GREENLEE.
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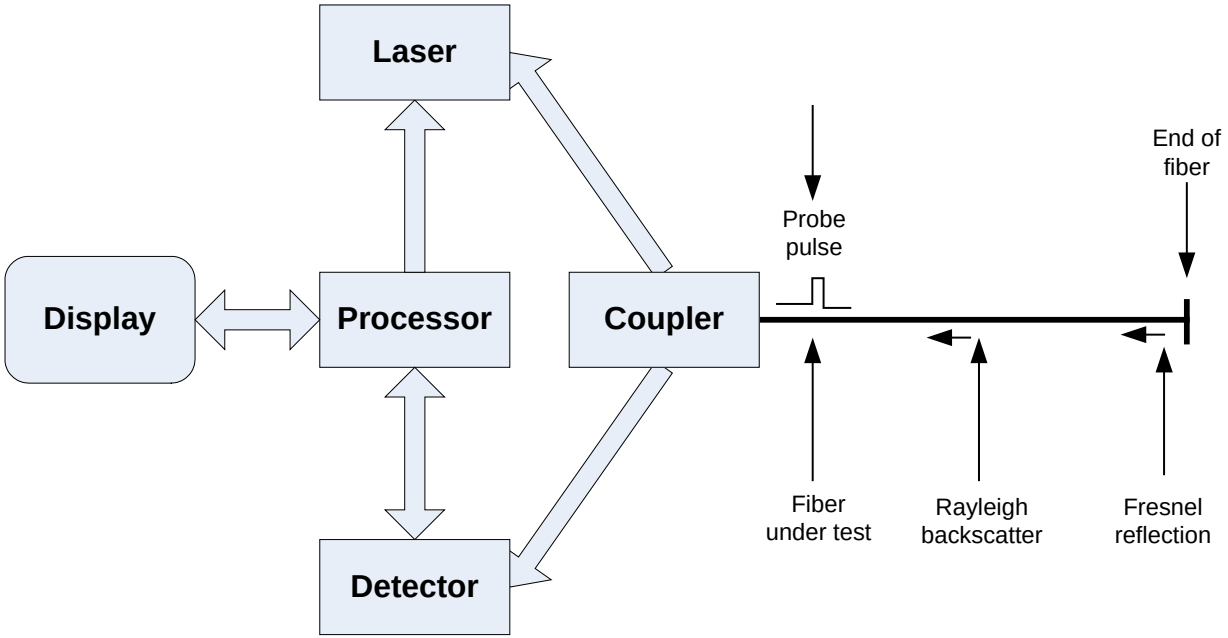
A Textron Company

920XC Training

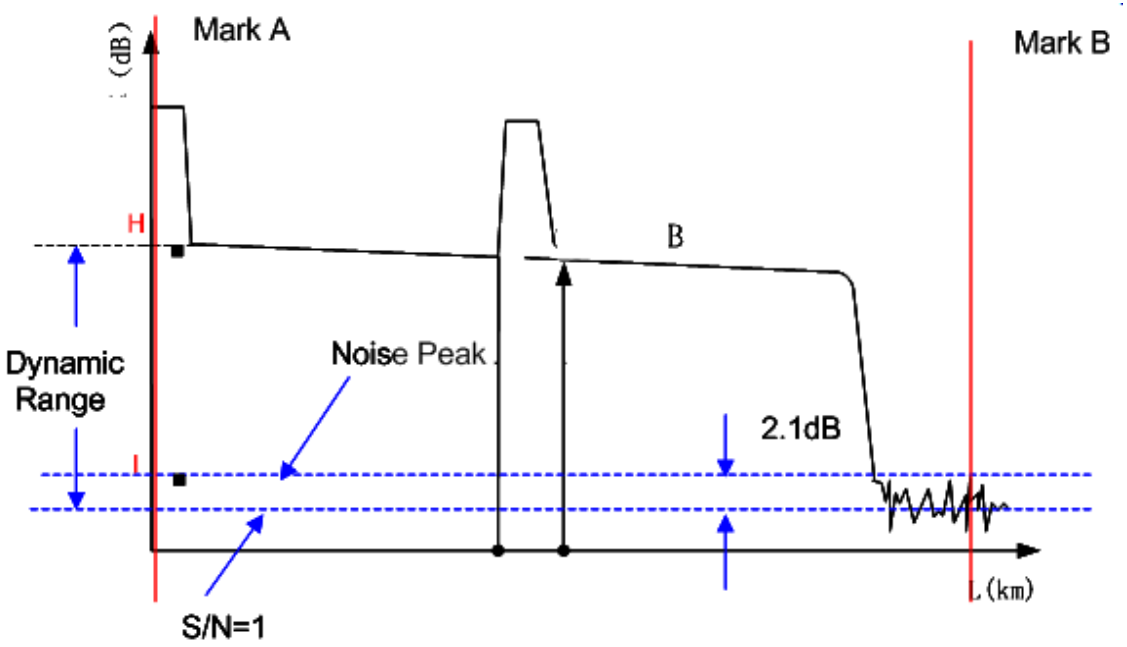
VER 1.0

OTDR Basic Operation



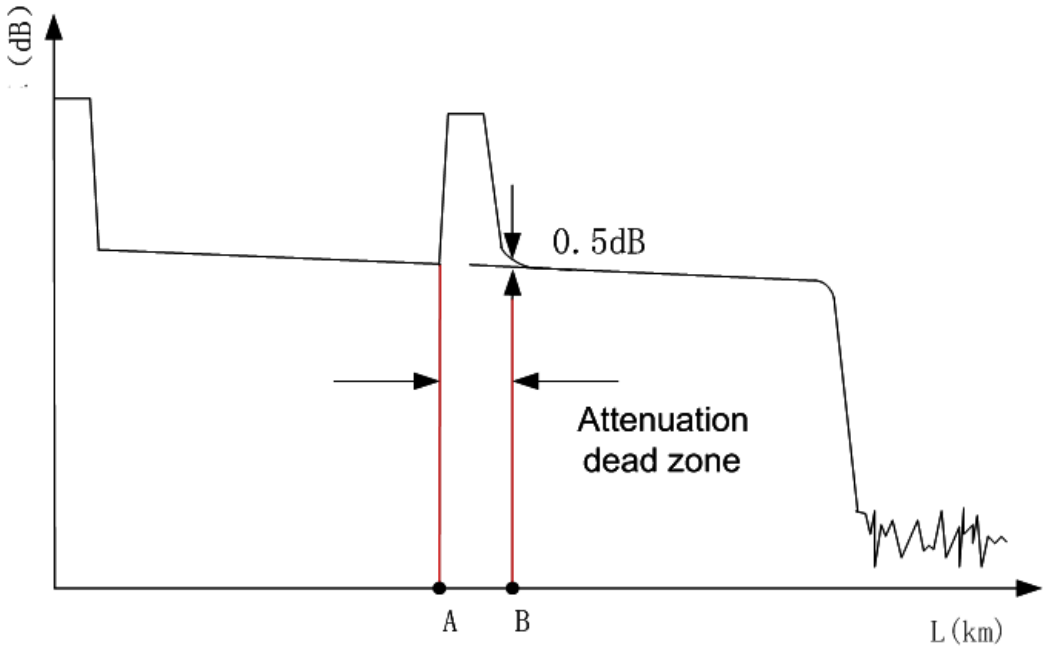
The Optical Time Domain Reflectometer (OTDR) is an instrument that uses the inherent backscattering properties of an optical fiber to detect faults and categorize its condition. The OTDR sends high-power pulses of laser light down the fiber and captures the light that is reflected back (much like a radar system). By measuring the timing and power levels of the return pulses, the instrument correlates the reflected information with physical locations along the fiber and displays a “trace” that shows optical power versus distance. Attenuation of the fiber is displayed as the slope of the trace. Interruptions such as splices, connectors, bends, breaks or flaws in the fiber appear as transitions (“events”) that represent their nature and location.

Dynamic Range



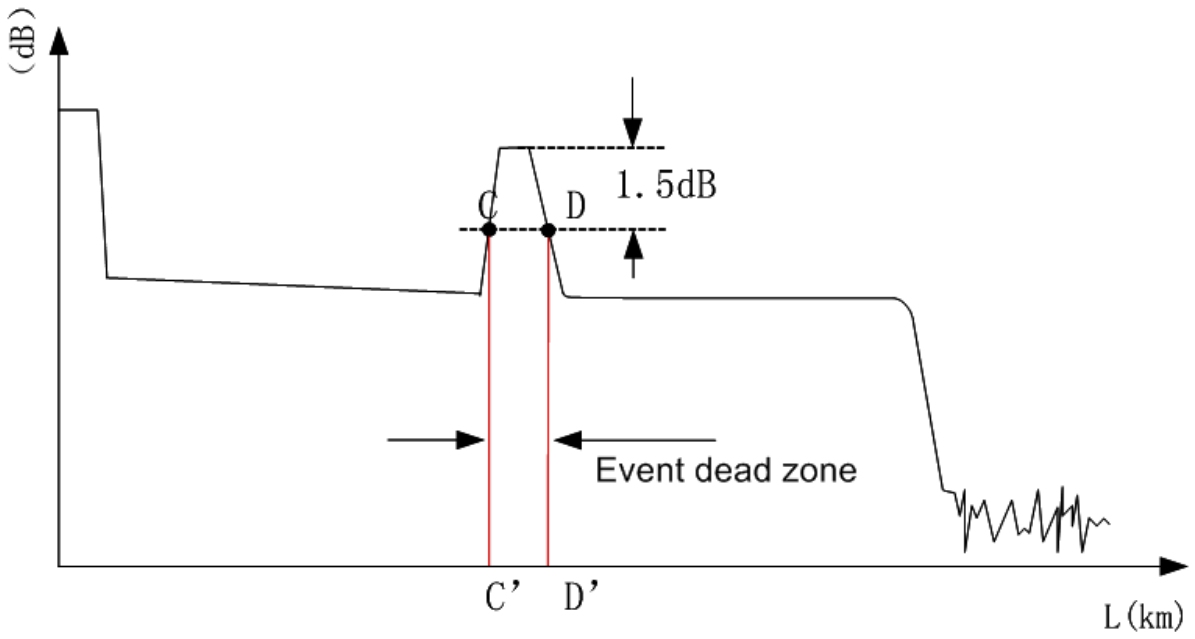
The measure of a system's ability to distinguish signals in the presence of noise. Several definitions exist for OTDR dynamic range. Bellcore defines the dynamic range as the displayed attenuation (in dB) from the backscatter level at the front panel to an imaginary line (past the end of the fiber)that lies just above 98% of the noise. Another common definition (based on Signal-to-noise ratio = 1) uses an imaginary line that lies just above roughly 63% of the noise.

Attenuation Deadzone



The minimum distance after a reflective event before the OTDR can accurately measure the loss of a non-reflective event. Typically, the attenuation dead zone is the distance from the leading edge of the reflection to the point past the reflection where the OTDR signal level returns to within 0.5 dB of the backscatter level.

Event Deadzone



The minimum distance after a reflection before the OTDR can accurately measure the distance to a second reflection, sometimes called the “two point spatial resolution.” The event dead zone is measured from the leading edge of the reflection to the point past the reflection where the level of the OTDR signal drops at least 1.5 dB from the top of the reflection.

920XC Product Overview

Features

- Easy to Use/Compact Handheld Design
- Automated Measurement/Analysis/File Save
- 38dB Dynamic Range
- 1.5 meter event deadzone
- Large color LCD display
- Measure length and defects of coiled fiber
- RS-232 and USB interface
- Store 1000 measurement results
- NiMH battery for 8 hours continuous use
- Internal VFL (650nm)

920XC Measurements

Measurement Application

- The 920XC instruments display power relating to the distance of returning signals. This information can be used to identify the main properties of an optical fiber chain.

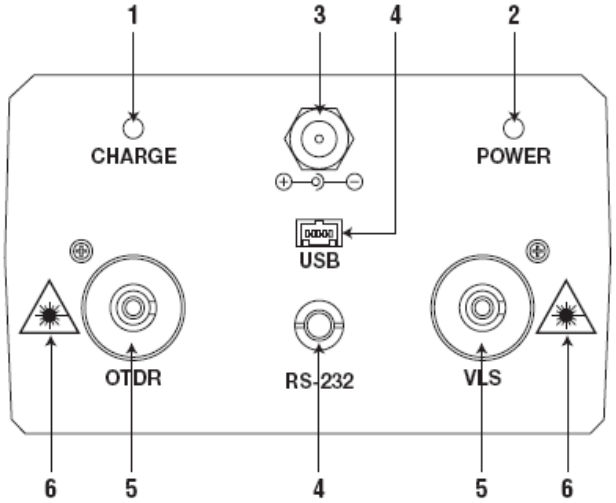
Measurement Contents

- Event location (distance), end, or rupture of optical fiber chain.
- Attenuation coefficient of fiber.
- Loss of a single event (for example, 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.

Trace Analysis

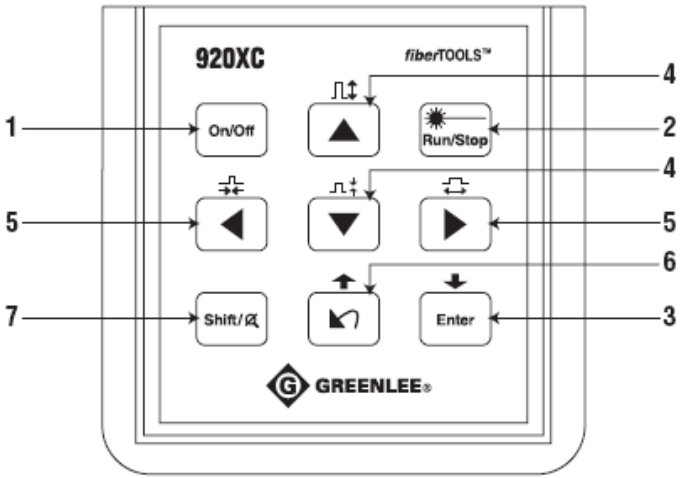
- The trace analysis of the 920XC OTDR is fully automatic. The trace locates:
- Reflection events of connections and mechanical tie-ins.
- Non-reflection events.
- End of optical fiber.
- Through scanning the first loss event that is larger than the end threshold, identifies the end of optical fiber.
- Events list: Event type, loss, reflection, and distance.

920XC - Ports and Indicators



1. **Charge Indicator: When lit, measurement power is charging.**
2. **Power Indicator: When lit, measurement power is on.**
3. **AC Power Jack: Power adapter jack requirements are 13.8 VDC at 1.2 A.**
4. **Data Transfer Ports: USB and RS-232 interfaces to transfer saved traces in the instrument to a PC for further analysis with Trace Viewer software (provided).**
5. **Fiber Optic Output for OTDR and VLS (visual fault locator): The VLS Connector is used for the OTDR interface at 1625nm.**
6. **Invisible Laser Caution: Do not look directly at the optical output or stare at the laser beam.**

Keypad Definitions



1. On/Off:

- Press to turn power on or off to the instrument.

2. Run/Stop:

- Under GUI, press to start measurement.
- While testing, press to stop measurement.

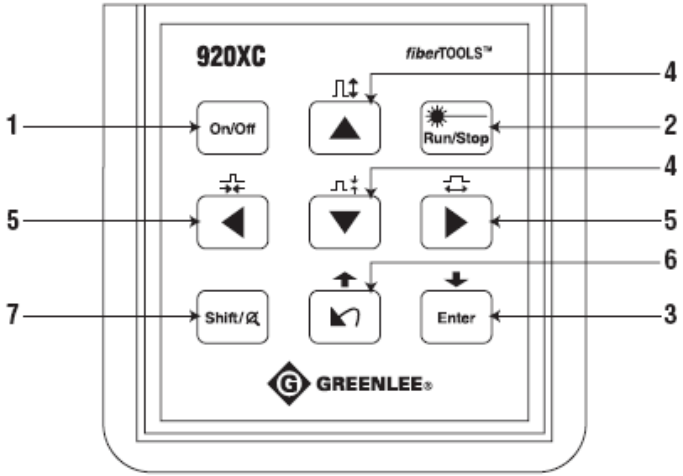
3. Enter:

- Under GUI, press to confirm the current operation.
- Use with the Shift key to browse down the events list.

4. ▲▼ (up and down) arrows:

- Move menu bar in menu operation.
- Highlight the icon to be selected.
- Adjust parameter in parameter configuration.
- Use with the Shift key to zoom out or zoom in trace vertically.

Keypad Definitions



5. ◀ ▶ (left and right) arrows

- Select parameter to be adjusted in parameter configuration.
- Move marker left or right in trace operation.
- Turn page while in Help submenu.
- Use with the Shift key to zoom out or zoom in trace horizontally.

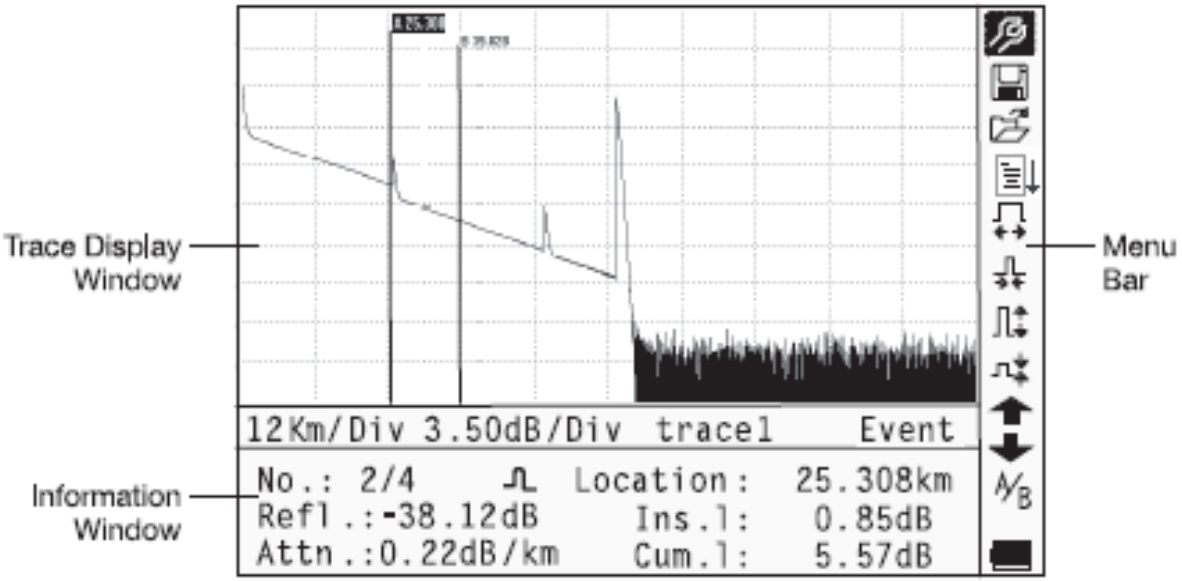
6. Arrow

- Read Help menu when power .on.
- Cancel the current operation.
- Exit menu configuration.
- Switch between information windows.
- Use with the Shift key to browse up the events list.

7. Shift

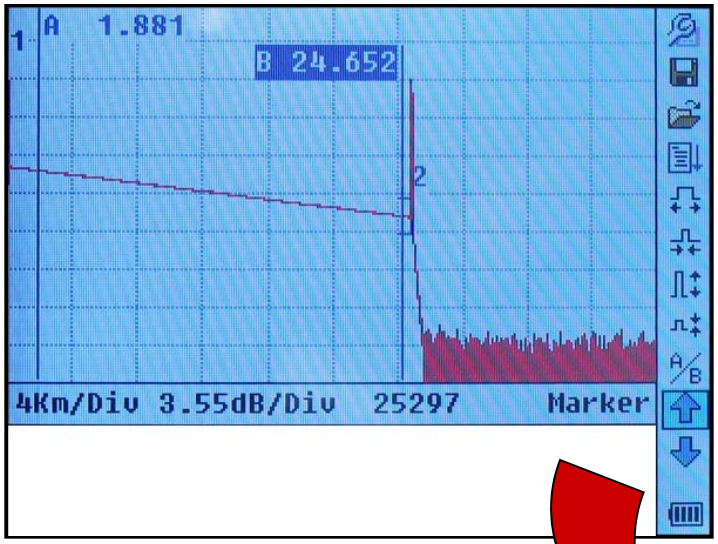
- Under GUI, press to return a trace to original size without any zoom.
- Activate the integration function by pressing this key together with other keys.

Main Display



Measurement Window

Measurement Window



Event Finder View

```
No.: 2/2      Location:  25.296km
Refl: -32.57dB  Ins.L.:  --.--
Attn.:  0.18    Cum.L.:  4.66dB
```

Manual Measurement View

```
A-B: 22.7716km
2Pt.Loss : 4.214dB
2Pt.Atten:  0.185dB/km
```

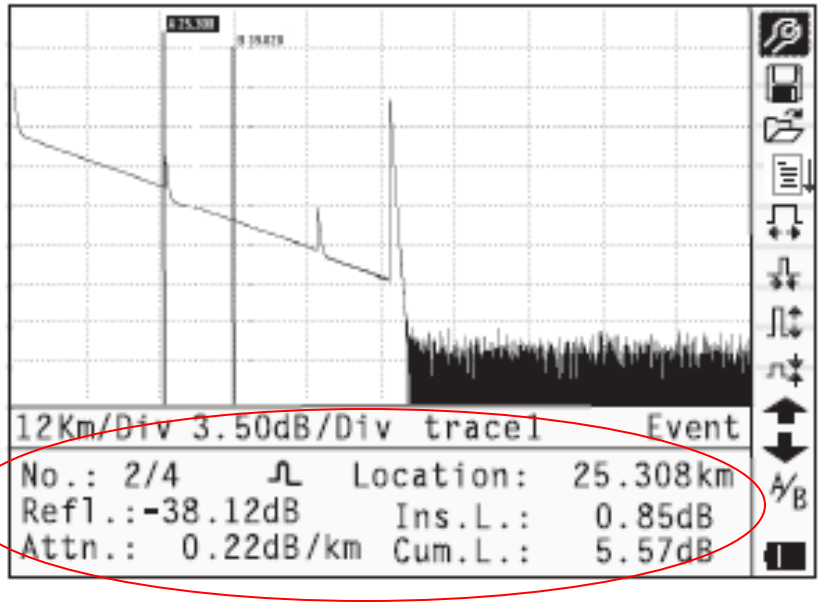
Instrument Setup View

```
Avg.Time: 30 s
Range:40.0km      PulseWidth: 275ns
IOR: 1.4666       Wavelength: 1550nm
```

Fiber Analysis View

```
Date: 06-Mar-2006 13:46
NRefl.Thre.:0.20  End Thre.:3.00
Refl.Thre.:-52.00 Scat.Coef.:-52.1
```

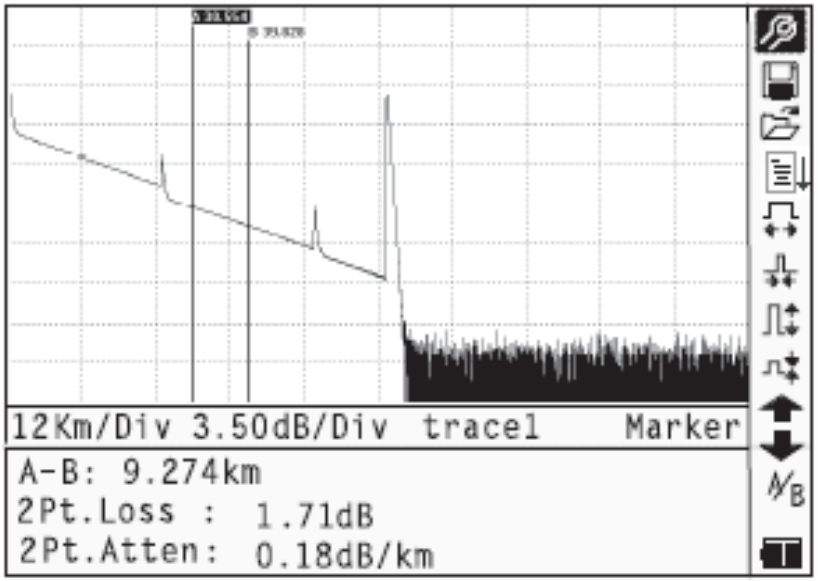
Event List



Events

- No.: Event sequence number.
- Four types of events: . .begin .end; . reflection event; fiber end; attenuation event.
- Location: Distance from beginning point to event.
- Refl.: Magnitude of reflection.
- Ins.L.: Loss of inserted event.
- Attn.: Attenuation characteristic from one event point to the current event.
- Cum.L.: Cumulative loss, calculating from beginning point to the current event.

A & B Markers



A & B Markers

A marker is used to mark and analyze a single event, trace section, and distance. Distance, attenuation, and loss at a marker or between markers will be displayed in marker information

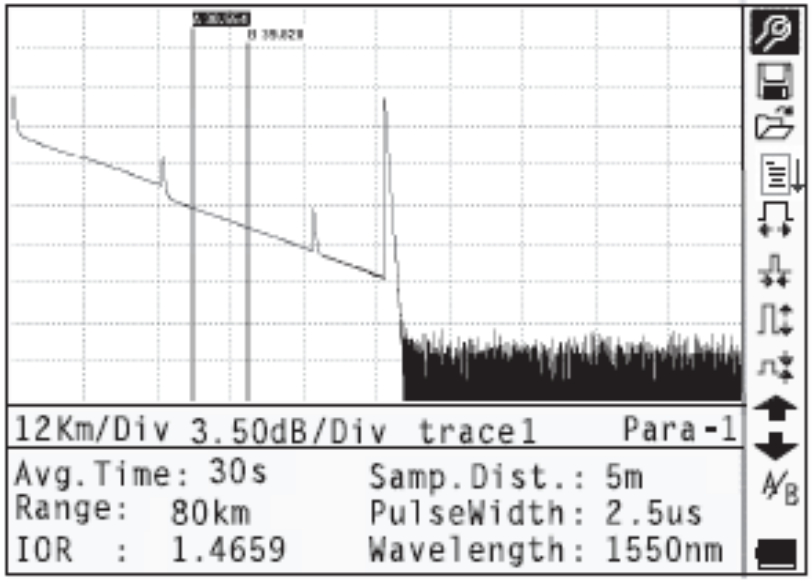
The following parameters are measured between marker A and B. Changing either marker will change the record accordingly.

A-B: Distance between two markers.

2Pt. Loss: Loss between two markers; power difference between two markers.

2Pt. Atten: 2 points loss of unit length

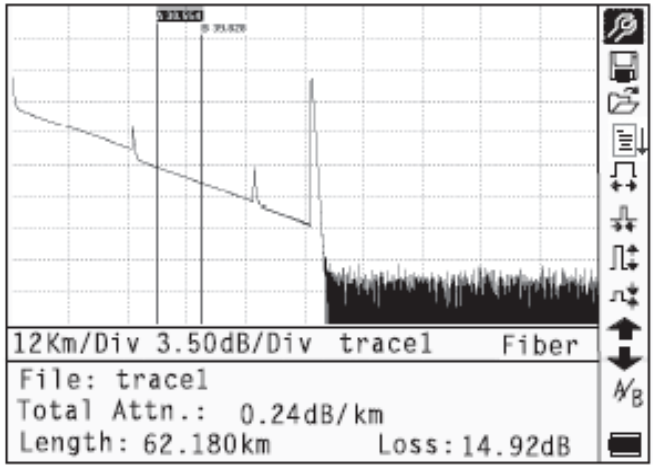
Measurement Trace Parameters



Measurement Trace Parameters

- Important measurement and analysis parameters are displayed in the information window .
- For definitions and configurations of items (average time, sample distance, range, IOR, wavelength, and pulse width) as well as definitions of item (date, reflection threshold, non-reflection threshold, end threshold, and scattering coefficient), refer to “Setup Configuration” later in the presentation.

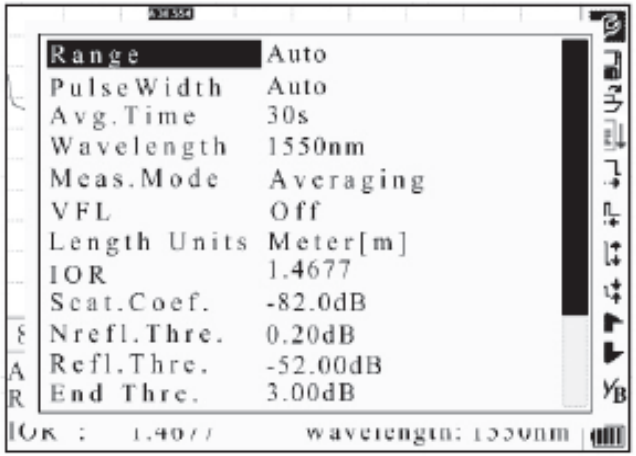
Menu Bar and Icons

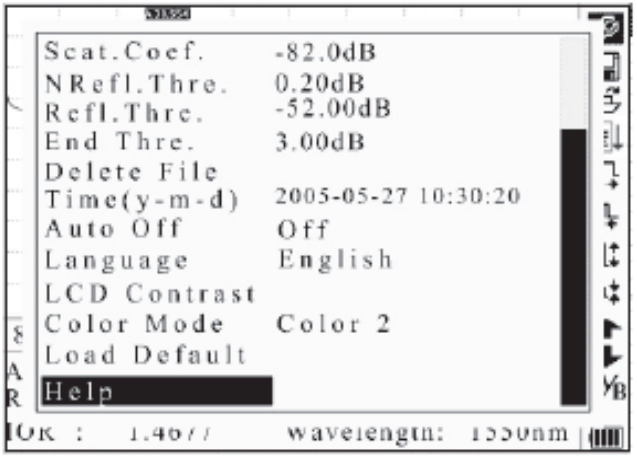


Menu Bar and Icons

No.	Icons	Description
1		Parameter configuration
2		Save file
3		Open file
4		Re-analyze the trace
5		Zoom out trace horizontally
6		Zoom in trace horizontally
7		Zoom out trace vertically
8		Zoom in trace vertically
9		Switch between markers
10		Review events list upward
11		Review events list downward
12		Battery power indicator

Setup Parameters

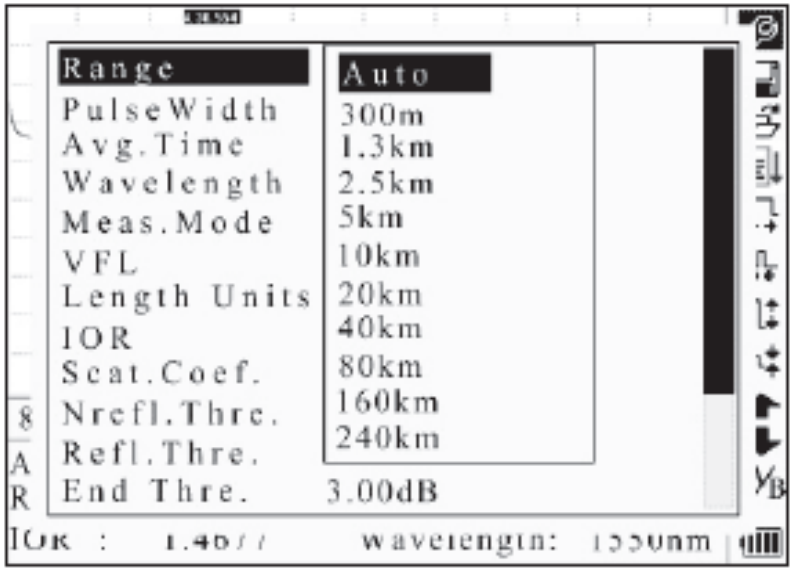




Definitions of Measurement Parameters

Parameter	Definition
Range	Length of optical fiber relevant to the trace
Pulse Width	Width of laser pulse sent out from OTDR to optical fiber
Average Time	Select suitable testing time
Wavelength	Select laser wavelength for measurement
Measurement Mode	Select mode for measurement
VFL	Power on or off for visible laser
Length Units	Select units of measurement
IOR	IOR of optical fiber which affects the transmission speed of laser
Scatter Coefficient	Affects backscatter power of laser in fiber
Non-reflection Threshold	Events whose insertion loss is > the threshold displayed here
Reflection Threshold	Reflection events ≥ the threshold displayed here
End Threshold	First event with insertion loss ≥ the threshold is considered the end of fiber, and all following events will be ignored
Delete File	Delete stored trace data in the instrument
Time	Show current system time
Auto Off	Enable or disable auto off function
Lang./语 言	Choose language
LCD Contrast	Adjust contrast of LCD
Color Mode	Select suitable color setting for display
Load Default	Set all parameters to factory setting
Help	Show Help files (quick reference)

Setup – Range Setting



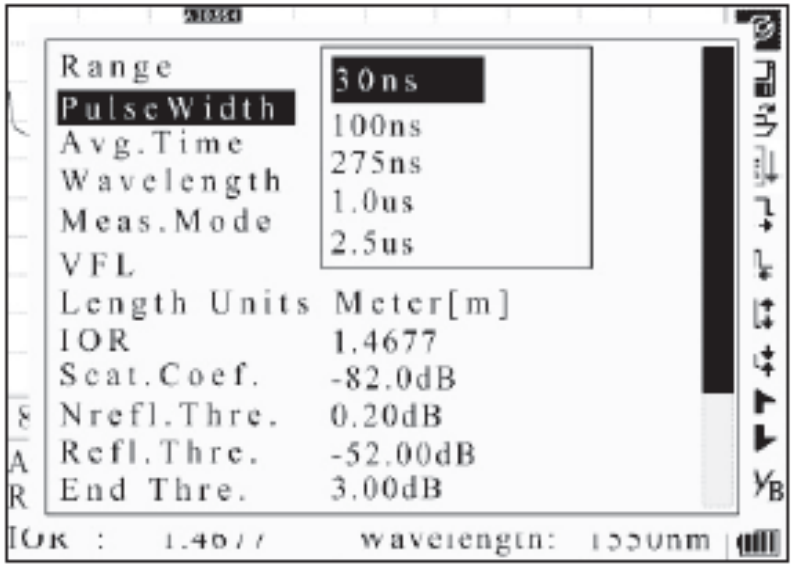
Range Setting

•Use ▲ and ▼ to select an adequate range. Press Enter to confirm.

Notes:

- "Auto" means automatic measurement. When this function is selected, the instrument automatically selects an adequate range and pulse width for the measurement. The process of measurement does not require any intervention by the user.
- "Auto" is the default setting.

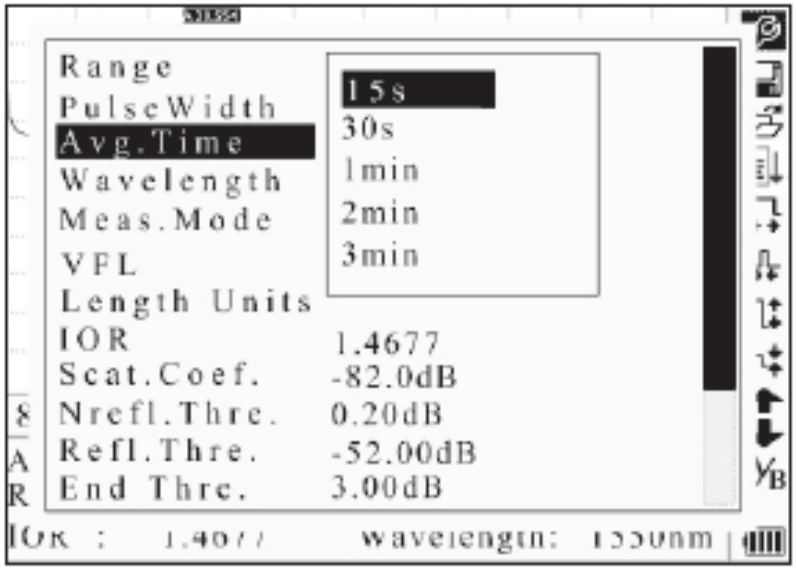
Setup – Pulsewidth



Pulse Width Configuration

- The selection of pulse width affects the dynamic range and resolution of the measurement. With a narrow pulse width there will be higher resolution and smaller deadzone; however, the dynamic range will be decreased. A wide pulse width will bring higher dynamic range and measure comparatively longer distance, but resolution and deadzone will be increased. Therefore, users should make the choice between dynamic range and deadzone. .
- The options for pulse width will change according to the distance range selected.
- Under the parameter configuration menu use ▲ and ▼ to highlight “PulseWidth.” Press Enter to select a value. (Press ↘ to .exit.)
- “Auto” is the default setting.
- When the range is set to “Auto,” the pulse width automatically is set to “Auto.”

Setup – Avg. Time

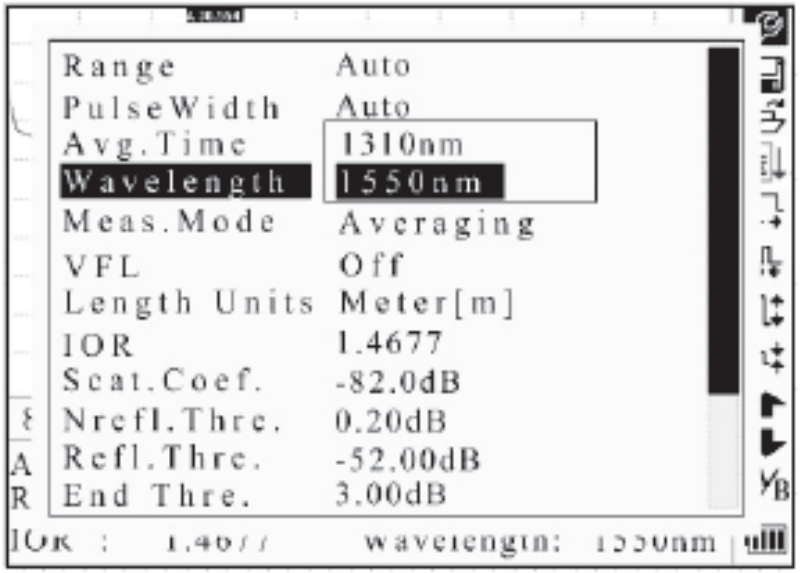


Averaging Time

•Average time will affect the SNR directly. The longer the average time is, the higher SNR is, as well as dynamic range. Therefore, when measuring long-distance optical fiber, a long average time should be selected in order to review events at the long-distance end.

- Under the parameter configuration menu use ▲ .and ▼ to highlight “Avg. Time.” Press Enter .to .confirm (Figure 3-12). Press .to .exit.
- Use ▲ .and ▼ to highlight the desired time. Press Enter to confirm.
- There are five levels of predefined average time: 15 s, 30 s, 1 min, 2 min, and 3 min.
- The default setting is “30 s.”

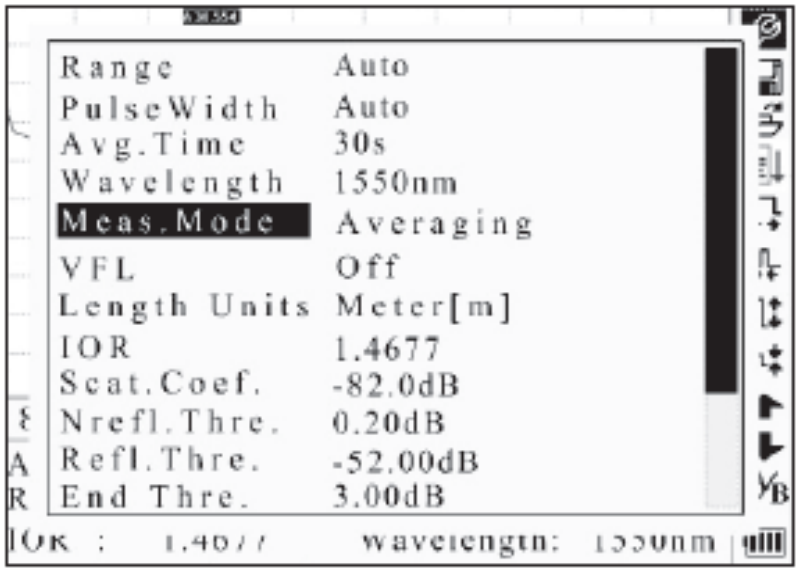
Setup – Wavelength



Wavelength Selection

- Under the parameter configuration menu use ▲ and ▼ to highlight “Wavelength.” Press Enter to change the wavelength.
- Only on the 920XC

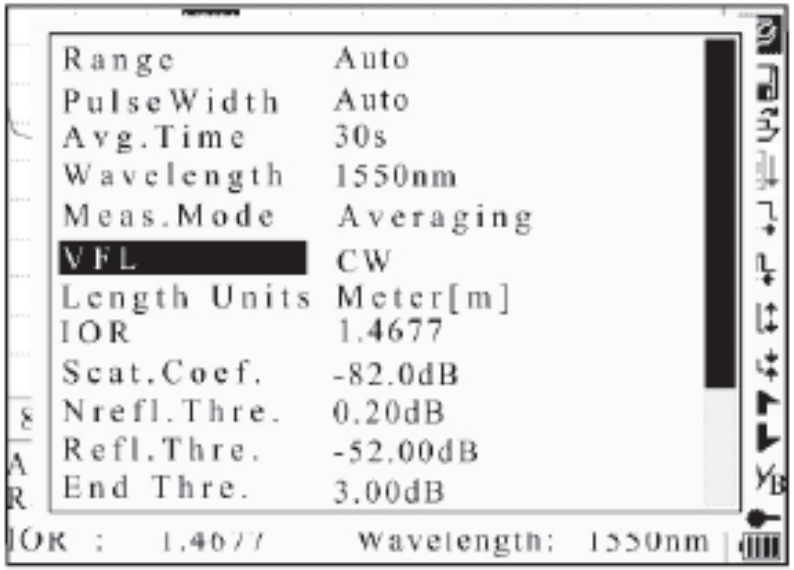
Setup – Measure Mode



Measure Mode

- There are two kinds of measurement mode: averaging and real-time. Under real-time mode the 920XC will undertake real-time measurement for the connector of exterior fiber and refurbish the measure trace. While under real-time mode, press Run/Stop to stop; otherwise it will measure continuously. Under Averaging mode the tool will average the data within the measure time, which is set by the user. When exceeding the set time, it will stop automatically and display the result. In general, averaging is the preferred mode.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Meas. Mode.” Press Enter to select “Averaging” or “Real-time” mode. Press ↘ to .exit.

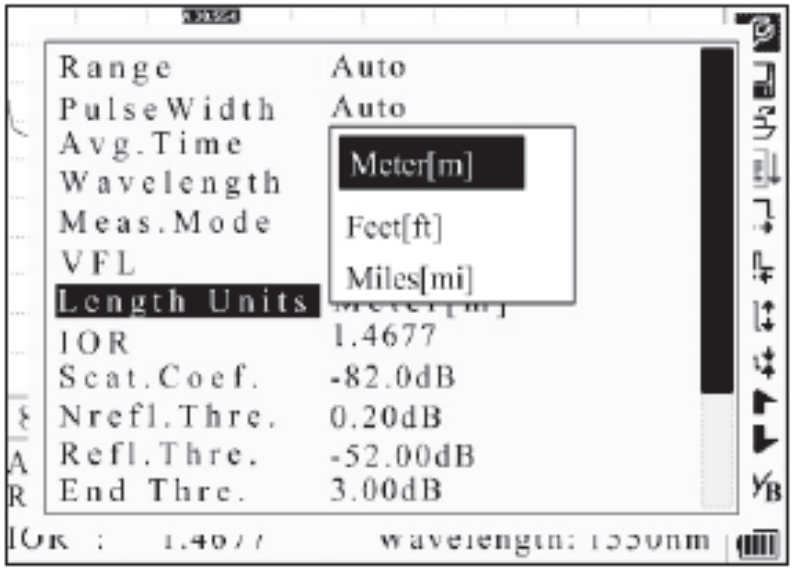
Setup – VFL



VFL Configuration

Under the parameter configuration menu use ▲ and ▼ to highlight “VFL.” Depending on demand, press Enter to select “CW,” “1Hz,” or “Off.” Press to exit.

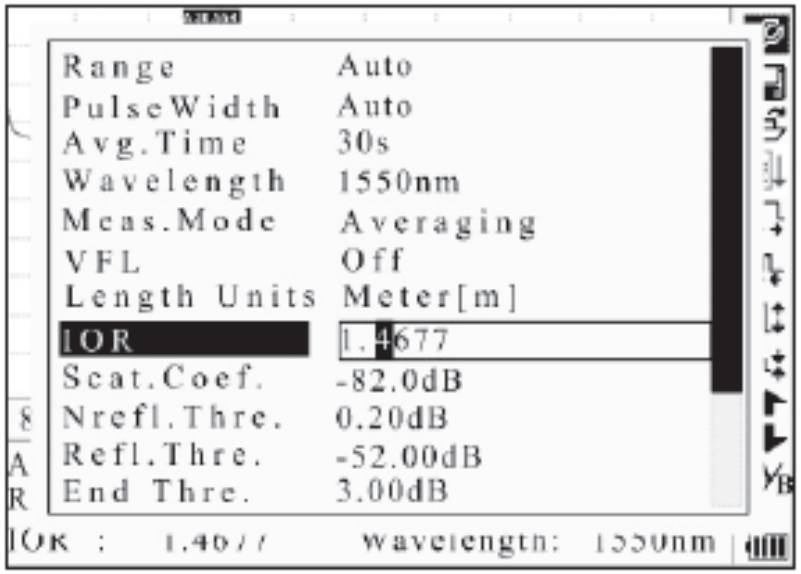
Setup – Length Units



Length Units

- Under the parameter configuration menu use ▲ and ▼ to highlight “Length Units.”
- Press Enter to select the desired units of measurement.
- Press ↘ to exit.

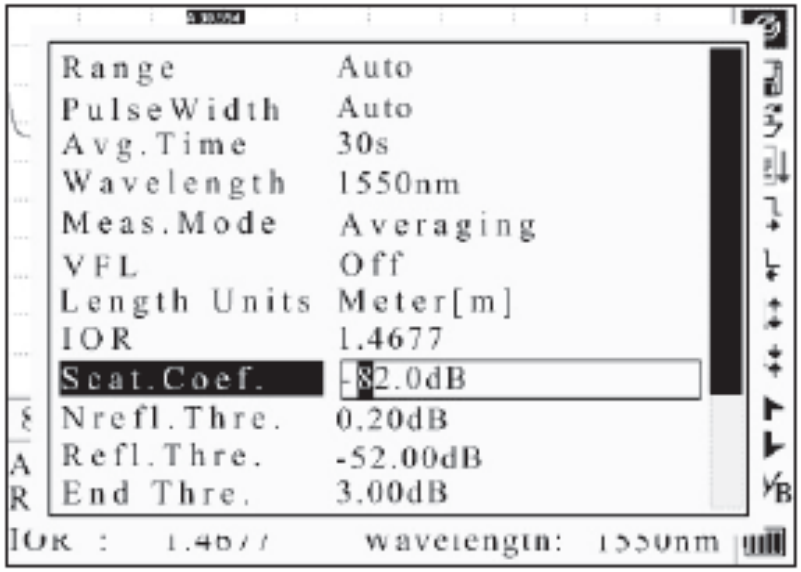
Setup – IOR



Index of Refraction (IOR) Configuration

- Because IOR is a key factor affecting the speed of laser transmission in optical fiber, the IOR configuration has a direct impact on the accuracy of measurement. In general, the IOR parameter is provided by the optical fiber manufacturer, and it can be set to the accuracy of four digits after the decimal point between 1.0 .and 2.0.
- Under the parameter configuration menu use ▲ and ▼ to highlight “IOR.” Press Enter to enter a value Press ↘ to exit.
- Use .◀ and ▶ to adjust the position of the highlighted area. Use ▲ and ▼ to change the digits. After setting, press Enter to confirm.

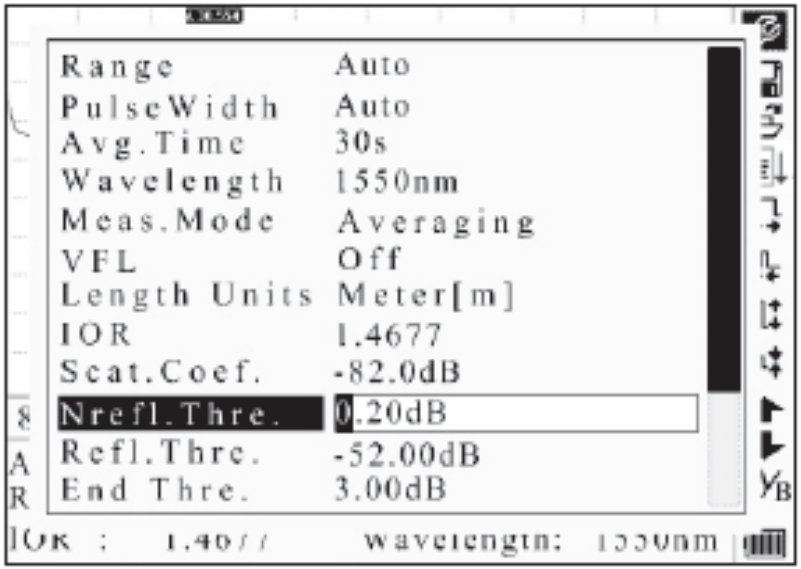
Setup – Scattering Coefficient



Scatter Coefficient Configuration

- Scatter coefficient determines the value of backscatter power. This configuration affects the calculation of reflection value.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Scat. Coef.” Press Enter to enter a value. Press ↘ to exit.
- Use ◀ .and ▶ to adjust the position of the highlighted area. Use ▲ and ▼ to change the digits. After setting, press ↘ Enter to confirm.

Setup – Non-Reflective Threshold



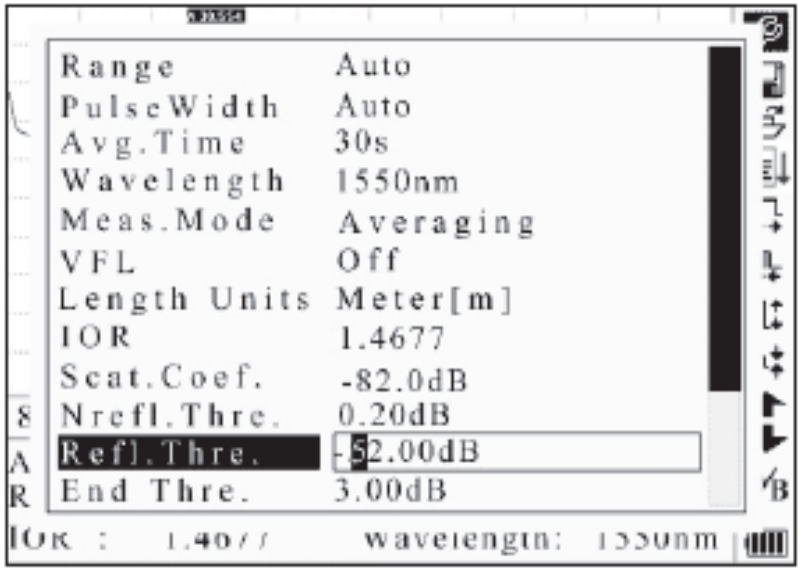
Non-reflection Threshold Configuration

- This configuration has direct impact on the listing of insertion loss events. Only events ≥ to this threshold will be listed.

•Under the parameter configuration menu use ▲ and ▼ to highlight “Nrefl. Thre.” Press Enter ↘ to enter a value . Press ↘ to exit.

- Use ◀ and ▶ to adjust the position of the highlighted area. Use ▲ .and ▼ to change the digits. After setting, press Enter to confirm.
- Note: The default setting is “0.20 dB.”

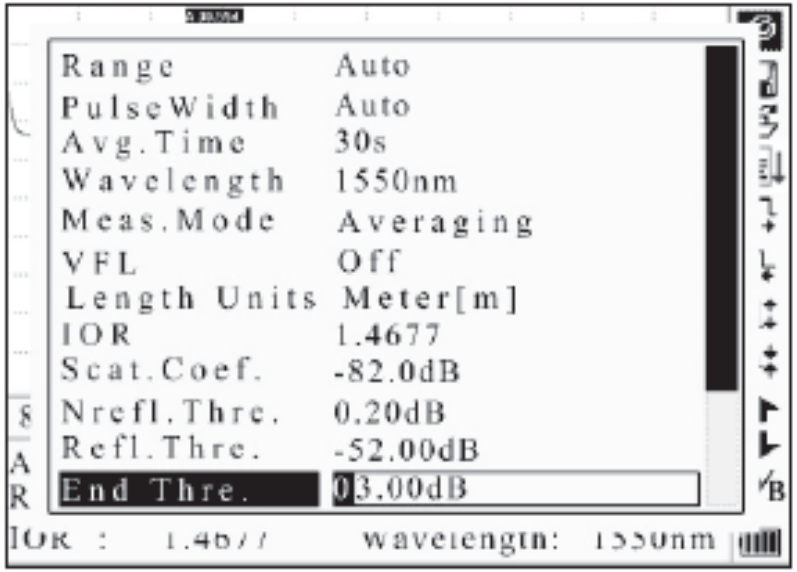
Setup – Reflective Threshold



Reflection Threshold Configuration

- This configuration has direct impact on reflection events listing. Only reflection events ≥ to this threshold will be displayed in the events list.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Refl. Thre.” Press Enter to enter a value. Press ↘ to .exit.
- Use ◀ .and ▶ to adjust the position of the highlighted area. Use ▲ and ▼ to change the digits. After setting, press Enter to confirm.
- Note: The default setting is “–52.00 dB.”

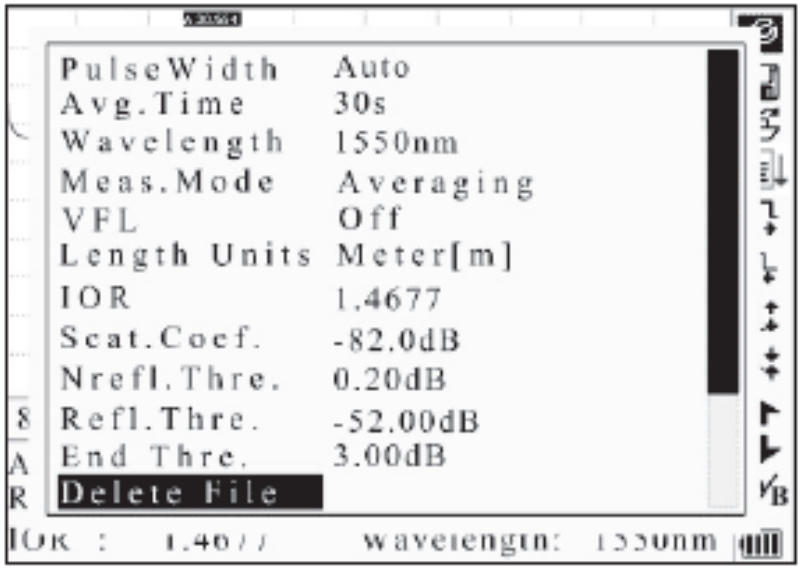
Setup – End Threshold



End Threshold Configuration

- This threshold is the end threshold of optical fiber. If the end threshold equals 3.0 dB, then the first event with insertion loss ≥ 3 dB will be considered the end of the optical fiber. If the value is set to 0 .dB, there will be no end threshold.
- Under the parameter configuration menu use ▲ and ▼ to highlight “End Thre.” Press Enter to enter a value. Press ↘ to exit.
- Use ◀ and ▶ to adjust the position of the highlighted area. Use ▲ .and ▼ to change the digits. After setting, press Enter to confirm.
- Note: The default setting is “03.00 dB.”

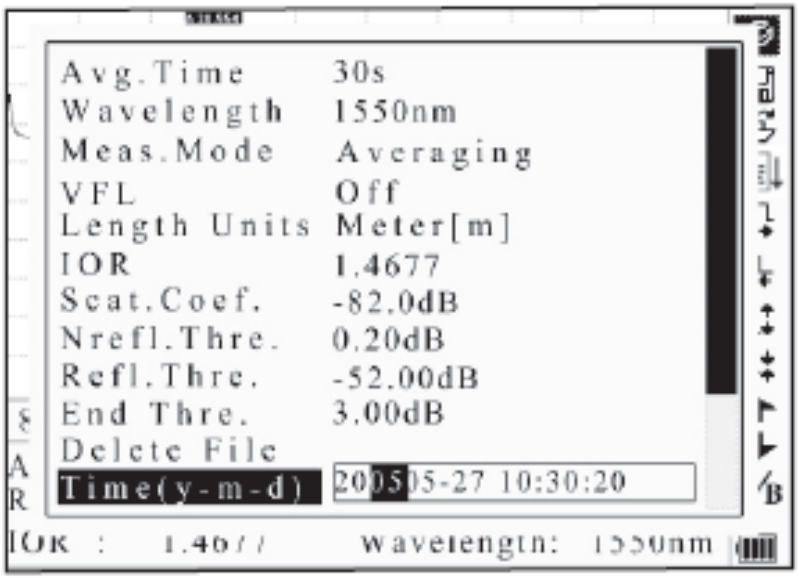
Setup – Delete File



Delete File

- This function deletes saved traces.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Delete File.” Press Enter to enter. Press ↘ to exit.
- Use ▲ .and ▼ to choose the files to delete. Press Enter to confirm.
- One or several files can be deleted at a time. Use ◀ and ▶ to select “Delete.” Press Enter, and choose “Yes” to delete or “No” to not delete. Choosing “Cancel” will exit the Delete menu.

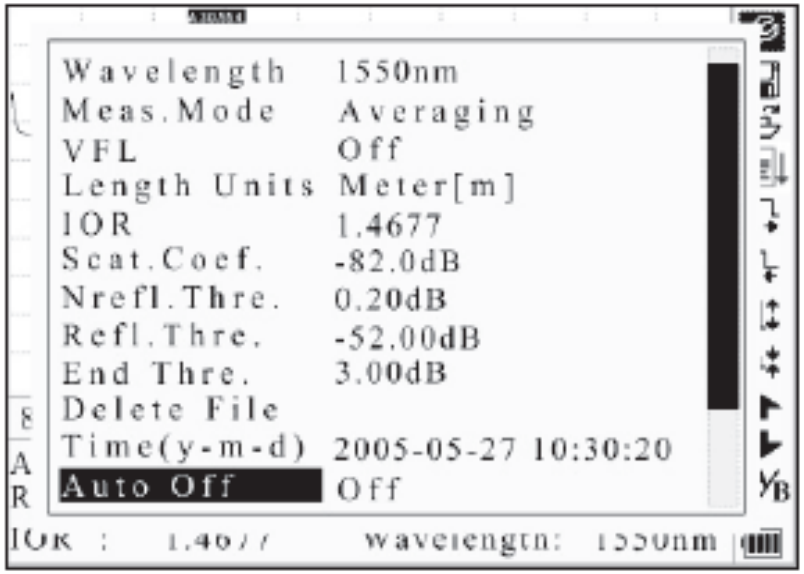
Setup – Time Configuration



Time Configuration

- Time configuration is used to change system time.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Time (y-m-d).” Press Enter .to change. Press ↘ to exit.
- Use ◀ and ▶ to adjust the position of the highlighted area. Use ▲ and ▼ to change the digits. After setting, press Enter to confirm.

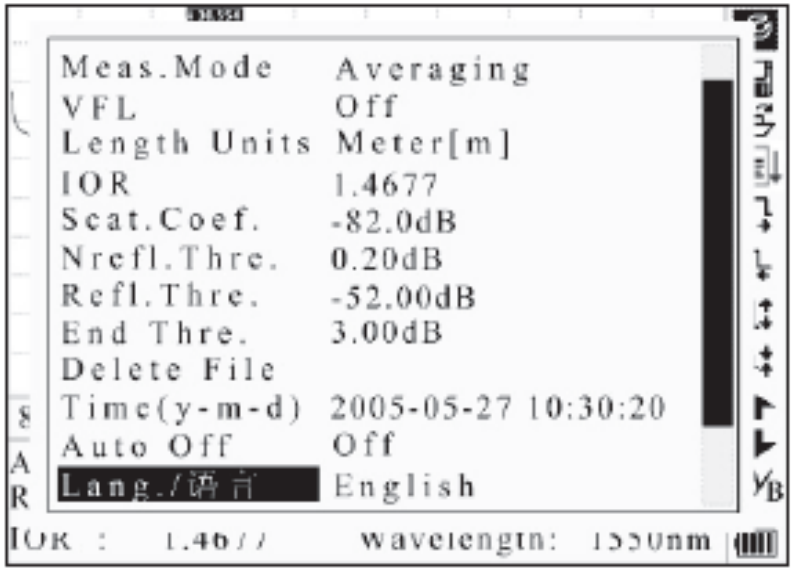
Setup – Auto Off



Auto Off Configuration

- This function conserves battery power. When auto off is enabled, the instrument will automatically power off when idle for 5 minutes.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Auto Off.” Press Enter to switch between “Off” and “On”. Press ↘ to exit.
- Note: The default setting is “On.”

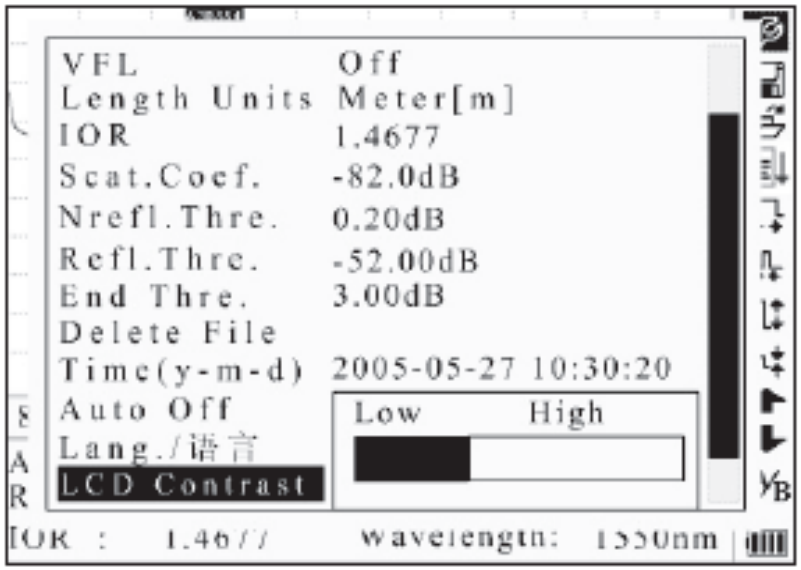
Setup – Language



Language Configuration

- There are two language options: English and Chinese.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Lang./ .” Press Enter to .switch the language. Press ↘ to exit.

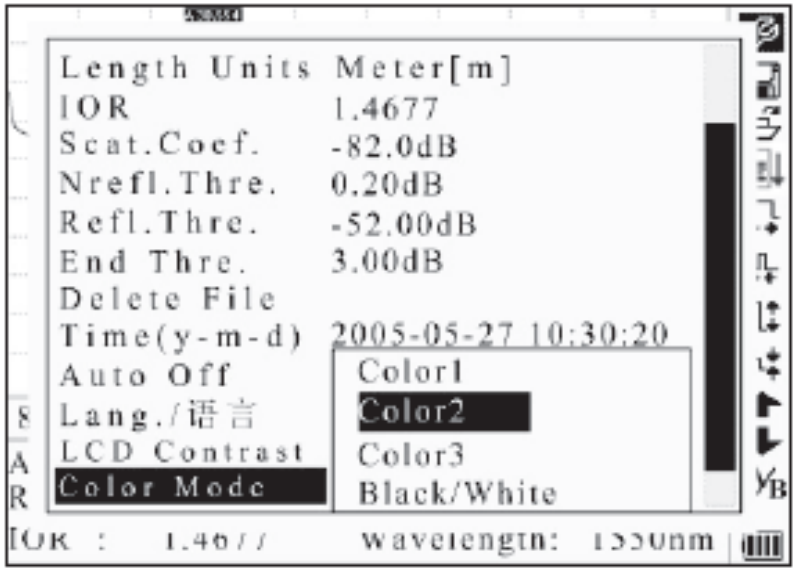
Setup – LCD Contrast Adjust



Contrast Adjustment of LCD

- The contrast of the LCD can be adjusted.
- Under the parameter configuration menu use ▲ and ▼ to highlight “LCD Contrast.” Press Enter to adjust. Press ↘ to exit.

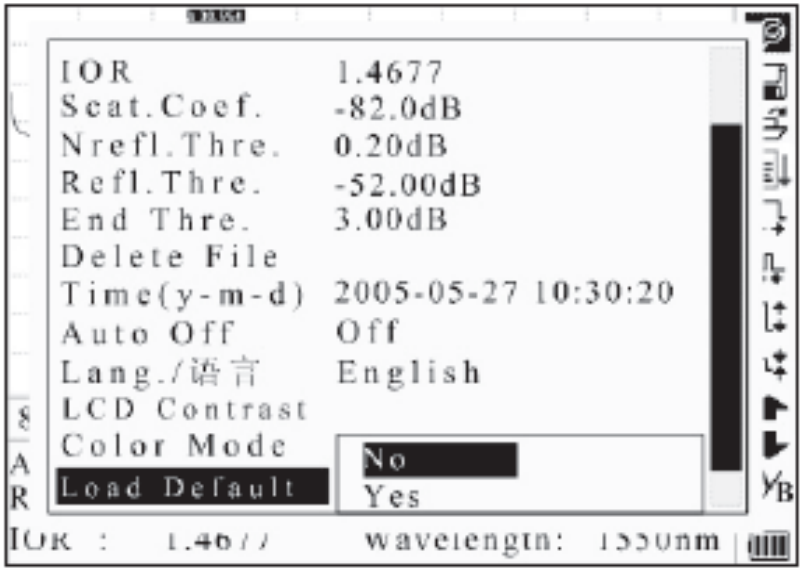
Setup – Color Mode



Color Mode Setting

- This setting changes the color .scheme of the display.
- Under the parameter configuration menu use ▲ .and ▼ to highlight “Color Mode.” Press Enter to choose a different mode. Press ↘ to .exit.
- Use ▲ and ▼ to highlight the desired color mode setting. Press Enter to confirm the selection.

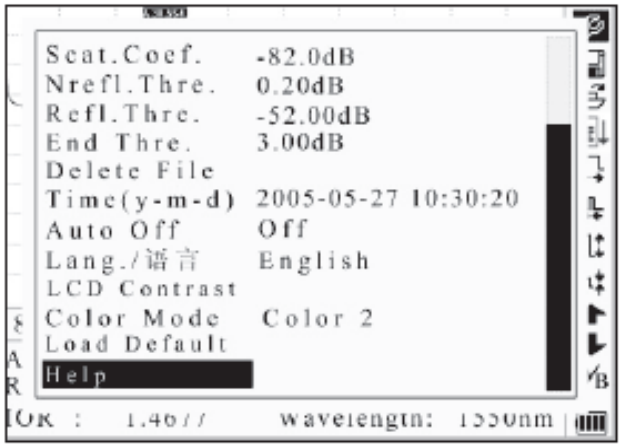
Setup – Default Setting

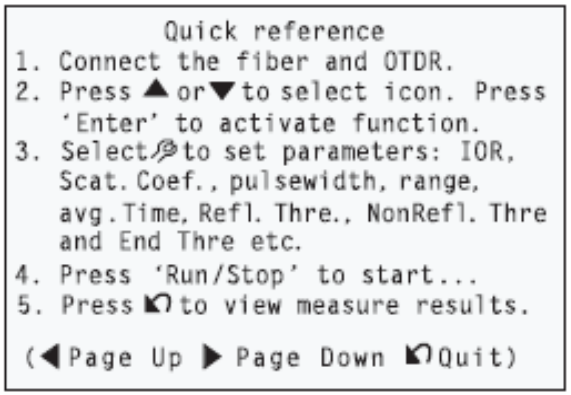


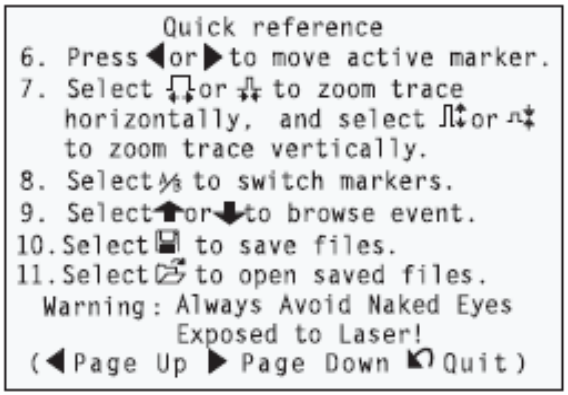
Default Setting

- This function is used to set the OTDR parameters to factory settings. These parameters include: range, pulse width, average time, IOR, non-reflection threshold, reflection threshold, end threshold, and scatter coefficient.
- Under the parameter configuration menu use ▲ and ▼ to highlight “Load Default.” Press Enter to enter. Press ↘ to exit.
- Use ▲ .and ▼ to highlight “Yes” or “No.” Press Enter to confirm.

Setup – Help





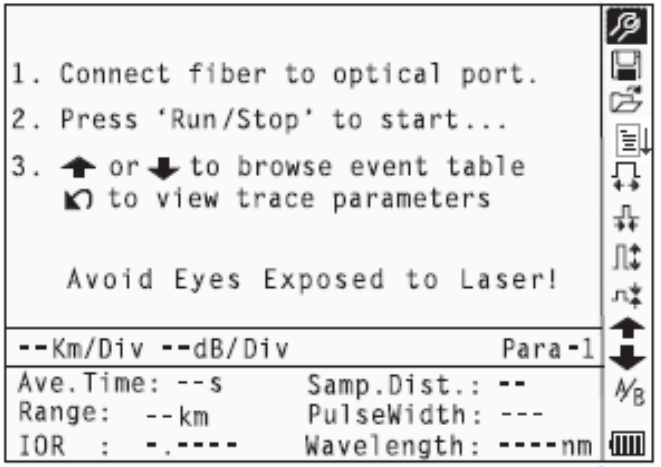


Help

- The Help function provides access to the quick reference screen.
- Under the parameter configuration menu use ▲ and ▼ to highlight "Help." Press Enter to display the quick reference screen. Press ↘ to exit.

Performing a Measurement

Initial Splash Screen



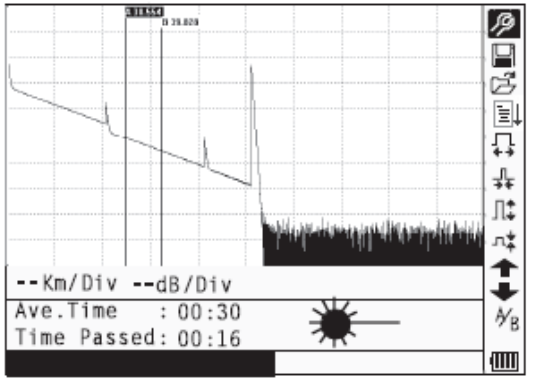
Quick Reference Screen

Performing a Measurement

Setup

1. Connect the optical fiber directly to the 920XC optic output. No tools are required.
2. Clean the connectors.
3. Clean the tie-ins, making sure they are compatible (APC or UPC).
4. Connect optical fiber to the 920XC.

• Note: Range is set to “Auto” when auto measurement is on.



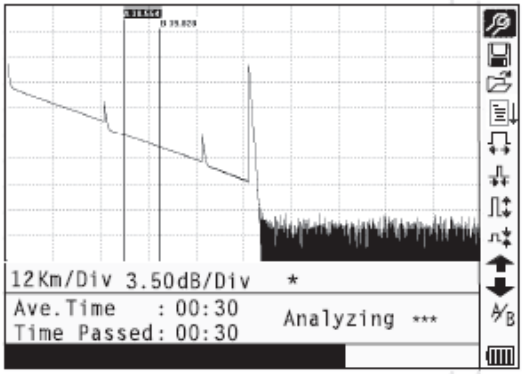
Screen while acquiring trace

Auto Trace Measurement

Auto measurement can be used if the length of optical fiber is unknown. The 920XC will select an adequate range for measurement.

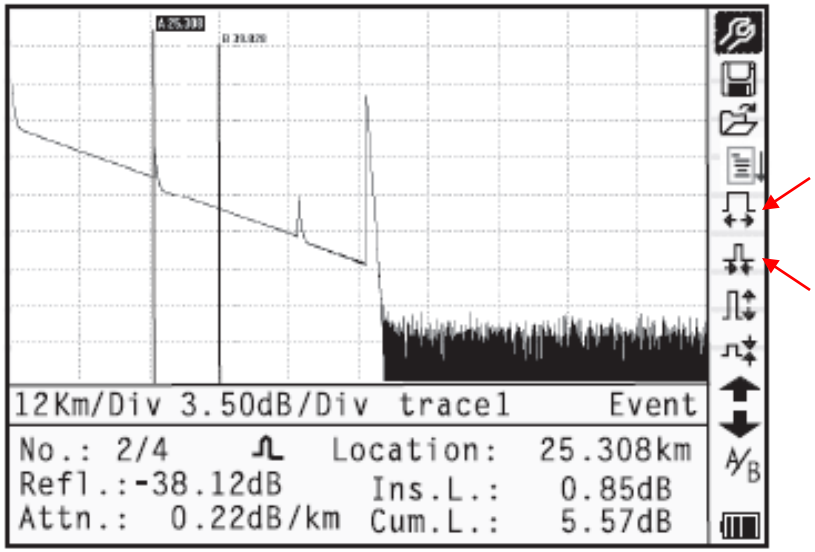
For auto measurement follow these steps:

1. Set the range to “Auto.”
2. Press Run/Stop to start the measurement.
3. Interface:
4. Total: 00:30: .Measure .time, which is set by user, is 30 seconds.
5. Passed: 00:16: Total measurement time has passed 16 seconds.
6. : ng of this icon means laser is active.



Screen while analyzing trace

Zoom a Trace Horizontally



Zoom out Trace Horizontally

To review the details of an event more closely, follow these steps:

1. Under GUI use ▲ and ▼ to highlight and then .press Enter to zoom out the trace horizontally. To zoom out horizontally using the keypad, press Shift + ▶.

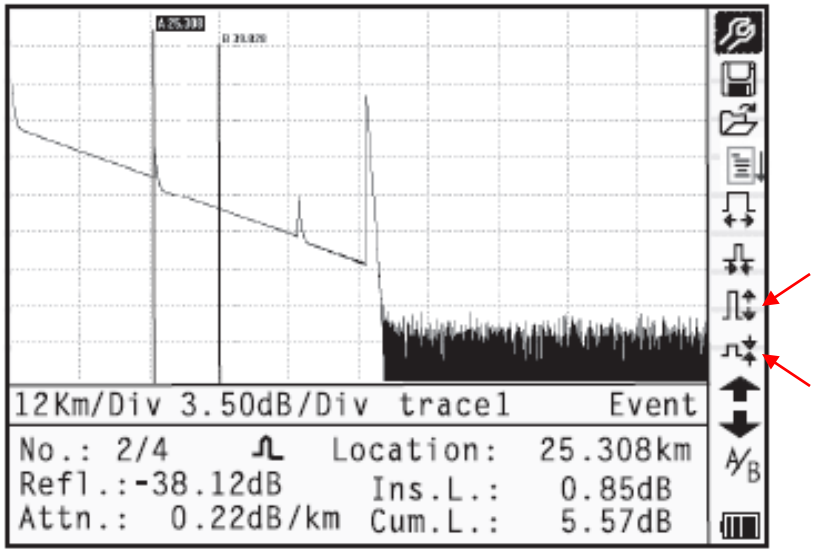
2. .Use ◀ or ▶ to move the marker to the event point being reviewed.

3. Refer to “Switching between Marker A/B” above for more information.

Zoom in Trace Horizontally

Under GUI use ▲ and ▼ to highlight and then press Enter to zoom in the trace horizontally. To zoom in horizontally using the keypad, press Shift + .◀.

Zoom a Trace Vertically



Zoom out Trace Vertically

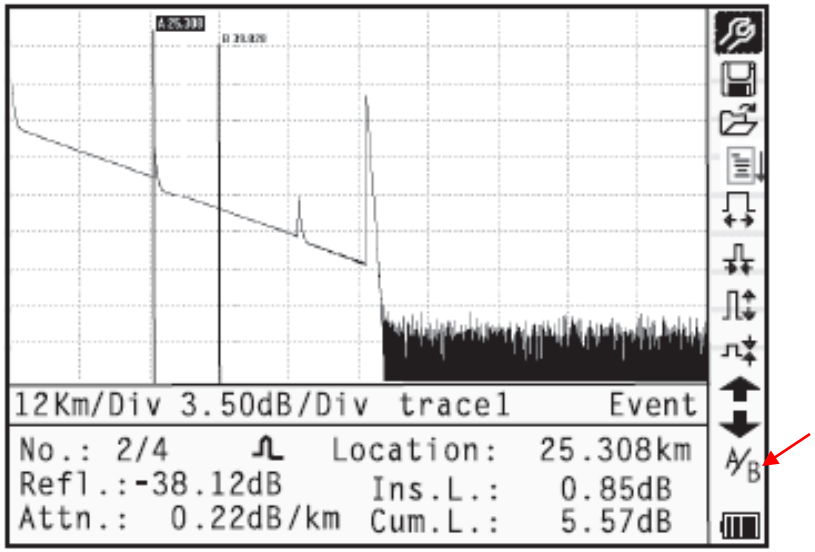
To review the details of an event more closely, follow these steps:

1. Under GUI use ▲ and ▼ to highlight and then press Enter to zoom out the trace vertically. To zoom out vertically using the keypad, press Shift + ▲.
2. Use ◀ or ▶ to move the marker to the event point being reviewed.
3. Refer to “Switching between Marker A/B” above for more information.

Zoom in Trace Vertically

1. Under GUI use ▲ and ▼ to highlight and then press Enter to zoom in the trace vertically.
2. To zoom in vertically using the keypad, press Shift + ▼.

Change A & B Marker



Reviewing Marker A/B Information

Switching between Marker A/B

Under GUI use ▲ and ▼ to highlight A/B and then press . Enter to switch between marker A/B.

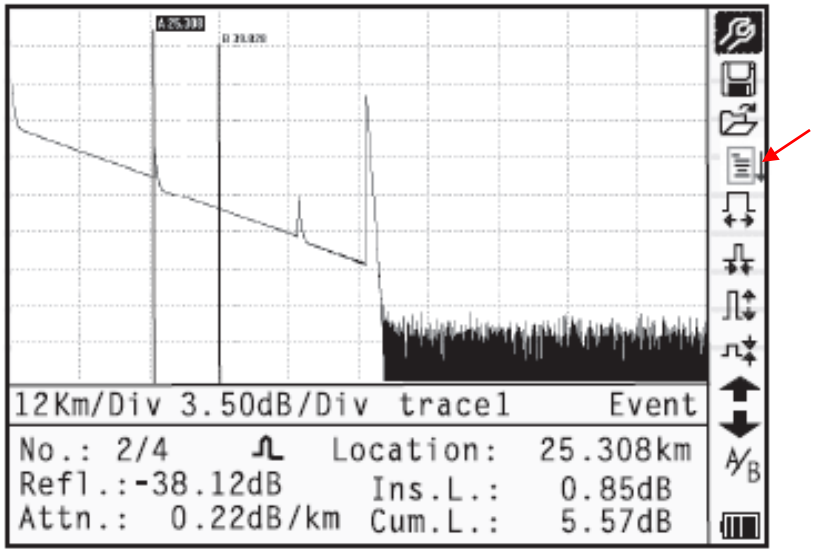
Use ◀ and ▶ to move marker A or B.

Information between Marker A/B

Under GUI press to ↘ switch the information window to marker A/B information.

Use ◀ or ▶ to change the position of marker A or B, and the marker A/B information will change accordingly in the information window.

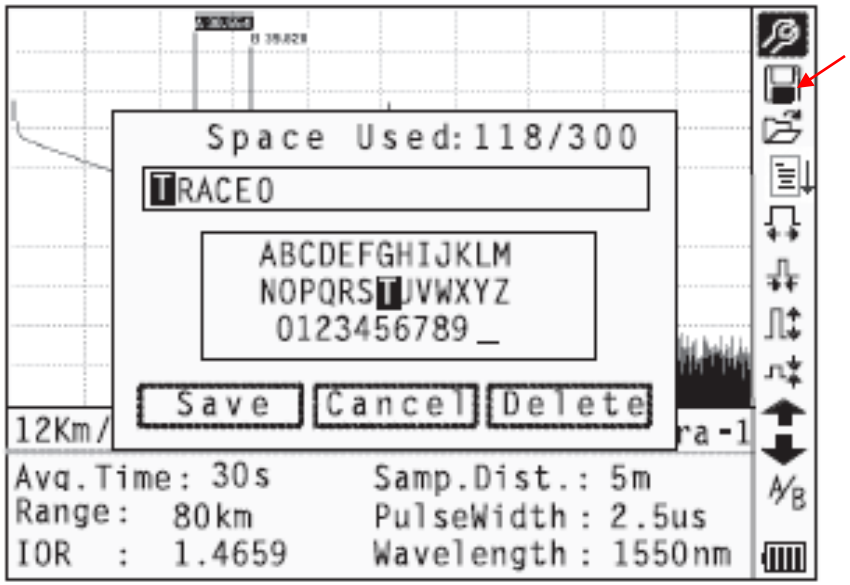
Re-analyze a trace



Re-analyze a Trace

- If the test result at a certain threshold is not adequate, it can be re-analyzed using this function to change the threshold. This function can be effective while the OTDR is disconnected from the fiber.
- Under the parameter configuration menu edit the threshold value, and then press ↘ to exit the parameter configuration menu. Press to re-analyze the trace.

Save a Trace



Save a Trace

When auto or manual measurement is finished, the measurement trace can be saved. The contents of a saved trace include the trace curve and related information of the trace.

1. Under GUI use ▲ and ▼ to highlight , and then press **Enter** to enter

2. Input filename: Use ▲ ▼ ◀ and ▶ to choose the alphanumeric characters one by one, and then press **Enter** to confirm. The filename can be a maximum of eight characters in length.

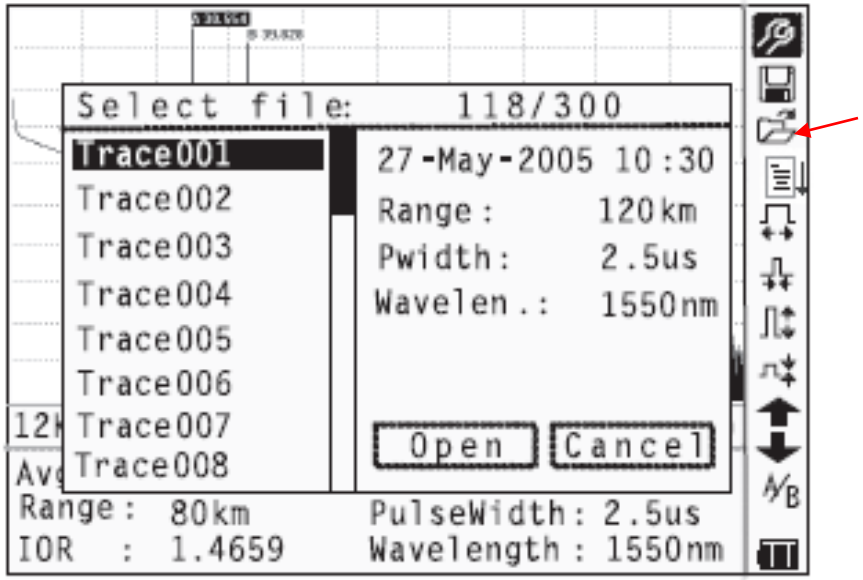
3. Save file: Use ▲ ▼ ◀, and ▶ to highlight “OK,” and then press **Enter** to save.

4. Cancel save file: Use ▲ ▼ ◀ and ▶ to highlight “Cancel,” and then press **Enter** to cancel the save file operation.

5. Delete alphanumeric characters: Use ▲ ▼ ◀, and ▶ to highlight “Delete,” and then press **Enter** to delete the characters.

6. Memory space: “118/300” means that total memory space is 300 files; 118 files have been saved so far.

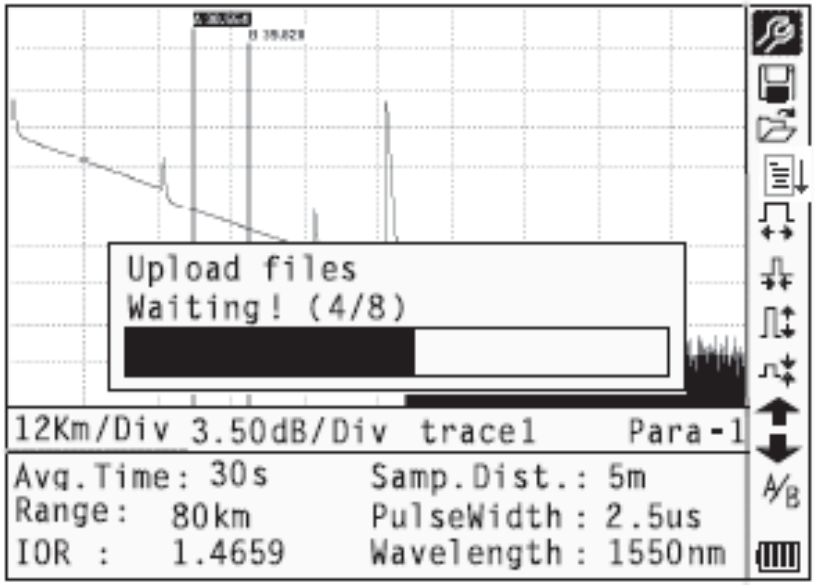
Browse a Saved Trace



Browse a Saved Trace

1. Under GUI use ▲ and ▼ to highlight , and then press **Enter** to confirm.
2. Use ▲ and ▼ to highlight the trace, and then use ◀ and ▶ to choose “Open” or “Cancel.” Press **Enter** to confirm.
3. Memory space: “118/300” means that total memory space is 300 files; 118 files have been saved so far.

Upload a Saved Trace



Upload a Saved Trace

Saved traces can be uploaded to a PC with the included Trace Viewer software. Then traces can be further processed on a PC.

1. Install the software and run. Refer to Section 7.

2. Power off the 920XC.

3. Connect the 920XC to a PC through RS-232 or USB interface cable.

4. Power on the 920XC, and upload data with the software.

Notes:

Make sure the instrument is powered off when connecting to a PC through RS-232 or USB data cable.

USB operation rules must be followed while connecting to a PC. Proper installation of a USB driver is necessary before uploading the data.

This operation cannot be applied under the GUI for parameter configuration, save trace, browse saved traces, and measuring in progress.

Battery Information

- NiMH rechargeable batteries
- 8 hours continuous operation
- 20 hours standby operation
- User changeable batteries

Battery Information

Use of Batteries

The 920XC tools use a NiMH battery.

Auto Off Mode

The instrument will enter auto off mode when there is insufficient power during operation. The low power icon will be displayed on the LCD.

If unused for a long time, causing insufficient power, the instrument will enter auto off mode several seconds after powering on in order to protect the batteries in case of excessive discharging. .The .internal .battery .should .be .recharged .immediately .through .the .adapter. .

Recharging

Perform a quick charge first, and then switch to trickle charge after the voltage reaches a predefined figure. Quick charge temperature is 5 °C to 45 °C (41 °F to 113 °F), and trickle charge temperature is 0 °F to 55 °C (32 °F to 131 °F). Battery will not be fully charged or may be damaged if the charging temperature is beyond the above range, which may shorten battery life.

A quick charge takes 3 hours.

Do not charge for over 8 hours.

Battery Information

Battery Recharge Status

When the 920XC is powered off and powered through the AC/DC adapter, the “CHARGE” indicator on the interface panel will be lit. When the battery is fully recharged, the indicator will turn off.

When the instrument is powered on and powered through the AC/DC adapter, the internal battery is automatically recharged. The icons mean the following:

Battery is being recharged

Battery is fully charged

When the 920XC is powered by the internal rechargeable battery, the power level of the battery is shown on the LCD:

No power

Low power

Half power

More than half power

Full power

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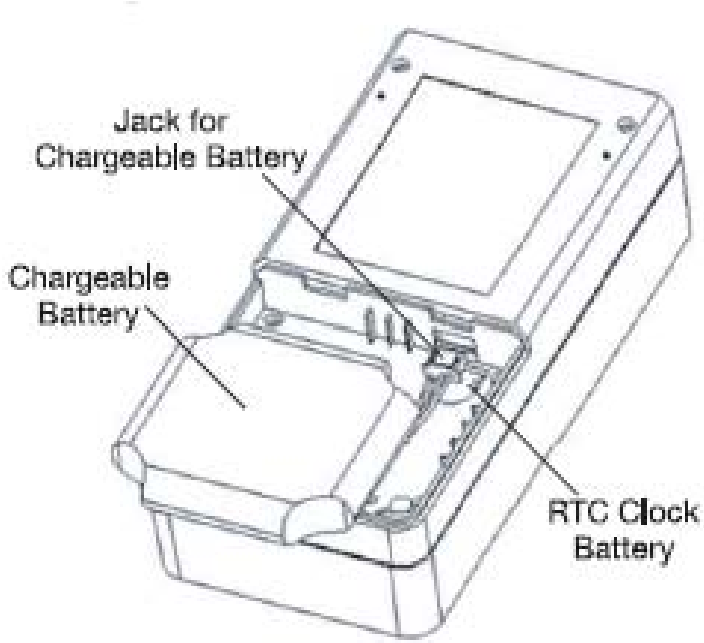
A Textron Company

Maintenance and Replacement of Batteries



Maintenance and Replacement of Batteries

The 920XC has two batteries: a NiMH battery to power the instrument and a real-time clock (RTC) battery for data retention.

Note: Recharge the battery prior to use if the OTDR has not been used for one month.

To replace the NiMH battery (Figure 5-1):

1. Remove the battery compartment cover.

2. Remove the battery and disconnect the battery connector.

3. Replace the battery with the Greenlee supplied replacement battery.

To replace the RTC battery (Figure 5-1):

1. Remove the NiMH battery as above.

2. Remove the RTC coin cell battery.

3. Replace using a CR1220. Insert the replacement coin cell with the positive side facing up.

Cleaning Interfaces and Connectors

Cleaning Connectors

Interfaces must be kept clean. Isopropyl alcohol may be used to clean the optical output. Always replace the protective dust caps when the unit is not being used, and keep the protective dust caps clean. In addition, flanges must be cleaned periodically.

Notes:

The diameter of optic core is 9 um, and the diameter of dust and other particulates ranges from 1/100 to 1/1/10 um. Dust and other particulates can cover part of the optical end and therefore degrade the performance of the instrument.

In addition, power density may burn dust into optical fiber and induce further damage (for example, 0 dBm optic power may produce about 16000000 W/m*m power density in single mode fiber). If this happens, the measurement will be inaccurate and damage will be irreversible.

Tools for Cleaning Interfaces and Connectors

Optical fiber cleaner (for cleaning optical connectors)

Optical fiber cleaning rod (for cleaning optical outputs)

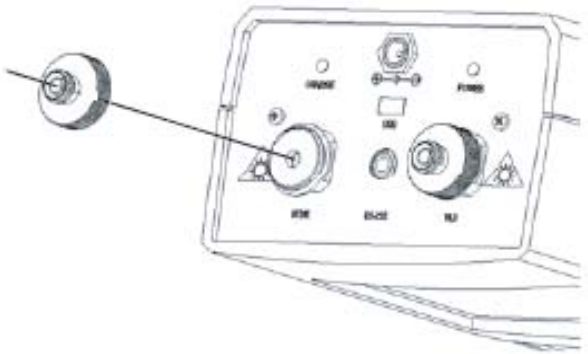
Optical fiber cleaning tissue (for cleaning optical interfaces)

Isopropyl alcohol

Paper tissue

Cleaning brush

Cleaning swabs



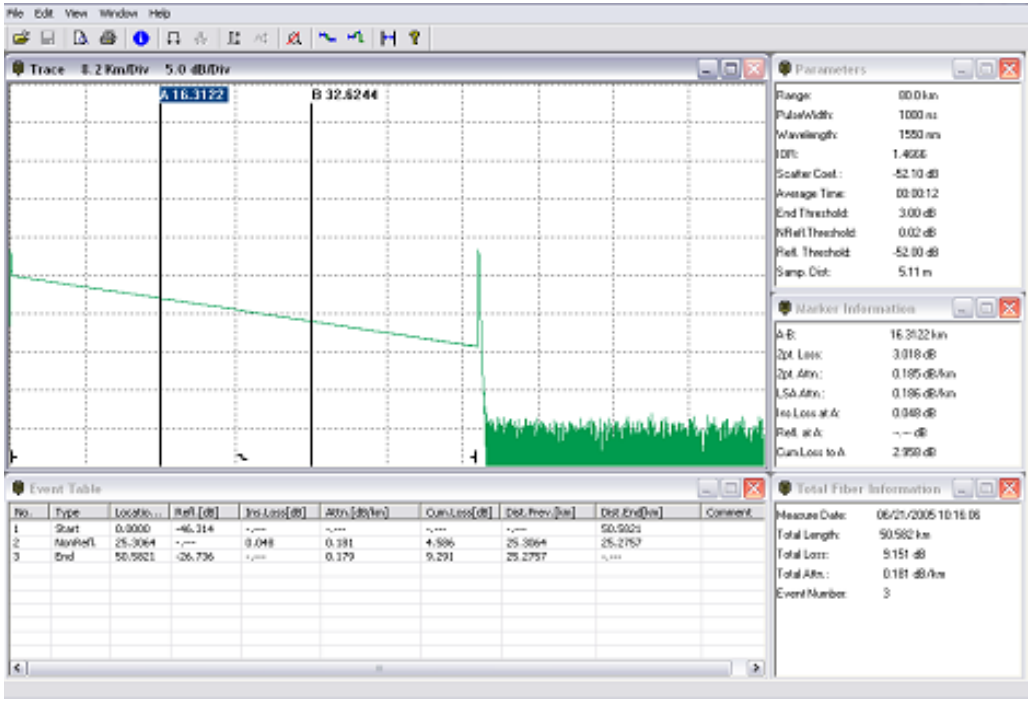
Procedure for Cleaning Interfaces and Connectors

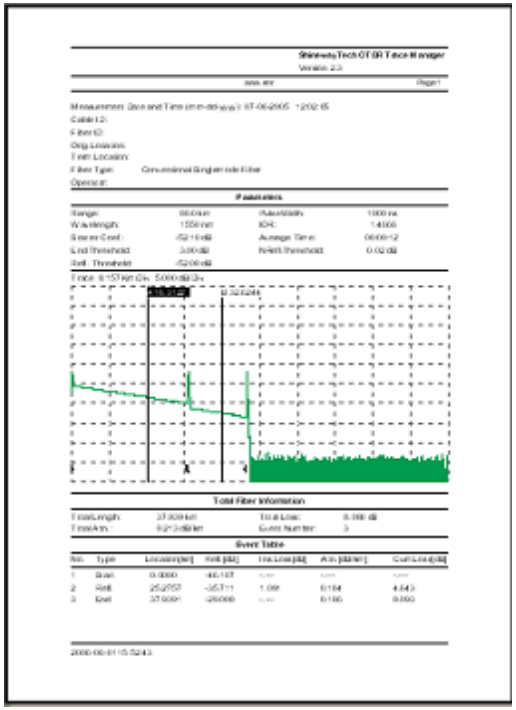
1. Unscrew the adapter from the bulkhead.
2. Carefully clean the bulkhead and the inside of the adapter.
3. Screw the adapter back onto the bulkhead.

Specifications

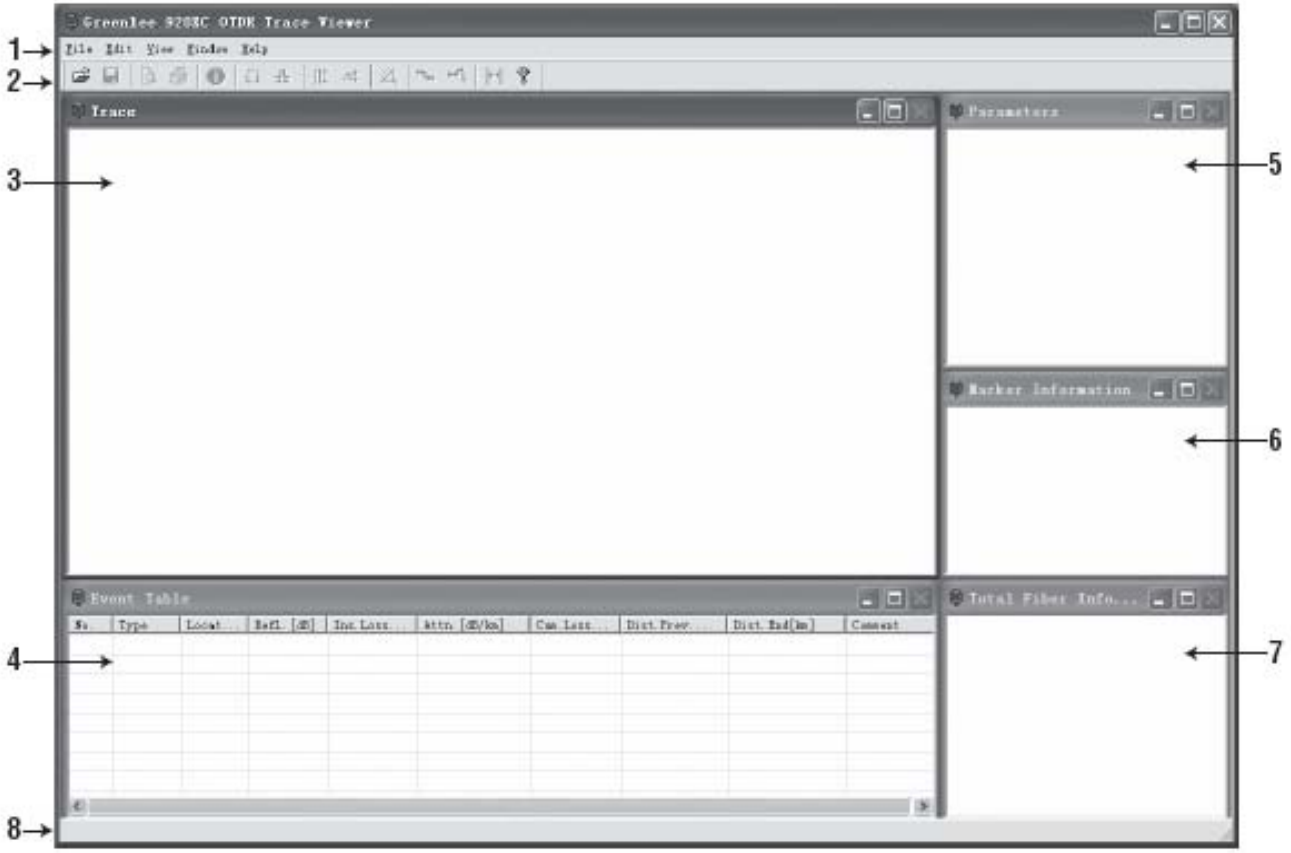
Optical Specifications[1]	920XC-20C	920XC-20M	920XC-30F	920XC-30P
Dynamic Range (db)[2]	35	18/22	38/37/37	
Wavelength (±20 nm)	1310/1550	850/1300	1310/1550/1625	1310/1490/1550
Display Type	Color			
Fiber Type	Single-mode	Multi-mode	Single-mode	
Selectable Ranges (km)	0.3/1.3/2.5/5/10/20/40/80/160/240	@ 850 nm: 0.1/0.3/0.5/1.3/2.5/5/10; @ 1300 nm: 0.1/0.3/0.5/1.3/2.5/5/10/20/40/80	0.3/1.3/2.5/5/10/20/40/80/160/240	
Pulse Widths (ns)	5/10/30/100/300/1000/2500/10000/20000	@ 850 nm: 12/30/100/275/1 µs; @ 1300 nm: 30/100/275/1 µs/2 µs	5/10/30/100/300/1000/2500/10000/20000	
Average Time (s)	15/30/60/120/180			
Attenuation Deadzone (m)[3]	14	20	10	14
Event Deadzone (m)[3]	2.5	7	1.5	2.5
Sampling Range (m)	0.1 to 15	1 to 10	0.1 to 15	
Sampling Points	16000 (maximum)			
Distance Measure Accuracy	± (1 m + 5 x 10^{-5} x Distance (m) + sampling space)			
Attenuation Measure Accuracy	0.05 dB/dB			
Reflection Measure Accuracy	±4 dB			
Measurement Data Storage	1000 test curves			
Connector Type	PC, APC	PC	PC, APC	
Data Transmission	RS-232/USB port			

Trace Viewer Software



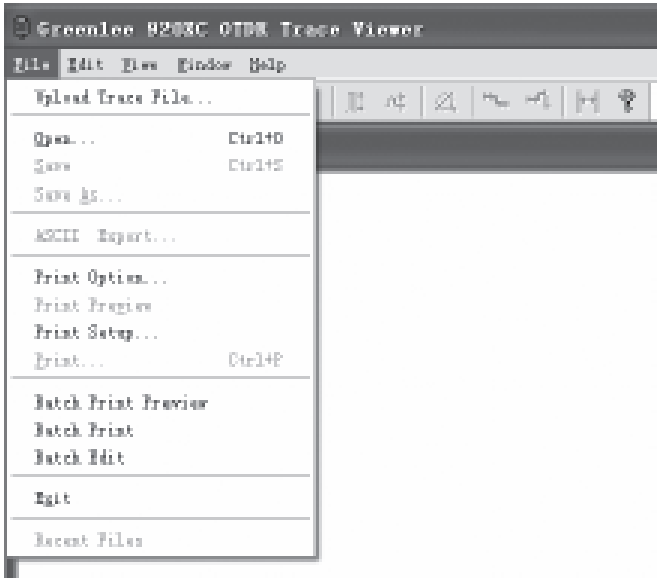


Trace Viewer Software GUI



1. Menu
2. Tool bar
3. Trace display window (spectral line)
4. Events list window (Events Table)
5. Measurement and analysis parameter window (Parameter Sheet)
6. Fiber information window (fiber section information)
7. Fiber chain information window (fiber chain information)
8. Status bar

Menu



File (F)

The functions enabled under the “File” menu include: upload trace file, open file, save opened file, ASCII format output, printing configuration, printing preview, printing, batch print preview, batch print, batch edit, and exit application.

Edit (E)

Use the Edit” menu to edit the events list: add event, delete event, and edit optical fiber information. Optical fiber information is explanatory text relating to the trace file that users type in. For each measurement, users can save the measurement trace with the 920XC. This software provides an interface for text input. For each trace file, users can input related information

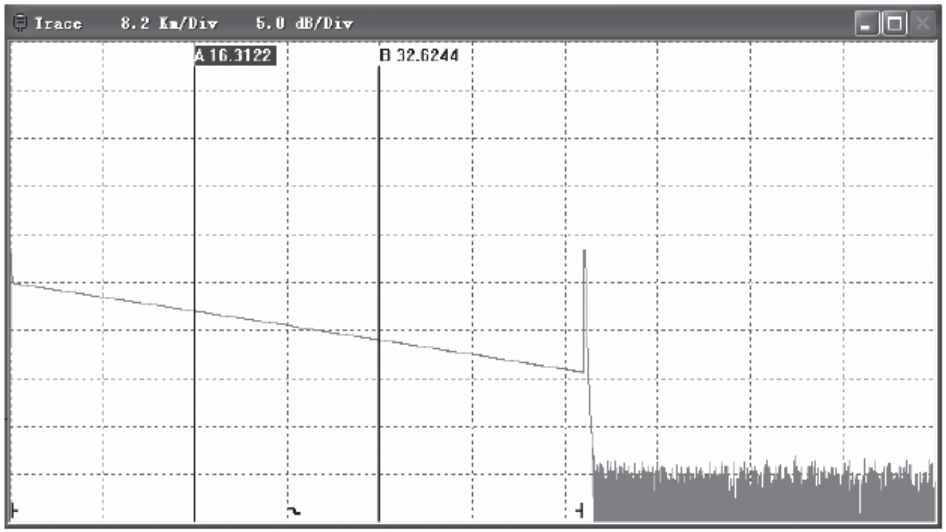
Window (W)

The “Window” menu (Figure 7-5) controls the display of the sub windows: trace window, events table window, parameter window, and fiber chain information. Tile function displays sub windows in a layout similar to. Other submenus take the selected window as the current active window.

Help (H)

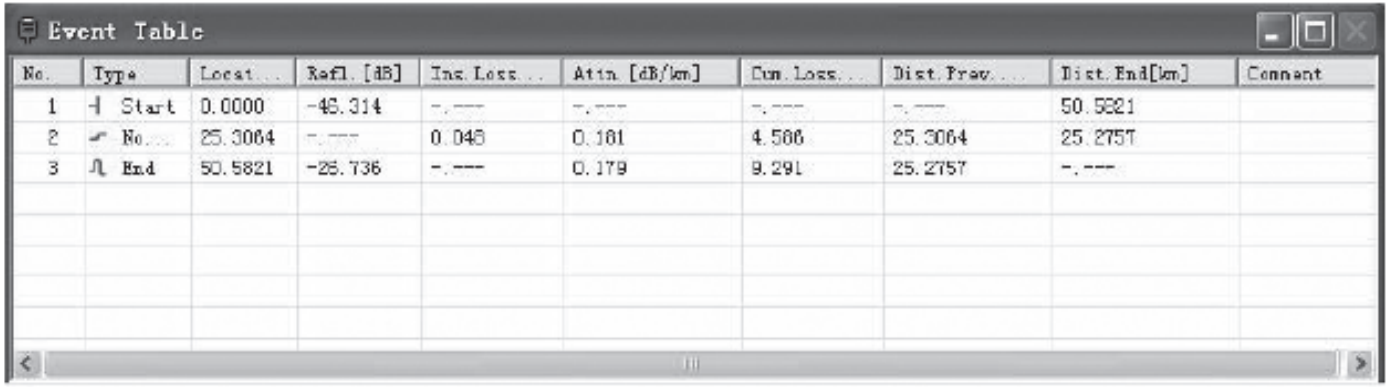
The “Help” menu displays the version of the software.

Trace Window



- The x-axis displays the distance (km); the y-axis represents the backscatter power (dB).
- There are two markers, A and B; click either one to activate it. To move the marker, click and drag with the mouse pointer; the position information will change accordingly. By moving the marker, the horizontal distance and vertical power can be read manually.
- Zooming in and out of the trace features depends on the activation of a marker. The sloped line represents backscatter from the optical fiber. The peaks are reflective events in the fiber chain.
- The end of the fiber is shown by the sudden drop in optical power, which is followed by noise.
- The symbols at the bottom of the window indicate the type of event.

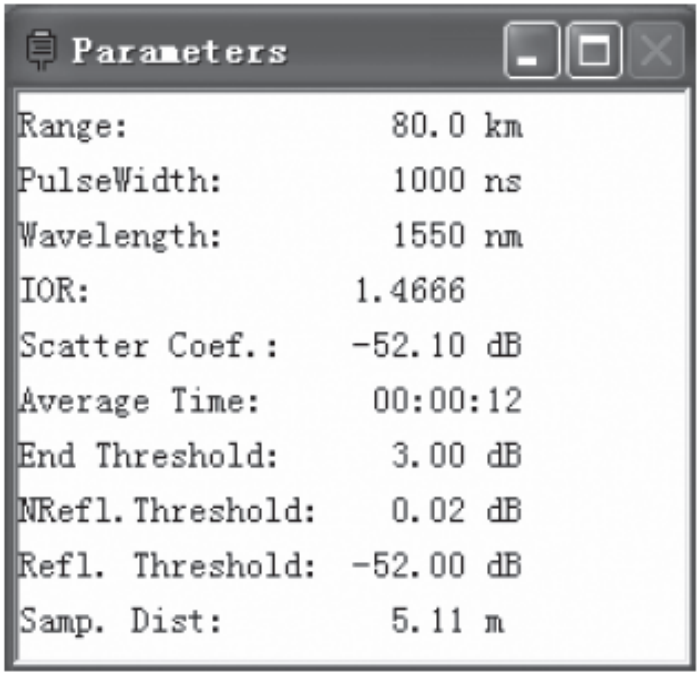
Event Table



The events list contains the following items:

- **No.: Sequence of events in optical fiber chain.**
- **Type: Beginning, end, reflection, and non-reflection event.**
- **Distance: Distance from OTDR to event point.**
- **Reflection Value: Value of reflection event.**
- **Insertion Loss: Vertical .decline .of .dB.**
- **Attenuation Coefficient: Value of attenuation per kilometer between current event point and previous event point in optical fiber chain.**
- **Cumulative Loss: dB value of loss from 0 km to current event point.**
- **Dist. Prev. (km): Distance from the previous event.**
- **Dist. End. (km): Distance from the end event.**
- **Comment: Notify other details of the event.**

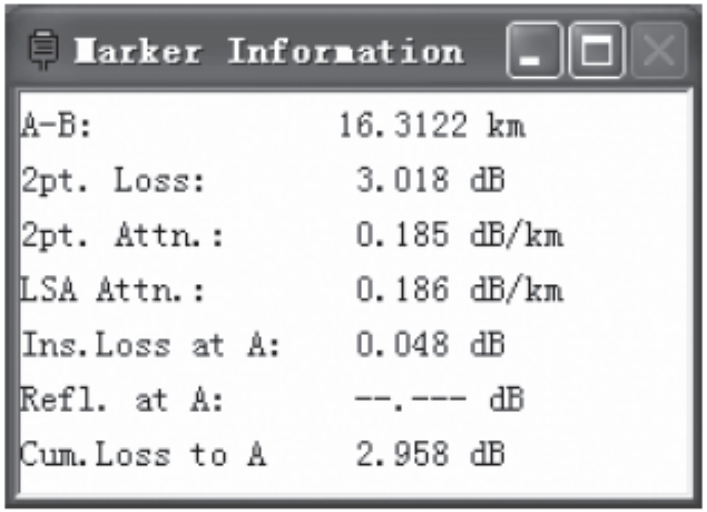
Parameter Window



Parameter Window

- **The parameter window displays the default parameters of the currently displayed trace.**
- **Measurement parameters include: range, pulse width, average time, and wavelength.**
- **Analysis parameters include: IOR, scattering coefficient, end threshold, non-reflection threshold, reflection threshold, and sampling distance.**

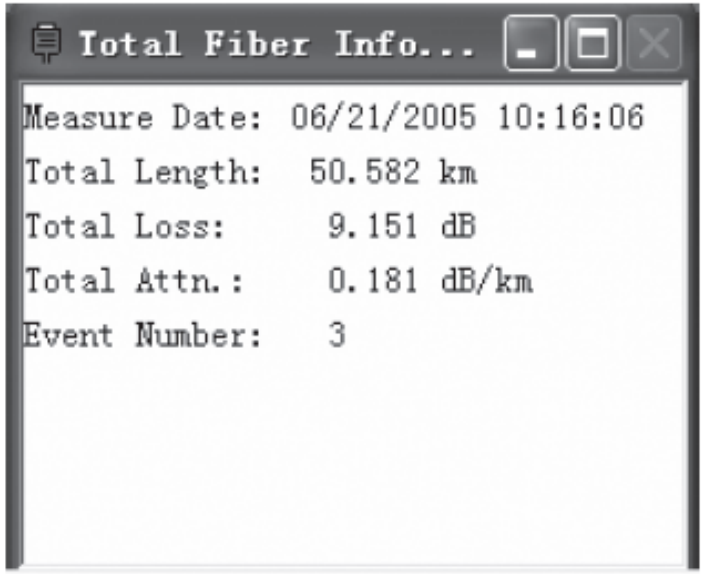
Marker Information



Marker Information Window

- This window displays the distance between marker A and B, attenuation coefficient, and loss information.
- The two point loss is the difference of vertical power between marker A and B.
- Two point attenuation is the two point loss of marker A and B divided by the horizontal distance between marker A and B.

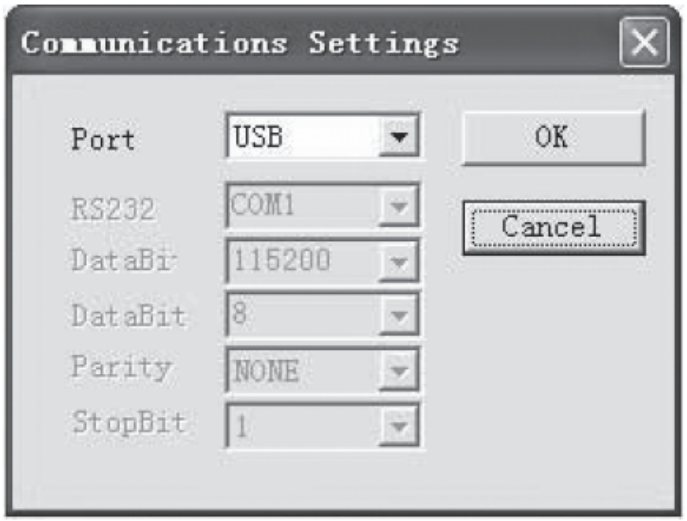
Total Fiber Info



Total Fiber Info

The contents displayed in this window are date of measurement, length of fiber chain, loss of fiber, attenuation, and event number of fiber.

Upload Trace Data



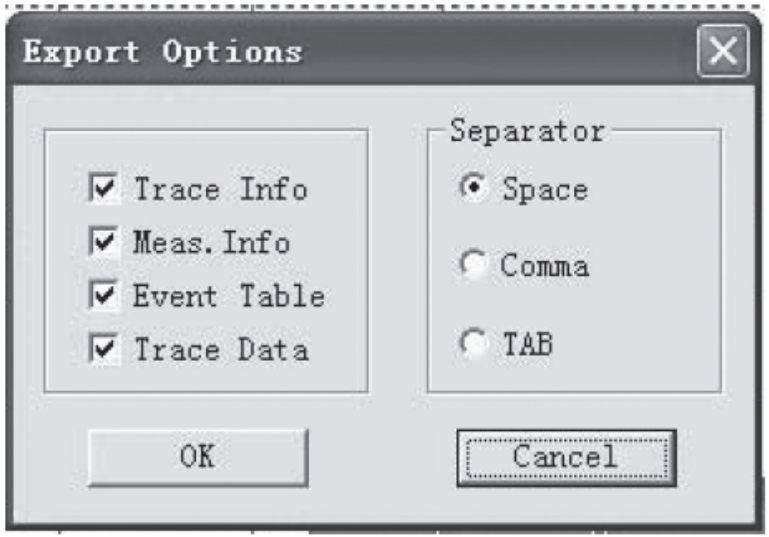
Upload Trace Data

- **Power off the 920XC**
- **Connect the 920XC to a PC via a serial port cable or USB cable.**
- **Turn the 920XC on and run the 920XC Trace Viewer software.**
- **Under the “File” menu, select “Upload trace file…”, and the “Communications Settings” dialog box appears.**
- **Choose a communication port (USB or RS-232) and click “OK”.**
- **Choose the saved position of traces, and then start uploading data.**

Tool Bar

- Open file
- Save file
- Printing preview
- Printing
- Edit optical fiber information
- Zoom out trace horizontally
- Zoom in trace horizontally
- Zoom out trace vertically
- Zoom in trace vertically
- Full screen
- Analyze insertion loss (the five-point measurement to test the insertion loss)
- Analyze reflectance
- Lock marker A and B
- Display version

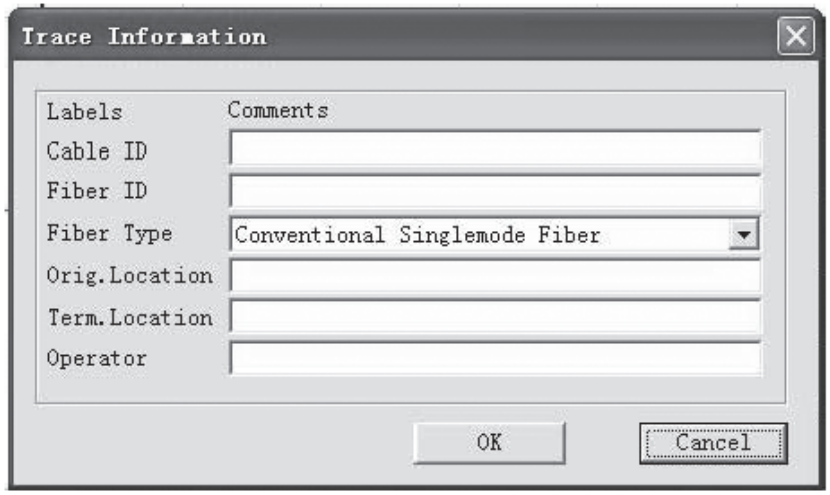
ASCII Format



ASCII Format Output

- **The Trace Viewer software provides a software interface so that data can be exported in ASCII format and then opened and viewed by a third-party application.**
- **Select “ASCII format output” under the “File” menu.**
- **Select the information and format, and then press Enter to choose the path and file name.**

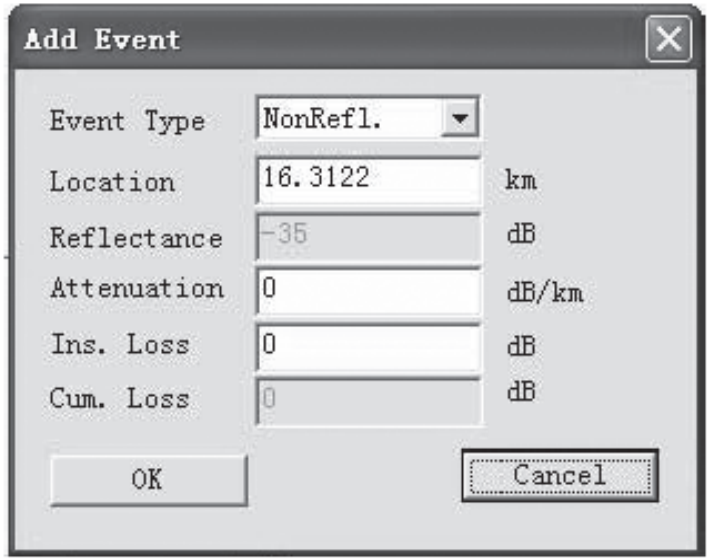
Edit Optical Fiber Information



Edit Optical Fiber Information

- **Select “Edit information of optical fiber” under the “Edit” menu to start editing optical fiber information.**
- **Information of optical fiber is a description of measurement trace displayed in the trace window.**
- **Users input relevant information for efficient management of measurement files. Upon completion of editing, press Enter to confirm.**

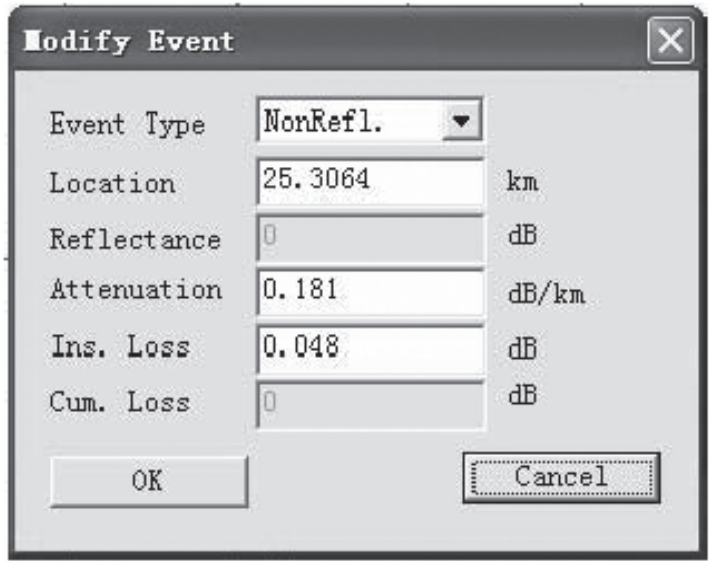
Add Event



Add Event

- If an event on the measurement trace is not listed in the events list (due to inaccuracies caused by poor SNR or inadequate parameter configuration), use the “add event” function to manually add this event into the events list.
- Click the events list window, and select “Add event” under the “Editing” menu.
- Choose the type of event from the pull-down menu, enter the event features, and then press Enter to add the event to the events list.

Modify Event



Modify Event

- **Use the “revise event” function to manually revise features of an event (due to inaccuracies caused by poor SNR or inadequate parameter configuration).**
- **Select the event to be revised in the events list window, and select “Revise event”.**
- **After modifying the event feature(s), press Enter to confirm the changes. The software will automatically refresh the event sequence.**

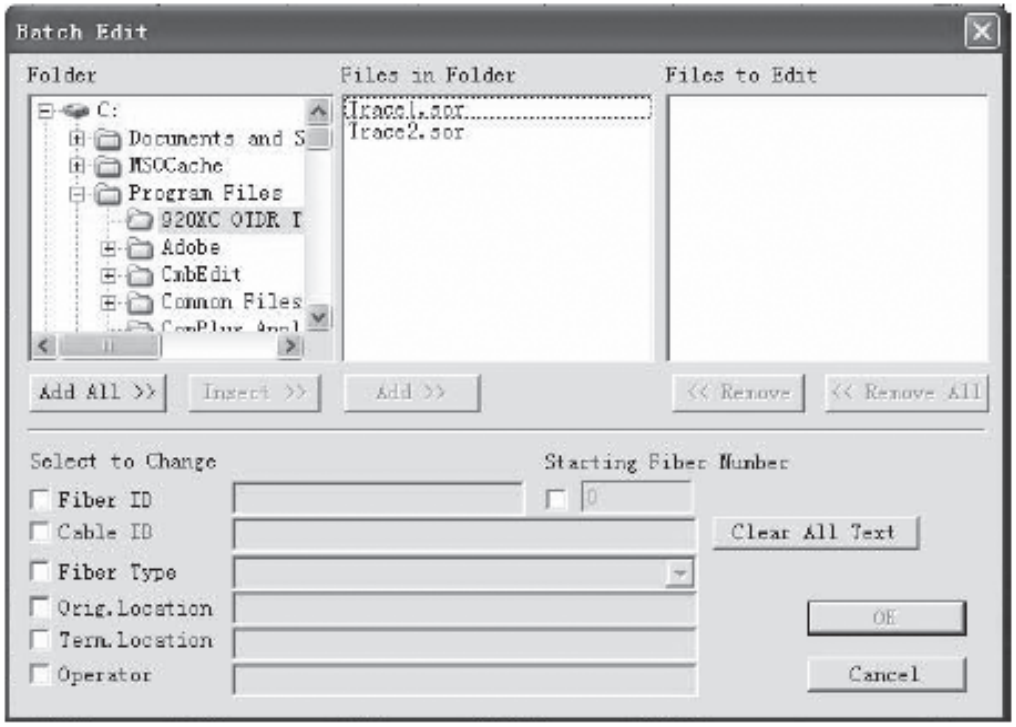
•Events can also be revised by clicking on the event to access a pop-up menu.

Delete Event

Delete Event

- **Use the “delete event” function to manually delete a trace from the events list when it appears in error (due to inaccuracies caused by poor SNR or inadequate parameter configuration).**
- **Highlight the event to be deleted, and then select “Delete event” under the “Editing” menu.**
- **Events can also be deleted by clicking on the event to access a pop-up menu.**

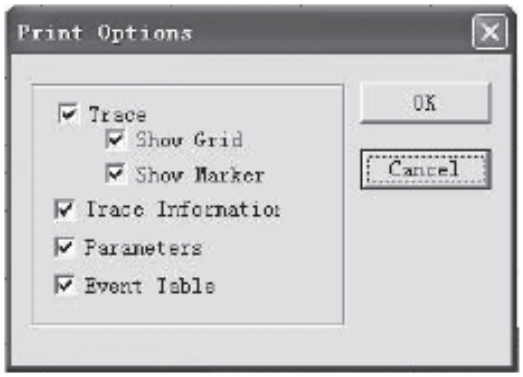
Batch Edit



Batch Edit

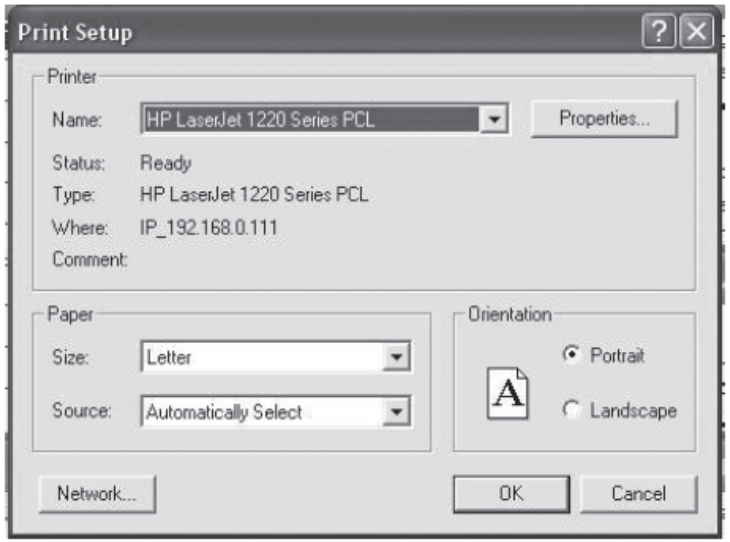
- **The 920XC Trace Viewer software has a batch-edit function that allows users to edit the trace information of several trace files in the same folder at one time.**
- **Select “Batch Edit” under the “File” menu.**

Printing



Printing Options

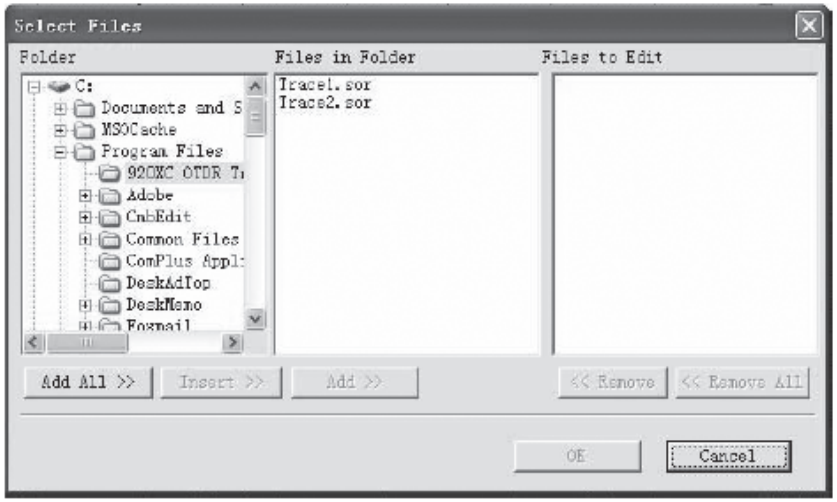
- **Select “Printing options…” under the “File” menu to select the contents to be printed.**



Printing Setup

Select “Printing setup” under the “File” menu to select the printer, paper size, and printing orientation.

Batch Print



Batch Print

- **The 920XC Trace Viewer software has a batch-print function that allows users to print several trace files in the same folder at one time.**
- **Select “Batch Print” under the “File” menu.**

XC *fiber*TOOLS™

920XC
Handheld OTDR

CSR Training

GREENLEE
A Textron Company

Why the 920XC?

Why is Greenlee launching the 920XC Handheld OTDR?

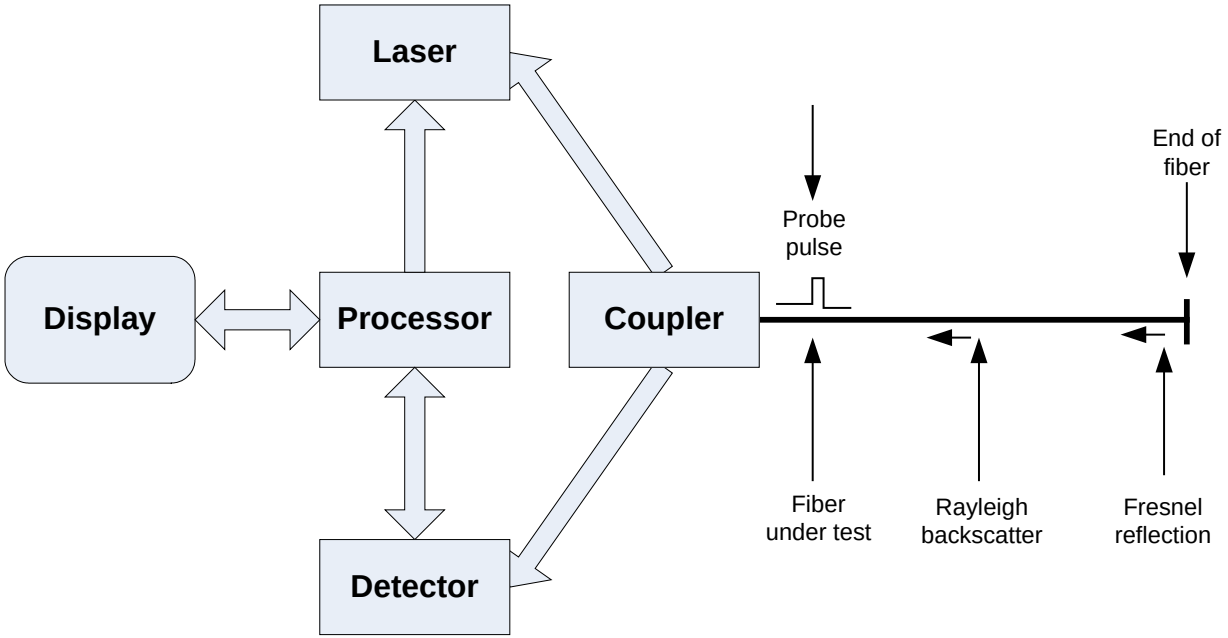
Telecommunications service providers are installing fiber optic networks to deliver high bandwidth service to their customer base. Telecommunications providers ***require*** an OTDR to perform cable acceptance testing and fault location on fiber optic networks. There are two main types of networks being deployed by the telecom service provider:

- ♦FTTN – fiber to the node in which a fiber is run from the central office to node that service the neighborhood of business.
- ♦FTTH – Fiber to the Home were a fiber is run directly to the home.

Product Positioning Statement

We are proud to announce the 920XC series of handheld OTDR's. The 920XC product launch coincides with the rapid expansion of telecom service provider's fiber optic build out of the last mile high bandwidth network. The 920XC is the ideal instrument for the OSP telecom technician to use for cable acceptance testing and fault locating.

What is an OTDR?



The Optical Time Domain Reflectometer (OTDR) is an instrument that uses the inherent backscattering properties of an optical fiber to detect faults and categorize its condition. The OTDR sends high-power pulses of laser light down the fiber and captures the light that is reflected back (much like a radar system). By measuring the timing and power levels of the return pulses, the instrument correlates the reflected information with physical locations along the fiber and displays a “trace” that shows optical power versus distance. Attenuation of the fiber is displayed as the slope of the trace. Interruptions such as splices, connectors, bends, breaks or flaws in the fiber appear as transitions (“events”) that represent their nature and location.

What is cable acceptance testing and fault locating?

What is cable acceptance testing?

When a fiber is installed by a telecom service provider they are required (typically by the service providers method and practices (procedure) to perform OTDR testing. The OTDR cable acceptance test documents the loss of the fiber span, the length of the cable and the loss of any splices that may be on the fiber cable.

What is fault locating?

As fiber proliferates into the last mile of the service provider's fiber optic network, fiber optic cable faults will increase. Fault locating is using the OTDR to find a break in the fiber optic cable. The 920XC easily accomplishes this task through the Auto setup mode. The user simply has to press the START/STOP key and reads the distance to the fiber break.

920XC Feature Overview

Features

- Easy to Use/Compact Handheld Design
- Automated Measurement/Analysis/File Save
- 38dB Dynamic Range
- 1.5 meter event deadzone
- Large color LCD display
- Measure length and defects of coiled fiber
- RS-232 and USB interface
- Store 1000 measurement results
- NiMH battery for 8 hours continuous use
- Internal VFL (650nm)

920XC Handheld OTDR

Protective Rubber Boot

Color LCD with Protective Cover

Sealed Membrane Panel

USB and RS-232 port

OTDR port

VFL port

Specifications

Optical Specifications[1]	920XC-20C	920XC-20M	920XC-30F	920XC-30P
Dynamic Range (db)[2]	35	18/22	38/37/37	
Wavelength (±20 nm)	1310/1550	850/1300	1310/1550/1625	1310/1490/1550
Display Type	Color			
Fiber Type	Single-mode	Multi-mode	Single-mode	
Selectable Ranges (km)	0.3/1.3/2.5/5/10/20/40/80/160/240	@ 850 nm: 0.1/0.3/0.5/1.3/2.5/5/10; @ 1300 nm: 0.1/0.3/0.5/1.3/2.5/5/10/20/40/80	0.3/1.3/2.5/5/10/20/40/80/160/240	
Pulse Widths (ns)	5/10/30/100/300/1000/2500/10000/20000	@ 850 nm: 12/30/100/275/1 µs; @ 1300 nm: 30/100/275/1 µs/2 µs	5/10/30/100/300/1000/2500/10000/20000	
Average Time (s)	15/30/60/120/180			
Attenuation Deadzone (m)[3]	14	20	10	14
Event Deadzone (m)[3]	2.5	7	1.5	2.5
Sampling Range (m)	0.1 to 15	1 to 10	0.1 to 15	
Sampling Points	16000 (maximum)			
Distance Measure Accuracy	± (1 m + 5 x 10^{-5} x Distance (m) + sampling space)			
Attenuation Measure Accuracy	0.05 dB/dB			
Reflection Measure Accuracy	±4 dB			
Measurement Data Storage	1000 test curves			
Connector Type	PC, APC	PC	PC, APC	
Data Transmission	RS-232/USB port			

Product Configurations

What is the 920XC product configuration?

The 920XC has four base models to choose from:

Base Model	Description
920XC-30F	1310/1550/1625nm OTDR
920XC-30P	1310/1490/1550nm
920XC-20C	1310/1550nm OTDR
920XC-20M	8501300nm Multimode OTDR

Optical Interfaces

OTDR and VFL Interface

- PC or APC polish
- Ceramic alignment sleeve
- Removable adapter for easy cleaning
- Protective dust caps
- Connector adapters available
  - FC
  - ST
  - SC