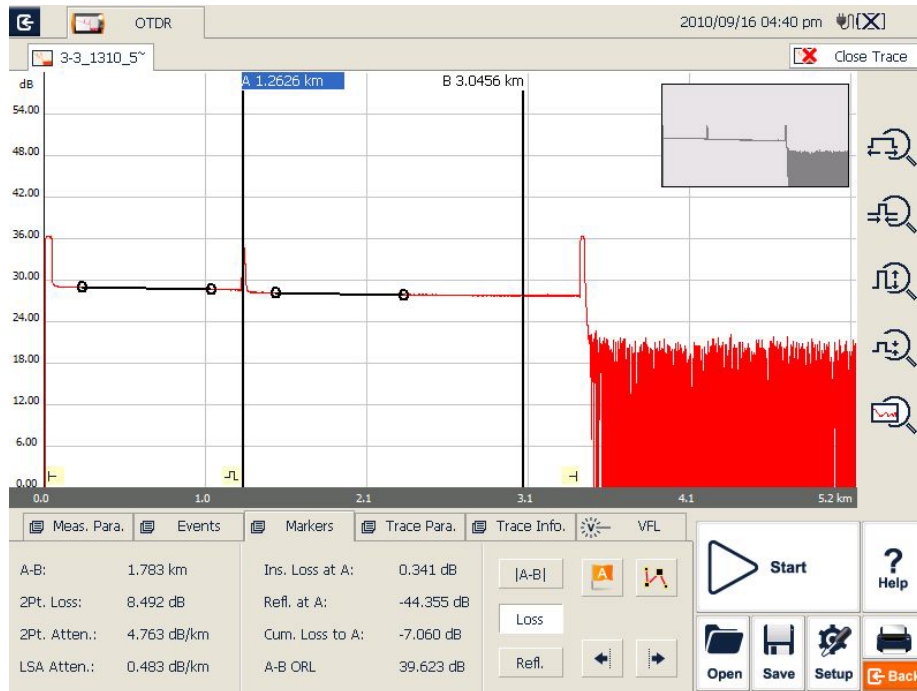


Fig. 12.4 Measure insertion loss in 5-point method

### NOTE

- The marking points on the left of the active marker cannot be moved to the right and vice versa.
- The loss showed in the Event List is measured by 5-point method.

## 12.4 Measure Attenuation (2-point and LSA method)

2-point method measures the attenuation between Marker A and B calculated by all the loss over the distance between Marker A and B (Unit: dB/Km). Use only these two points to calculate.

LSA (least-squares approximation) method uses linear regressions that is applied to the backscatter before and after an event (Between Marker A and B) to estimate the attenuation in the backscatter resulting from the event's loss. LSA method only measures the amplitude (decibel) change between the crossing points of the trace with Marker A and B.

Compared to 2-point method, LSA method is more accurate because it is less sensitive to trace noise and suitable for measuring splice attenuation. However, LSA method should not be applied to measure attenuation when there are reflective events between Marker A and B.

**Measure attenuation:**

- 1) Click {Markers} label in OTDR main interface to show Marker A and B.
- 2) Place Marker A and B at different points on trace.
- 3) Zoom in the trace to adjust marker position when necessary.
- 4) Check 2Pt. Atten. (2-point attenuation) and LSA Atten. (LSA attenuation) values, as shown in Fig. 12.5.

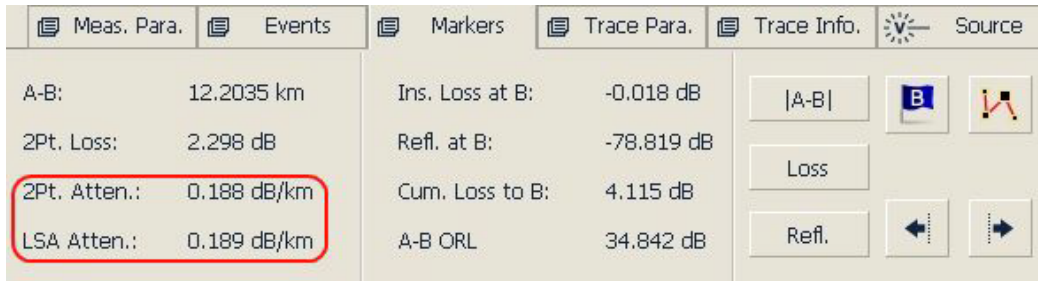


Fig. 12.5 View attenuation

**NOTE**

There should not be any event between Marker A and B when measuring attenuation with 2-point method.

## 12.5 Measure Reflectance

Reflectance is the ratio of reflected power ( $P_r$ ) to incident power ( $P_i$ ) of an event (such as a connector).

$$\text{Reflectance} = 10 \log (P_r/P_i).$$

- 1) Click {Markers} label in OTDR main interface to show Marker A and B.
- 2) Click [Refl.] button to show marking points.
- 3) Before measurement, zoom in the trace and place Marker A to the end of linear part of the trace before the event.
- 4) Move the first marking point to the beginning of the linear part of the trace before the event and Marker A.
- 5) Move the second marking point to the end of the linear part of the trace before the event and Marker A.
- 6) Place the marking point behind Marker A to the peak of the reflection event to be measured.
- 7) View the reflectance.

**NOTE**

Above process is applicable to measuring all reflection events' reflectance even if they are very close to each other.

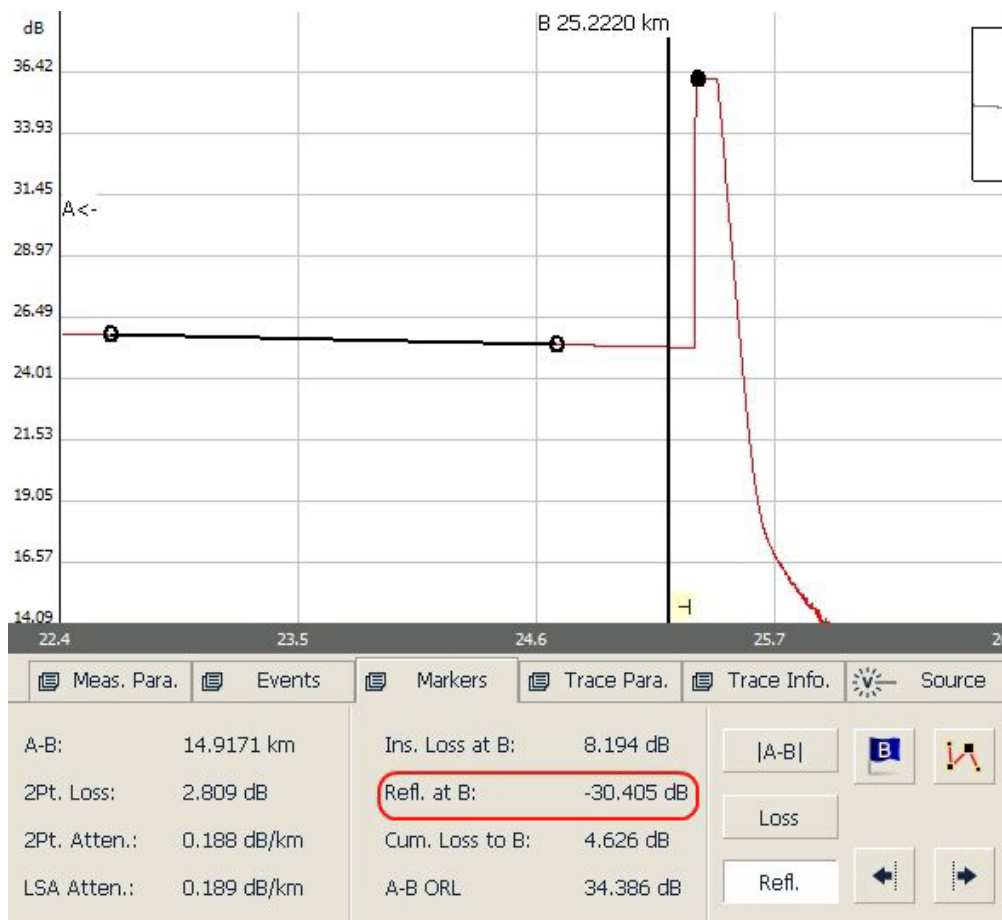


Fig 12.6 Measure reflectance

**NOTE**

For non-reflective events, reflectance will show as “-----”.

## 13 Trace File Management

User can save, open, rename and delete trace file after acquisition.

User can save and open trace file in OTDR main interface.

User can rename, copy, move and delete file in File Explorer.

### 13.1 Save Trace in Different Formats

In the OTDR main interface, user can choose trace saving format as Bellcore (.sor) or JPEG (.jpg).

If saving trace as other formats, user should copy the trace file to the PC and use the OTDR Trace Manager Software, which has installed on the PC, to select other formats.

### 13.2 Copy, Move, Rename and Delete Trace

There are two ways to copy, move, rename and delete trace.

Method one: Though File Explorer:

- 1) A. In the PRO-6350 main interface, click {Program} label and click [File Explorer] icon as shown in Fig 13.1:

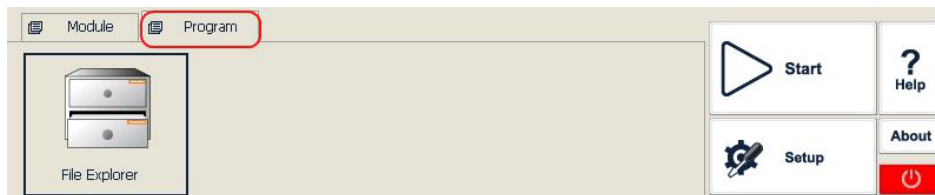


Fig 13.1 File explorer

- 2) B. Click [Start] button or press ►/■ (Start/Stop) button on front panel to enter File Explorer.
- 3) C. Click “SDMMC\_Disk” icon to enter internal memory space.
- 4) D. Copy, move, rename and delete trace.
- 5) E. After operation, click [✕] button to return to main interface.

#### NOTE

- In File Explorer, the file and directory operation is similar to Windows 98/XP system.
- User can move, rename and delete files saved in “SDMMC\_Disk” but the disk itself cannot be moved, renamed or deleted.
- For more information, please refer to the Help file on PRO-6350.

Method two: User can connect the PRO-6350 to a PC, and the PRO-6350 will be recognized as a mobile device. User can copy, move, rename and delete files in PC’s Windows System.



### 13.3 Check Disk Space

User can check disk space utilization status (used space and free space) in File Explorer:

- 1) Enter File Explorer in the PRO-6350 main interface.
- 2) Click “SDMMC\_Disk” icon and select [File] <Properties> or click and hold “SDMMC\_Disk” icon, select <Properties> from pop-up menu.
- 3) “SDMMC\_Disk” space utilization status is shown below:



Fig. 13.2 Check disk space utilization

- 4) Click “OK” to exit disk properties.

#### **NOTE**

It's suggested to check disk space utilization status from time to time and transfer or back up files to avoid insufficient disk space when the PRO-6350 is in use.

## 14 Print OTDR Report

User can manage saved trace files in the PRO-6350 and print report. For reference and report printing, it is necessary to manage and update trace information.

### 14.1 Trace Information

After trace acquisition, user can add or update tested fiber information which includes: Cable ID, Fiber ID, Fiber Type, Start Location, End Location and Operator.

Adding or updating the information can be completed in {Trace Info.}.

### 14.2 Check and Edit Trace Information

User can check and edit trace information in {Trace Info.} function window.

When newly tested trace is saved, the trace is saved with above information.

User can also edit saved trace information and save the trace with updated information.

#### NOTE

- After editing trace information of a saved trace, the updated trace file name will show a star sign (“\*”) to indicate the change. If user closes the editing window without saving, system will prompt user to save.
- The update to the trace information is only effective to current active trace in Multi-trace display mode.
- Editing trace information does not affect measurement parameters and result.

#### *Edit and save trace information:*

- 1) Click {Trace Info.} label in OTDR main interface.

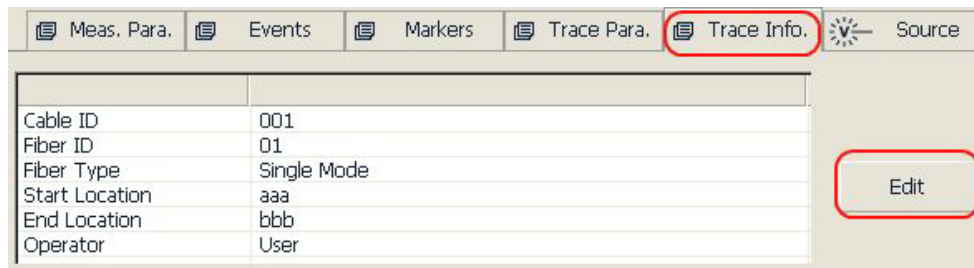


Fig. 14.1 Trace information and editing

- 2) Press [Edit] button and trace window will pop up.
- 3) Input trace information in the pop-up window.

The screenshot shows a 'Measure Info' dialog box with the following fields and values:

Field	Value
Cable ID	001
Fiber ID	01
Fiber Type	Single Mode
Start Location	aaa
End Location	bbb
Operator	User

- 4) After editing, press [Ok] to save and return to main interface; click [Cancel] to leave without change.
- 5) Click [Save] button in OTDR main interface to save the trace again and the updated information will be saved with the trace file.
- 6) Can use the same steps to view or change the trace information at any time.

#### **NOTE**

- Edited and saved traces can be used as a template for user's later reference.
- User can also use software to edit and save trace information.


### **14.3 Print OTDR Report**

The PRO-6350 supports direct connection to USB printer for printing.

OTDR report includes trace information, measurement parameters, trace, markers information, event list and etc.

Detailed contents to be printed can be specified in Print Option.

#### ***Print OTDR report:***

- 1) Connect USB printer to the PRO-6350.  
For first printing, please first configure printer, please refer to 2.7 Printer Configuration.
- 2) Click  button in OTDR main interface and printing dialog window will pop up.

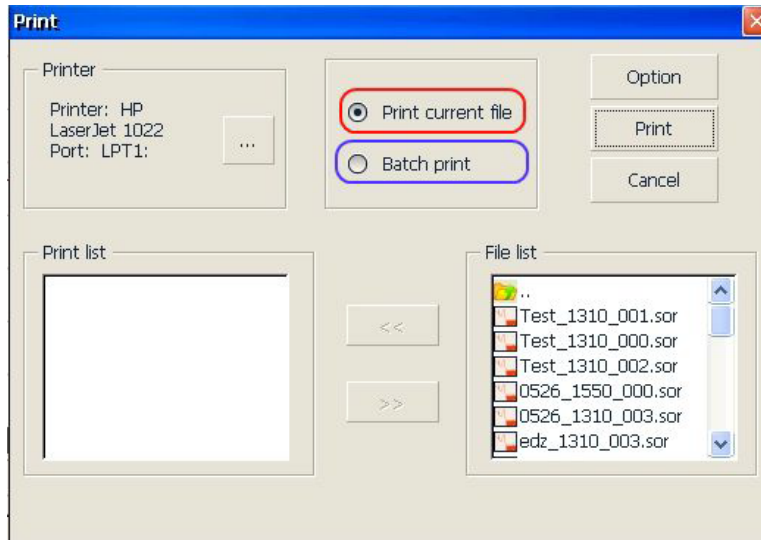


Fig. 14.3 Printing dialog window

- 3) Choose the traces to be printed:
  - a. To print current file, please check “Print current file” option and only one trace will be printed.
  - b. To print unopened traces saved in the PRO-6350, please check “Batch print” option which supports up to 8-traces printing.

4) Print Option:

User can customize OTDR report by clicking [Option] button on printing dialog window to specify the contents to be printed.

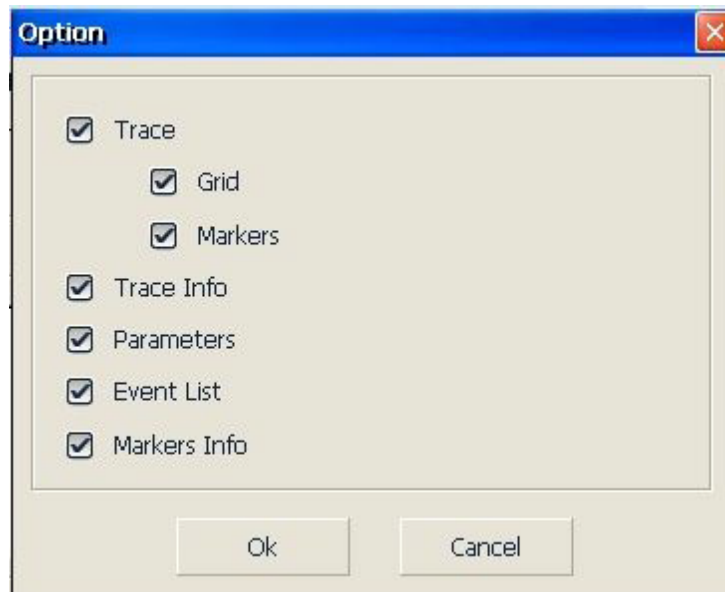


Fig. 14.4 Printing options

- 5) Press [Print] button to start printing.

During printing, system will display the message “Printing...Pease wait”, shown in Fig 14.5.

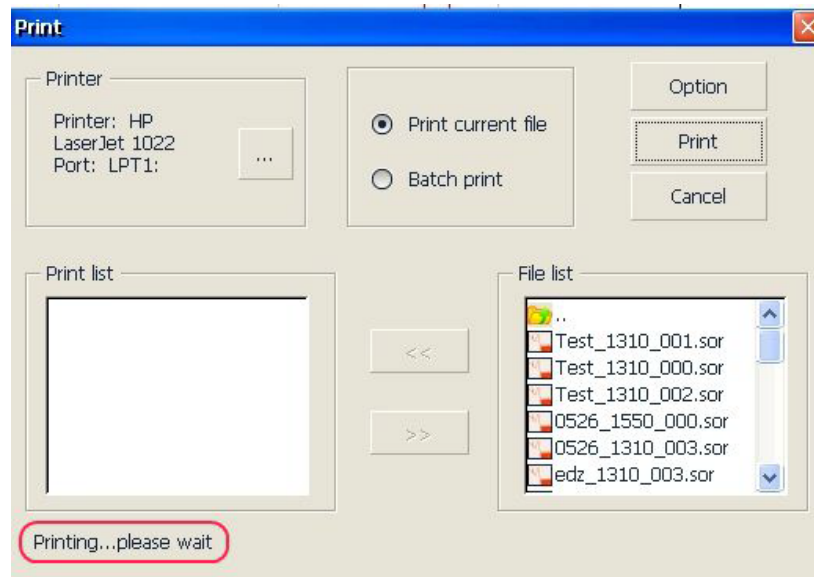


Fig. 14.5 Printing

- 6) After printing is finished, system will return to main interface.

**NOTE**

During printing, please do not manually close the printing window.

## 15 OTDR Module Built-in Stabilized Laser Source LS100

Under “SLS”, there are two setting interfaces: “General Setup”, “Reference Setting”. “General Setup” interface is shown as Fig 15.1

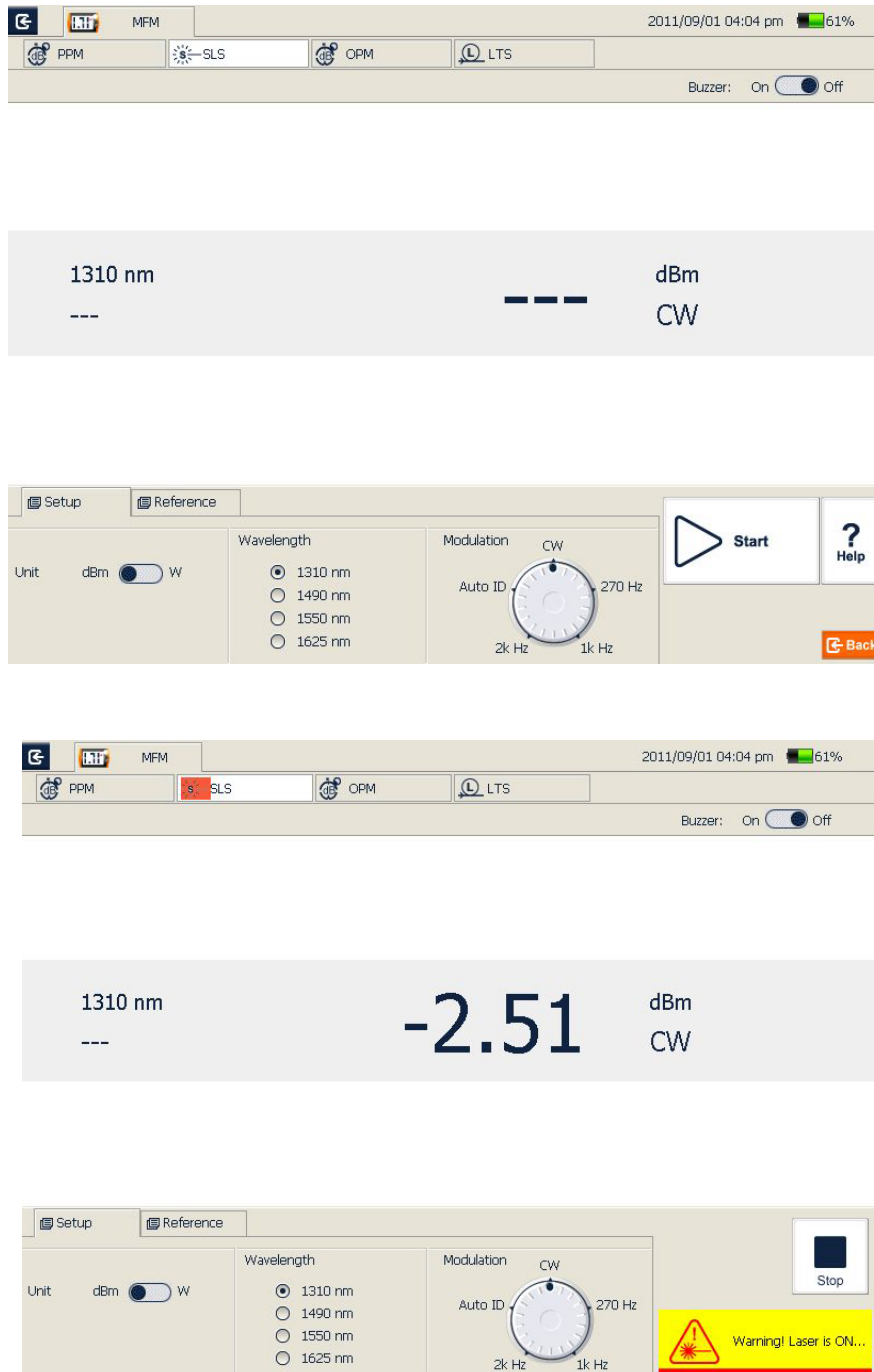


Fig.15.1 Stabilized Laser Source – Setup Interface

“Unit”: Shift between dBm and W.

“Wavelength”: Same as the wavelength of OTDR, wavelengths can be selectable. “Modulation”: Select different modes at CW, 270Hz, 1KHz, 2KHz, Auto ID.

After the setup, click [Start] button or Press “▶/■” (Start/Stop) button on the PRO-6350 front panel to start the measurement. Click [Stop] button or Re-Press “▶/■” (Start/Stop) button on the PRO-6350 front panel to stop the measurement.

### NOTE

The function icon turns red while switching on this function module.

“Reference setting” interface is shown as Fig 15.2

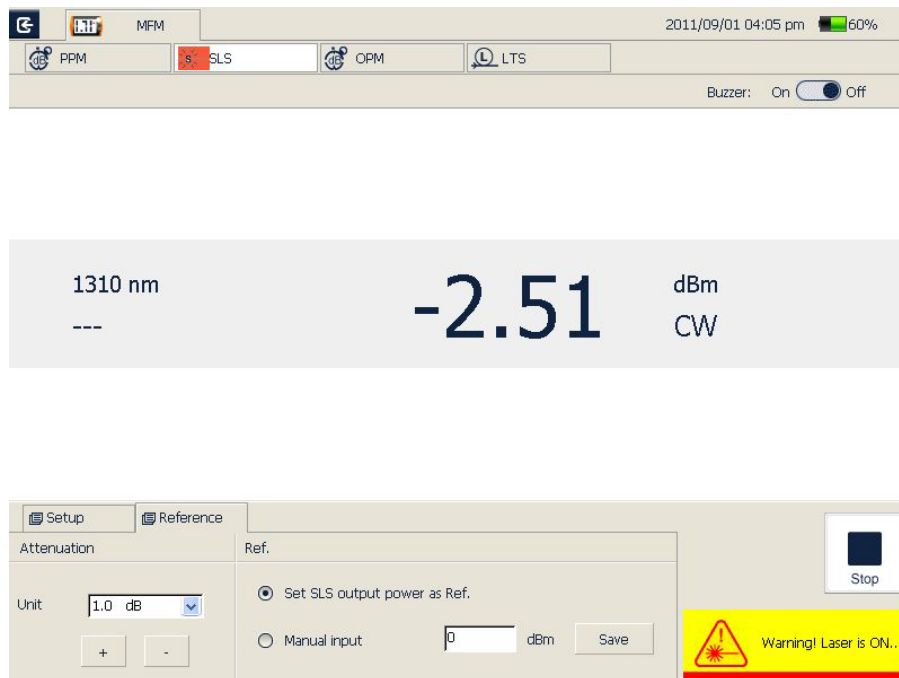


Fig. 15.2 Stabilized Laser Source – Ref. Setting

“Attenuation”: Select from steps at 1.0dB, 0.5dB, 0.1dB, 0.05dB. The adjustable range of output power is 6 dB.

“Ref.”: Select “Set SLS output power as “Ref” or “Manual input” to set the Ref. Click “Save” to save the Ref. setting.

## 16 OTDR Module Built-in Optical Power Meter PM100

### **Optical power meter operation:**

Click “OPM” icon to enter Optical Power Meter interface as shown in Fig 16.1.

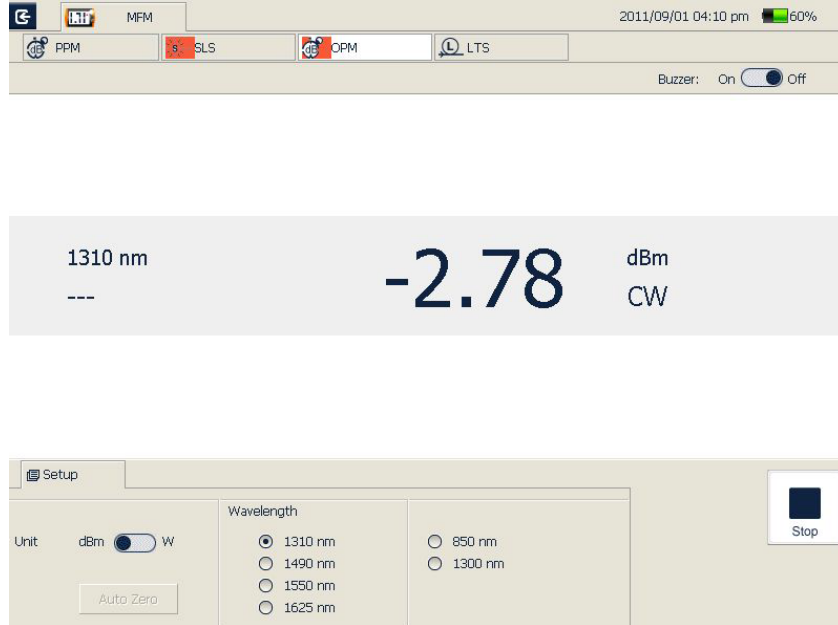


Fig. 16.1 Optical Power Meter

After the setup, click [Start] button or Press “▶/■” (Start/Stop) button on the PRO-6350 front panel to start the measurement. Click [Stop] button or Re-Press “▶/■” (Start/Stop) button on the PRO-6350 front panel to stop the measurement.

### **NOTE**

- The function icon turns red while switching on this function module.
- The wavelength of OPM will be changed to the current wavelength automatically if the Modulation set of SLS is Auto ID.

“Unit”: Shift between dBm and W.

“Auto zero”: This function provides an easy method of auto zero of power meter, which can be used to rectify the instrument’s power value under non-luminous state in daily testing.

### **NOTE**

Put protective cap on optical power testing output, and ensure that the tie-in is completely airtight.

“Wavelength”: Support 850, 1300, 1310, 1490, 1550, 1625, 1650nm wavelengths selectable.



**NOTE**

PM100 is only available with the OTDR module built-in PM100. With PM100, OTDR port will issue a special modulation signal.

**CAUTION**

Except the specific light port (light port used for online testing), do not connect the optical fiber which loads signal to the OTDR port, any external signal over -30dBm will affect the OTDR sampling and cause permanent damage to the OTDR.

**OTDR built-in source:**

- 1) Clean connector properly.
- 2) Connect tested fiber to OTDR port.
- 3) Click {Source/VFL} in OTDR main interface.
- 4) Select the suitable wavelength.
- 5) Select the modulation.
- 6) Press the [Open Source] in the {Source/VFL}.
- 7) Press the [Close Source] to break off the source.

**NOTE**

- If there is only one wavelength, the default is to select this wavelength.
- Under the modulation for loss measurement, please select the CW.
- Under the modulation for fiber identification, please select the 1kHz or 2kHz.
- For fiber identification easily, the PRO-6350 also offers a blink mode. When user select the blink mode, modulating signal (1kHz or 2kHz) will be emitted in 1s, then the next 1s signal will be closed, and then will be emitted in next 1s, and so on. User can select 1kHz+Blink or 2kHz+Blink for the Blink Mode.




## 17 VFL Application

The built-in VFL of OTDR module can shoot red laser into the tested fiber, the red laser will glow at the macro bend, breaking points and bare fiber end. The maximum detection range for the PRO-6350 VFL is over 5Km, it is a practical tool for fiber identification, detecting and highlighting breaks, tight bends, splices or defective connectors in optical fibers. The VFL is a perfect complementary tool to OTDR for its visualized detecting method in close range like OTDR dead zone.

### **NOTE**

VFL is only available with the OTDR module built-in VFL.

#### ***Fault locating with VFL:***

- 1) Clean connector properly.
- 2) Connect tested fiber to VFL port.
- 3) Click {  Source } in OTDR main interface.
- 4) Check “CW” option to emitter laser continuously or check “Flash” to emitter modulated laser at 1Hz.
- 5) Press [VFL On] button to start VFL and the {  Source } icon will turn orange.
- 6) When VFL is working, press [VFL Off] to turn off VFL and the {  Source } icon will turn back to grey.

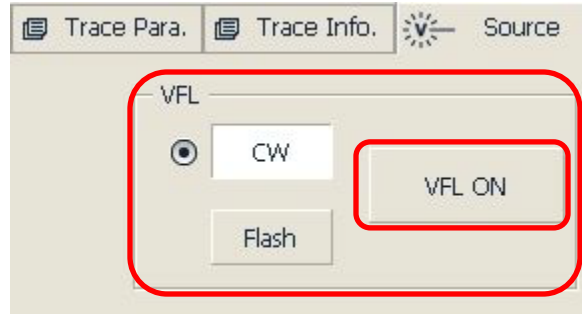


Fig. 17.1 VFL operation

## 18 Video Inspection Probe (VIP)

An Inspection Probe can display connector surface enlarged view and find dirty or damaged connector. It is convenient for the operator to view the connector and remove any hidden troubles, which may affect the transmission quality. The VIP is connected by USB, and the LCD displays the fiber endface image. The user can determine the quality of the endface and either pass or fail the endface. In order to meet different tests, the VIP offers kinds of specifications of male and female port adapter, including SC, FC, LC, MU and etc.


Video Inspection Probe supports the following video fiber inspection probe for common functions:

- Zoom in control: Support 200x and 400x.
- Focus control: Fine tuning display quality.
- Image capture: Can capture and save the image which displays in the LCD.

### NOTE

The VIP is only available with the OTDR module built-in VIP port.

### 18.1 Inspect the Optical Connector

- 1) Connect the probe to the VIP port .
- 2) Test fiber inserts the probe connector (Please select a suitable size connector).
- 3) Click “OCI” icon to enter Optical Connector Inspector interface as shown in Fig 18.1.

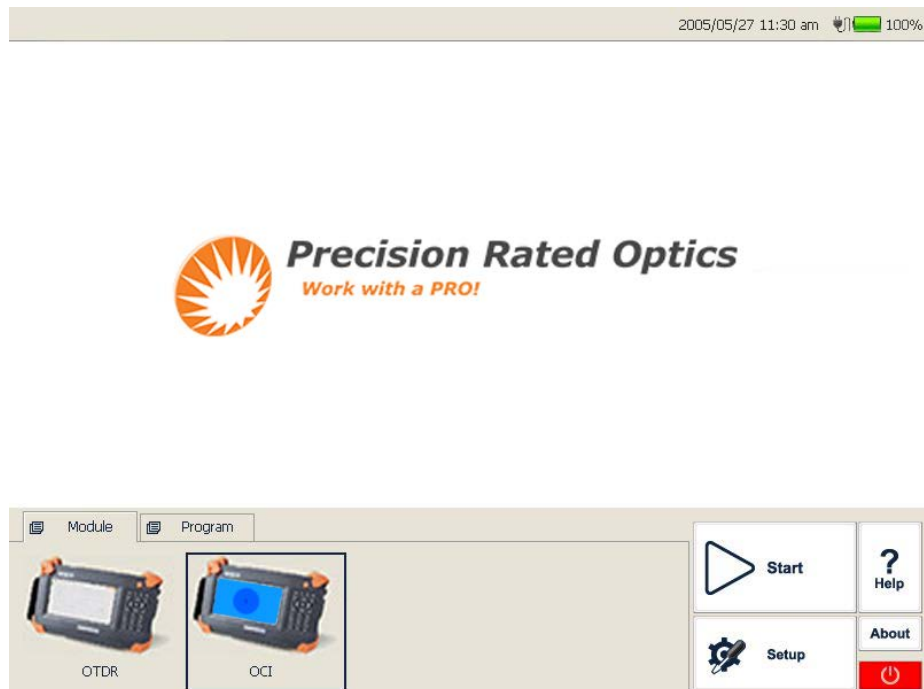


Fig. 18.1 Optical Connector Inspector Interface

- 4) Click [Start] button or Press “▶/■” (Start/Stop) button on PRO-6350 front panel to start the measurement. As shown in Fig 18.2

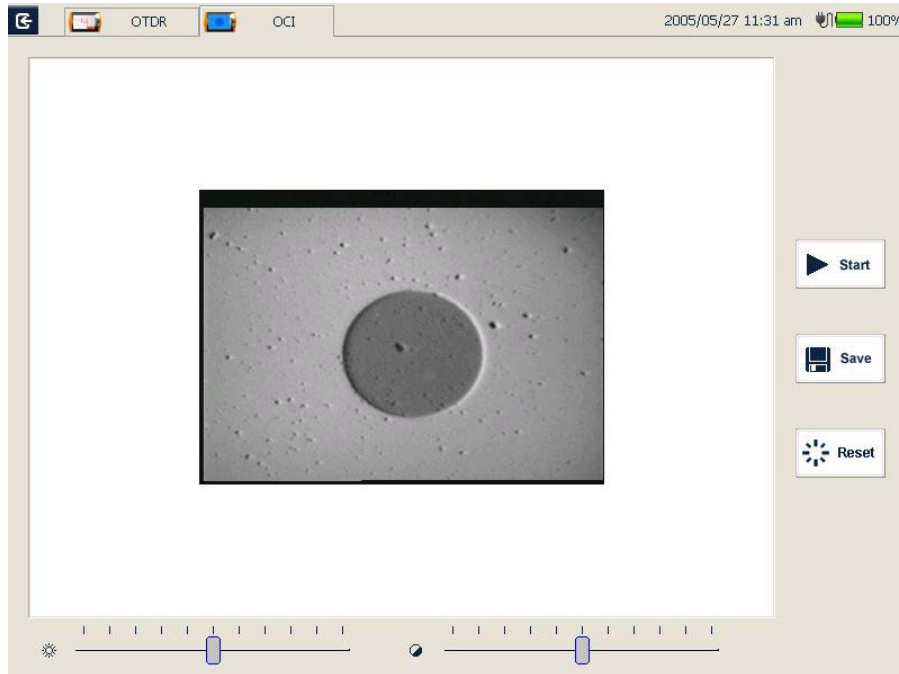


Fig. 18.2 Measurement

- 5) Click [Stop] button or Re-Press “▶/■” (Start/Stop) button on the PRO-6350 front panel to stop the measurement.
- 6) Exit this OCI interface: Click the exit button in the upper left corner; it will back to the main interface.

### NOTE

- In order to obtain a clear image, user needs to adjust focal length of probe and the brightness and contrast of image.
- If the probe is connected to the OCI before starting the application, user has to restart the application to initialize.

## 18.2 Adjust the Image Brightness and Contrast

Adjust the brightness with interface brightness slider.

Adjust the contrast with interface contrast slider.

## 18.3 Focus Control

Control the focus by the focus control knob in the probe.

## 18.4 Zoom Image

Press [Zoom In] button, the image will magnify double.

In the magnification status, press [Zoom Out] button, the image will recover the original size.

## 18.5 Capture Image

Inspection of the fiber connector, user can capture images and save images in BMP formats. Captured images can be viewed in the OCI or be sent to the PC to make a report.

### *Capture Image:*

- 1) Press [Start] button, and view the image. Then adjust the focus, brightness and contrast until satisfied with the image.
- 2) Press [Save] button capture images and enter the save file dialog box.
- 3) Choose the file name and save location.
- 4) Press [OK] button to save the image and back to the main interface.



## 18.6 View the saved Image

- 1) Click the file manager of main interface program.
- 2) Open the folder which saves the capture image.
- 3) Double click the capture image file which you want to view.
- 4) Press the [File] <OFF> to exit the file manager after you are finished.

## 19 File Management

User can directly copy, move, rename and delete file or folder on the PRO-6350. Files can also be exchanged between the PRO-6350 and external storage devices like USB flash disk, USB hard drive and PC.

The PRO-6350 is equipped with two types of USB ports:

- USB host (Type A,  for connecting to USB storage devices.
- USB (Type B, ) for data communication between the PRO-6350 and PC via USB cable.

### 19.1 Transfer Files or Folders between the PRO-6350 and USB Storage Device

- 1) Connect USB storage device to the PRO-6350 USB port.
- 2) Click [File Explorer] icon on {Program} label to enter File Explorer where active drives including USB drives and folders are displayed for file management.
- 3) After file transfer, user can directly unplug the USB storage device from the PRO-6350.

#### **NOTE**

In case USB storage device is not shown in File Explorer, please close File Explorer and enter again.

### 19.2 Transfer Files or Folders between the PRO-6350 and PC

Microsoft ActiveSync software must be installed first on PC for file transfer between the PRO-6350 and PC.

Some necessary software shall be installed on PC before connecting the PRO-6350 to PC. For more information about installation, please refer to the instructions in software setup CD.


- 1) If Microsoft ActiveSync software is not installed on PC, please install following the software setup instruction.
- 2) Connect the USB cable's type A end (flat) to PC and type B end () to the PRO-6350.
- 3) After Microsoft ActiveSync software is installed and indicates "Connected", click "Explore" to access the files and folders in the PRO-6350; or enter the PRO-6350 and access the files and folders from My Computer.



Fig. 19.1 ActiveSync connected

- 4) After file transfer, simply disconnect the USB cable.

**NOTE**

There's no need to turn off the PC and the PRO-6350 when you connect and disconnect USB cable.

**19.3 Delete Saved Files**

- 1) Click File Explorer icon on {Program} label to enter File Explorer.
- 2) Click “\SDMMC\_Disk” icon to enter internal storage space.
- 3) Select the files or folders to be deleted.
- 4) Click “Delete” in “File” menu to delete.

## 20 Maintenance and Calibration

### 20.1 Cleaning of Optical Interfaces

Interfaces must be kept clean. Special alcohol may be used to clean optic output. Always replace protective dust caps when the unit is not being used, and keep the protective dust caps clean.

In addition, flanges must be kept clean periodically.

### 20.2 Necessity of Cleaning

The diameter of optic core is 9 $\mu$ m, and diameter of dust and other particles ranges from 1/100 to 1/10  $\mu$ m. Comparatively speaking, the size of dust and other particles can cover part of optic end and therefore degrade the performance of the PRO-6350.

In addition, power density may burn dust into optic fiber and induce further damage (for example, 0dBm optic power may produce about 16,000,000W/m<sup>2</sup> power density in single mode fiber). In this case, measurement will be inaccurate and irreversible.

### 20.3 Safety Instructions before Cleaning

- 1) Make sure the PRO-6350 is powered off when cleaning.
- 2) Any operations contradict to the instructions may result in dangerous laser injuries.
- 3) Make sure laser source is off, when cleaning any optic connectors.
- 4) When the PRO-6350 is in operation, please always avoid looking directly into optic output. Although laser radiation is invisible, it may do serious injury to eyesight.
- 5) Be cautious of electric shock and make sure AC power is disconnected with the PRO-6350 before cleaning. Always use dry or moist soft cloth to clean the outside of the PRO-6350, and never clean the inside.
- 6) Please do not add any accessory to optic instrument or adjust the PRO-6350 at discretion.
- 7) For maintenance, always go to qualified or certified professionals

### 20.4 Cleaning Tools

- 1) Optic fiber cleaner (for cleaning of optic connectors)
- 2) Optic fiber cleaning rod (for cleaning of optic outputs)
- 3) Optic fiber cleaning tissue (for cleaning optic interfaces)
- 4) Isopropyl alcohol
- 5) Cotton ball
- 6) Paper tissue
- 7) Cleaning brush
- 8) Condensed air




## 20.5 Cleaning Procedure

- 1) Screw off the cap of flange
- 2) Clean the laser head carefully
- 3) Screw on the cap of flange

## 20.6 Battery Charging Instructions

Typically, the PRO-6350 Lithium battery supports over 7 hours continuous working.

Charging status is indicated in system main interface and the PRO-6350 front panel indicator.

- 1) In system main interface, charging status is displayed in the right upper corner.
- 2) Front panel charging indicator (  ) also indicates charging status (Please refer to 1.4 Front Panel Indicators Introduction).

## 20.7 Battery Instruction

### **NOTE**

- If the new battery is not fully charged, please charge the battery before the first time use which takes approximately 3 hours.
- Charging time is subject to the type of functional modules in use, environment and etc.
- After the battery is used for a length of time, its capacity may not match charging status indication (e.g. charging indicator indicates full but the PRO-6350 may power off due to low battery), then battery calibration is necessary (Please refer to 20.9 Battery Calibration).

### **WARNING**

- Please do not store battery in the environment where temperature is over 60°C (140F).
- Use specified charger to charge the battery.

## 20.8 Charge Battery

Plug the charger to the PRO-6350 and power outlet, charging process automatically starts and finishes after battery is fully charged.

## 20.9 Battery Calibration

After the battery is used for a length time, the battery gauge may not be accurate, e.g. it indicates battery has run out but the battery can still provide power supply, or battery power is zero, but the battery power can last a long time. Then the battery should be re-calibrated.

Procedure:

- 1) Run out of the battery completely.
- 2) Charge the battery until fully charged.

## 20.10 Change Battery

- 1) Power Off the PRO-6350 and unplug power adaptor.
- 2) Open the battery dock cover.
- 3) Change battery.
- 4) Close the battery dock cover.

### **NOTE**

- Please note if the power indicator on front panel is off before changing battery; make sure the PRO-6350 is completely off before changing battery.
- Only factory can change clock battery.

## 20.11 Calibration Requirements

Calibration of the PRO-6350 is recommended every two years. Please contact our representatives or nearby customer service centers for proper calibration.

## 20.12 Shipment

During shipment, please keep the PRO-6350 in prescribed temperature range.

Please note following points to protect the PRO-6350 during shipment:

- Use original packing materials.
- Avoid excessive temperature and humidity change.
- Avoid direct exposure to sunlight.
- Avoid shock and vibration.

## 21 Troubleshooting

### 21.1 Common Problems and Solutions

Problem	Possible Reason	Solution
Power on failure	Battery power run out	Charge the battery. Change a new battery. Connect the PRO-6350 to external power supply.
	External power supply is not connected	Connect the PRO-6350 to external power supply.
	External power supply is unplugged	Make sure external power supply is well connected on both ends.
	Battery dock cover is not closed properly	Close the battery dock cover properly.
Black Screen	Screen backlight is off, but power indicator is on.	Press any key to exit power saving mode.
	Battery run out, PRO-6350 is off, power indicator is off.	Charge the battery. Change a new battery. Connect the OTDR to external power supply.
External keypad no response	External keypad is not recognized.	Unplug the keypad and re-plug Power off PRO-6350, plug keypad and power on the PRO-6350 again.
External mouse no response	External mouse is not recognized.	Unplug the mouse and re-plug Power off the PRO-6350, plug mouse and power on the PRO-6350 again.
Screen display blurs	Brightness is not set properly.	Adjust brightness
Application no response	Problem error	Restart the PRO-6350 and run the application again.
Operation time is short	Battery run out.	Change the battery.
	Battery is not fully charged.	Charge the battery. Re-calibrate the battery
Touch screen is not responding properly with stylus	Touch screen larger deviation	Connect external USB mouse to calibrate the stylus
PRO-6350 indicates low battery after battery is fully charged	Battery is not fully charged	Re-calibrate the battery

Tab. 21.1 Common Problems and Solutions

## 21.2 Trace Measurement Problems and Solutions

<b>Problem</b>	<b>Possible Reason</b>	<b>Solution</b>
Expected events are not shown in the trace	Events are too close to each other.	Try again with short pulse width Try testing from the other end of the fiber
	SNR is poor	Try again with wide pulse width or increase averaging time.
	Wrong configuration	Check OTDR parameters, such as Reflection threshold, non-reflection threshold and end threshold; and then re-analyze or test again.
Special events appear at the end of the trace	Wrong configuration, e.g. wrong end threshold setting.	Adjust configuration and test again
	The fiber under test is too long to exceed the range	Select proper range and test again.

## 22 Warranty

### 22.1 Terms of Warranty

All PRO products are warranted against defective material and workmanship for a period of one (1) year from the date of shipment to the original customer. Any product found to be defective within the warranty period would be repaired or replaced by Precision Rated Optics. In no case will Precision Rated Optics liabilities exceed the original purchase price of the product.

### 22.2 Exclusion

The warranty on your equipment shall not apply to defects resulting from the following:

- Unauthorized repair or modification
- Misuse, negligence, or accident

Precision Rated Optics reserves the right to make changes to any of its products at any time without having to replace or change previously purchased units.

### 22.3 Warranty Registration

A warranty registration card is included with the original shipment of equipment. Please take a few moments to fill out the card and mail or fax it to the local Customer Service Center of Precision Rated Optics to ensure proper initiation of your warranty term and scope of your warranty.

### 22.4 Returning Instruments

To return instrument for reasons of yearly calibration or other, please contact the local Customer Service Center of Precision Rated Optics to obtain additional information and a RMA# (Return Materials Authorization number). And describe briefly reasons for the return of the equipment, to allow us offer you more efficient service.

#### **NOTE**

To return PRO-6350 in the case of repair, calibration or other maintenance, please note the following:

- Be sure to pack the PRO-6350 with soft cushion like Polyethylene, so as to protect the shell of the PRO-6350.
- Please use the original hard packing box. If use other packing material, please ensure at least 3 cm soft material around the PRO-6350.
- Be sure to correctly fill out and return the warranty registration card, which should include the following information: company name, postal address, contact, phone number, e-mail address and problem description.
- Be sure to seal the packing box with exclusive tape.
- Be sure to ship to our local representative or directly to us in a reliable way.

### 22.5 Contacting Customer Service

Please check our web site ([www.precisionratedoptics.com](http://www.precisionratedoptics.com)) for updates to this manual and additional application information.



**Precision Rated Optics, Inc.**

**Corporate Office**

Billing & Processing

PO Box 877 Trexlertown, PA 18087

**Precision Rated Optics, Inc.**

**Product Distribution Center Manufacturing & Testing**

9999 Hamilton Blvd Breinigsville, PA 18031