



FTE-7100

Optical Time Domain Reflectometer

User's Guide

This guide is written for use with the FTE-7100 OTDR series.

Revision A
1/2019

Information contained in this manual is believed to be accurate and reliable, however, no responsibility is assumed by Terahertz Technologies Inc. for its use nor for any infringements of patents or other rights of third parties that may result from its use. No license is granted by implication or otherwise under any patent rights of Terahertz Technologies Inc.

The information contained in the publications is subject to change without notice.

Table of Contents

1.	Using This Manual.....	1
2.	Safety.....	2
3.	FTE-7100 OTDR Quick Start Guide.....	4
4.	Introduction	5
5.	OTDR Inspection and Identification.....	6
	5.1 Inspection	
	5.2 Identification and Configuration	
6.	FTE-7100 OTDR Description.....	7
	6.1 OTDR Physical Description	
	Instrument Enclosure	
	Front View	
	Top View	
	6.2 Home Screen Display	
	6.3 Power Requirements	
	6.4 Battery Replacement	
7.	Fault Locator.....	10
	7.1 Fault Locator Operation	
	Set Wavelength	
	Start Scan	
	View Trace with OTDR	
	7.2 Fault Locator Screen	
	Fib-R-Map	
	Event Table	
	Event Table Field Definitions	
	7.3 Exit Fault Locator	
8.	OTDR Operations.....	14
	8.1 Entering OTDR Function	
	8.2 Menu and Menu Icon Definitions	
	8.3 Main OTDR screen	
	8.4 OTDR Parameter Settings Screen	
	Trace Parameters	
	Event Table/Fib-R-Map Sensitivity Settings	
	Pass/Fail Thresholds Settings	
	Date/Time Settings	
	Exit Parameter Settings Screen	
	8.5 Auto Test	
	Set IOR	
	Set Wavelength	
	Start Auto Test	

Table of Contents (Continued)

8.6	Manual Expert Mode	
	Set IOR	
	Set Wavelength	
	Set Range	
	Set Pulse Width	
	Set Averaging Time	
	Scan	
8.7	Construction Mode	
	Create or Open a Project	
	Set Base File Name	
	Set Wavelengths	
	Start Testing	
	Exit Construction Mode	
8.8	Trace Analysis	
	Unit of Measure	
	Zoom	
	Cursor Movement	
8.9	Loss Measurements	
	2 Point Loss	
	dB/km	
	Optical Return Loss	
	Basic Splice Loss	
	Least Square Approximation (LSA)	
8.10	Loss Measurement Settings	
	Setting Splice Loss Measurement Areas	
	Splice Loss Measurement Areas	
	Splice Loss Adjustment Positions	
	LSA Examples	
8.11	Event Analysis	
	Enter Event Analysis	
	Threshold Settings	
	Sensitivity Settings	
	Macrobend Analysis	
	Event Analysis Screen	
	Fib-R-Map	
	Event Table	
	Event Table Field Descriptions	
9.	Project Management.....	31
9.1	Project Management Description	
	Project Management Screen	
	Project Management Menu	
	Project Management File Tab	
	Project Management Edit Tab	
	Project Management View/Help Tabs	

Table of Contents (Continued)

9.2	Project Management Operation	
	Create a New Project	
	Open an Existing Project	
	Delete a Project	
	Upload a Project to CertSoft	
	Rename a Project	
	Modify Properties	
	Temporary Modification of Parameters	
	Exit Project Management	
10.	File Management.....	35
10.1	File Management Description	
	File Management Screen	
	File Management Menu	
	File Management File Tab	
	File Management Edit Tab	
	File Management View/Help Tabs	
10.2	File Management Operation	
	Saving a Trace	
	Open/View a Trace	
	Dual Trace Mode	
	Delete a File	
	Upload a Trace to CertSoft	
	Rename a Trace File	
	Exit File Management	
11.	Video Scope.....	38
11.1	Entering Video Scope Function	
11.2	Video Scope Display	
11.3	Video Scope File/Help Icon Menu	
	Home	
	Quick Save	
	Project Management	
	File Management	
	Help	
11.4	Video Scope Operations Icon Menu	
	Grading Rings	
	Pass/Fail Label	
	Brightness	
11.5	Video Scope Operation	
	Video Probe Tips	
	Viewing/Focusing a Connector	
	Centering a Connector Image	
	Pausing Image Scan	
	Grading Rings	
	Pass/Fail	
	Marking Points of Contamination	
	Auto Pass/Fail	
	Exiting Video Scope Operation	

Table of Contents (Continued)

11.6	Pass/Fail Criteria Tables	
	Fiber End Face Criteria Table for Angled PC Polished Connectors	
	Fiber End Face Criteria Table for Ultra PC Polished Connectors	
	Fiber End Face Criteria Table for PC Polished Connectors	
12.	Loss Test Set.....	43
12.1	Entering Loss Test Set Function	
12.2	LTS File/Help Icon Menu	
	Home	
	Quick Save	
	Project Management	
	File Management	
	Help	
12.3	Light Source Operation	
	Selecting Light Source Wavelength	
	Selecting Source Modulation	
12.4	Power Meter Operation	
	Set Power Meter Wavelength	
	Set Reference	
	Set Measurement Units	
12.5	LTS Project Management	
12.6	LTS File Management	
12.7	Exit Loss Test Set	
13.	Visible Fault Locator.....	45
13.1	VFL Safety	
13.2	VFL Descripton	
13.3	VFL Operation	
14.	Specifications.....	46
14.1	OTDR Specifications	
14.2	Power Meter Specifications	
14.3	Light Source Specifications	
14.4	VFL Specifications	
15.	Repair/Warranty.....	48
15.1	Repair Information	
15.2	Warranty Information	
16.	Version Control.....	49

Chapter 1 Using This Manual

This manual contains operation information for the Terahertz Technologies Inc., FTE-7100 OTDR Optical Time Domain Reflectometer. The touchscreen is a resistive style screen and only proper stylus devices should be used while operating this product.

Precautions

Optical time domain reflectometers are optical instruments that emit laser radiation and though this level of radiation is not considered a danger, there are safety considerations and certain practices that should be followed.

Please read and follow all warning and caution information noted in this manual.

There are warnings, cautions and notes posted throughout this manual.

Warning

A warning alerts to situations that could cause personal injury.

Caution

A caution alerts to situations that may cause damage to the equipment or produce poor testing conditions resulting in inaccurate test results.

Note

A special annotation that will assist the user with operational features.

Chapter 3 of this manual is a quick start guide. Prior to using the quick start guide or operating the equipment in any way, it is highly suggested the user reads all safety information.

The information in this chapter pertains to safety consideration of OTDRs in general.

This product has been designed and tested in accordance with the manufacturer's safety standards, and has been supplied in a safe condition.

This document contains information that must be followed by the user to ensure safe operation and to maintain the product in a safe condition. Failure to follow these safety warnings and cautions can result in harm to the user or damage to the instrument.

Warning

Personnel should always be aware when working with fiber optic test equipment that active fibers may be present, therefore infrared optical energy may be present.

Warning

Never look directly into the end of a connected fiber optic cable or fiber optic interface of optical test equipment- to do so could expose the user to laser radiation and could result in personal injury.

Warning

To Prevent Fire or Shock Hazard:

- Do not install battery types other than those supplied by the manufacturer.
- Do not use the charger without the proper batteries installed.
- Do not expose the battery charger to rain or excessive moisture.
- Do not use the AC adapter when there are signs of damage to the enclosure or cord.
- Ensure that you are using the correct charger for the local line voltage.
- Do not puncture batteries.
- Do not incinerate batteries.
- All batteries should be disposed of in a proper manner.

Failure to follow these caution statements could cause unsafe conditions for the operator and equipment and may void the warranty.

Failure to follow these cautions statements may void the warranty of, or cause damage to this equipment.

Caution

Fiber-optic connectors are easily contaminated or damaged. The connection to the OTDR is physical contact type of connections and dirty or damaged connectors may impair the instruments capabilities at minimum and at worst result in the need to return the OTDR to the factory for expensive repairs. Prior to making any connection to the unit, ensure that all proper cleaning procedures have been followed. Use UPC Finish Connectors Only. DO NOT insert APC connectors into the optical ports, unless the product is designed for and marked accordingly for use with APC style connectors.

Caution

The OTDR is equipped with a protection circuit to avoid damage from live fiber connections, the instrument will not operate properly with active fibers. Even with this protection, high power output from EDFA's or other equipment can damage detectors and should never be connected to the OTDR.

If a live fiber is connected to the OTDR and a scan is attempted, a warning dialog will be displayed as in fig. 2.1. Immediately remove the live fiber from the OTDR and press select to clear the message.

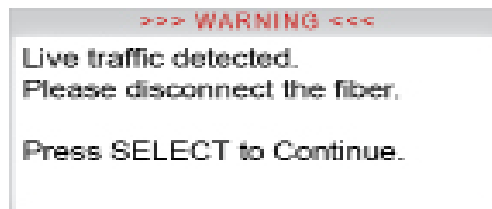


Fig 2.1

Chapter 3 Quick Start Guide

Prior to using this quick start guide or operating the equipment in any way, it is highly suggested the user reads all safety information in chapter 2.

Press  to turn on the OTDR.

Touch the OTDR icon to enter the OTDR function.

Connect the fiber to the appropriate port. (SM or MM OTDR Optical Port)

Touch the  (Lambda) icon on the display to open the wavelength list and choose the desired wavelength for the test.

Note:

Use only the single wavelength settings for the Auto Test feature. Dual wavelength indicators, such as 850/1300 or 1310/1550 are used for construction mode operation.

If approximate fiber length is unknown:

Touch the range  icon to display the available ranges. Touch AUTO to set the OTDR to Auto Test.

Touch Scan and the OTDR will start a test using the selected wavelength, allowing the OTDR to determine the most appropriate range and pulse width. (Autotest will set the averaging time to 15 sec.)

If approximate fiber length is known:

Set the Wavelength as above and further set the range, pulse width and averaging time in a similar manner, by touching the appropriate icon and choosing the desired value.

Touch Scan to complete the test at the user defined wavelength, range, pulse width and averaging time.

To view the event table with the trace, touch the Events tab, and an event table with the OTDR trace will be display and the corresponding events indicated on the trace.

To view the events in a schematic layout, touch the Schematic tab and a schematic layout will be shown with the trace, and the corresponding events indicated on the trace.

Note

The OTDR tab displays the trace with the parameters listed and loss and distance measurements displayed. The Event tab displays the trace with numbered events and an interactive event table, while the Schematic tab displays the trace with numbered events and the interactive Fib-R-Map schematic view of the data.

Dear Valued Customer,

Thank you for choosing Terahertz Technologies Inc. for your fiber optic testing requirements. Our professional staff is available to answer questions and provide any assistance that you may require. At Terahertz Technologies Inc., we strive to provide premier customer care and technical support through timely responsiveness and training. We are proud of our quality and high standards and aim to produce the most user-friendly and affordable fiber optic solutions to meet individual needs.

Chapter 5 Inspection and Identification

5.1 Inspection

Before shipment, this instrument was inspected and found to be in perfect working order and free of defects.

The shipping carton contains the following:

1. OTDR with Protective boot
2. USB 5 Volt charger and cable
3. Manual and CertSoft software on CD.
4. SC OTDR adapter
5. ST, FC, SC, 1.25 universal and 2.5 universal Power Meter adapters

5.2 Identification and Configuration

The instrument's Model/Part Number, Serial Number and Date of Manufacture are indicated on a label located on the back of the unit. The instrument's history is filed at the factory by model/part number and serial number. The unit's serial number is also located on the top plate just above the USB Port.

TTI Terahertz Technologies Inc. Oriskany NY 13424	
Conforms to DHHS Standards for Laser Products PER 21 CFR 1040	Model FTE7000-A-QUAD
CE Made In The USA 315-736-3642	Wavelength 850/1300/1310/1550nm
	Serial # 3086
	MFG Date 4/16/2014

Fig 5.1

Chapter 6 FTE-7100 OTDR Description

6.1 OTDR Physical Description

Instrument Enclosure

The TTI FTE-7100 OTDR is packaged in a rugged housing which is further protected with a rubberized boot. Although the front panel is weather resistant, care must be taken to avoid liquids and contaminants around the fragile optical and electrical connectors, and the glass display. Use a mild cleaning agent and soft damp cloth to clean up the panels and the outside case. See the maintenance section to clean the optical connector. NEVER open the instrument for cleaning. Return to the factory for servicing if necessary.

Front View



Fig 6.1

Top View

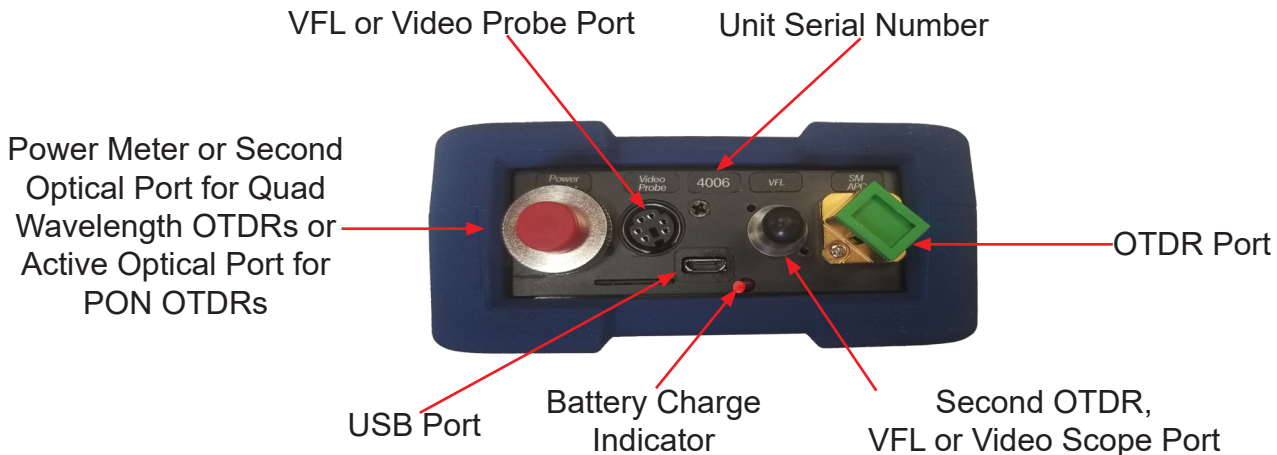


Fig 6.2

Chapter 6 FTE-7100 OTDR Description

6.2 Home Screen Display

This unit is equipped with a 4" color TFT resistive touch display.

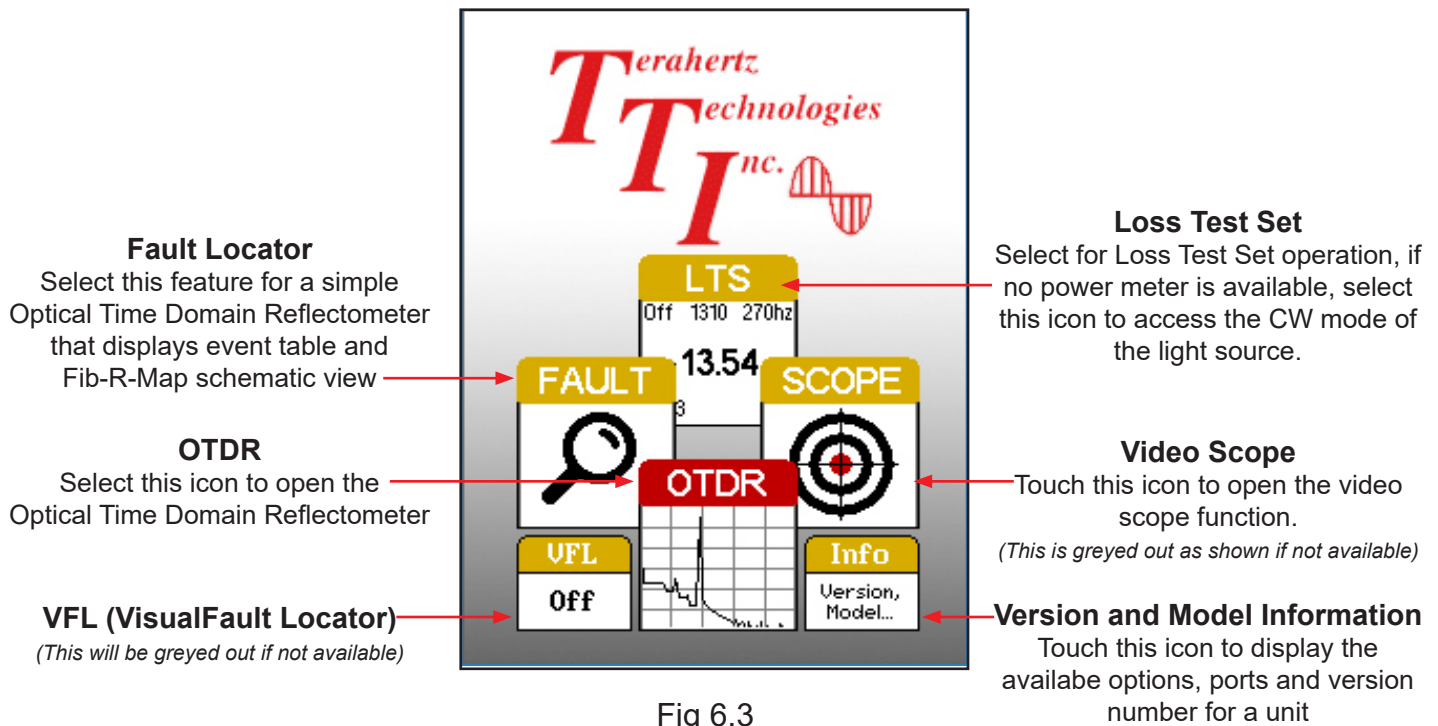


Fig 6.3

6.3 Power Requirements

The FTE-7100 OTDR is equipped with a 3500mAh Li-ion battery.

The FTE-7100 OTDR is supplied with a 100-240V USB power adapter with 5VDC, 2.1A output. A fully charged Li-ion battery will typically enable approximately 6 hrs. of use and require approximately 4 hours of recharging.

6.4 Battery Replacement

The battery is not field replaceable. An RMA should be acquired and the unit must be returned to the factory for battery replacement. This Li-ion battery pack should not be punctured, incinerated or disposed of improperly.

Warning

To Prevent Fire or Shock Hazard:

- Do not install battery types other than those supplied by the manufacturer.
- Do not use the charger without the proper batteries installed.
- Do not expose the battery charger to rain or excessive moisture.
- Do not use the AC adapter when there are signs of damage to the enclosure or cord.
- Ensure that you are using the correct charger for the local line voltage.
- Do not puncture batteries.
- Do not incinerate batteries.
- All batteries should be disposed of in a proper manner.

Failure to follow these caution statements could cause unsafe conditions for the operator and equipment and may void the warranty.

Chapter 7 Fault Locator Operation

7.0 Fault Locator

The Fault Locator is a simple autotest feature which displays the test results in event table with the Fib-R-Map schematic view. The fault locator will take a scan of the fiber in auto test mode. The user sets the wavelength to be tested and the OTDR will set the pulse width and range to best suite the fiber under test at the selected wavelength. The average time will be set to 15 seconds.

7.1 Fault Locator Operation

To enter the Fault Locator mode, touch the FAULT icon on the home screen. The screen below will be displayed.

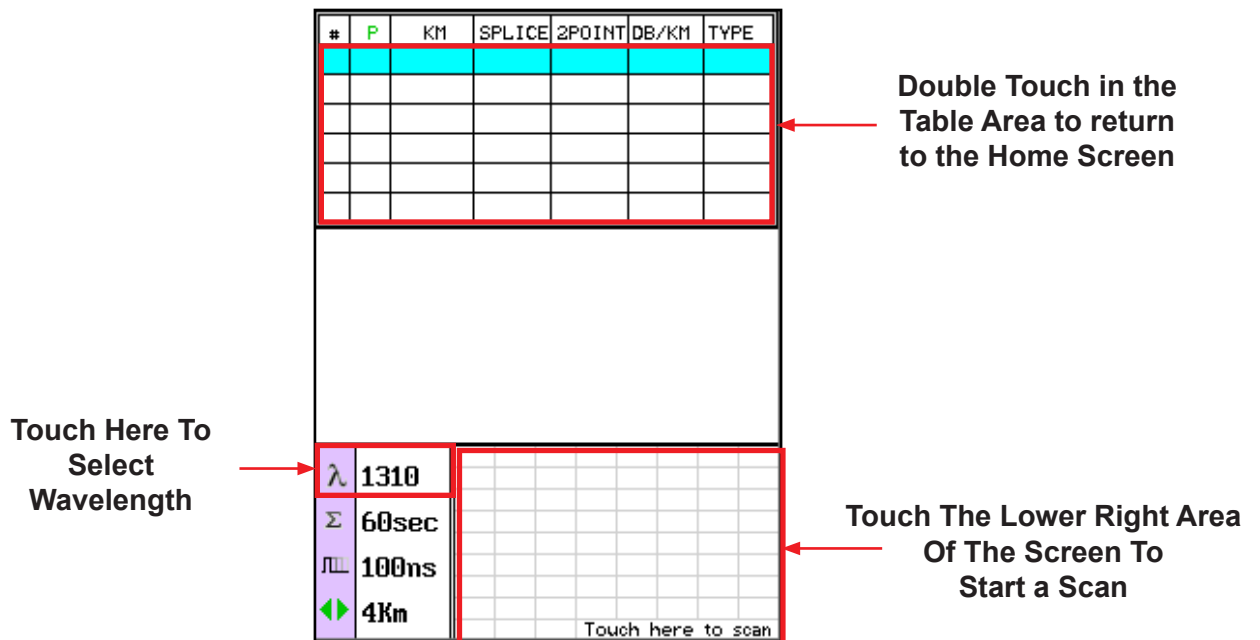


Fig 7.1

Set Wavelength

To select the wavelength to be tested, touch the wavelength indicator as shown in Fig. 7.1 above, this will display a list of the available wavelengths, touch the desired value.

Start Scan

To start a scan, touch in the bottom right corner of the display. The message "Please Wait, Scanning" will be displayed. The scan will take about 15 seconds.

Chapter 7 Fault Locate Operation

7.1 Fault Locator Operation Continued

View Test With OTDR

When a scan is performed with the Fault Locator, the trace information is temporarily stored in the OTDR. If the full trace needs to be viewed, touch the Home icon in the top menu to return to the home screen. Touch the OTDR icon to open the OTDR, the trace displayed will be that of the test taken in the Fault Locator function. Touch the OTDR icon and the trace will be displayed with full OTDR operation.

To use the data from a Fault Locator test in OTDR mode, save it with the Quick Save or in the file manager. See Chapter 10. File Management, for more information. Once files are saved, they may be opened from the OTDR application and view as an OTDR trace.

7.2 Fault Locator Screen

The fault locator screen includes the event table, Fib-R-Map (Schematic View) and event map view of highlighted event.

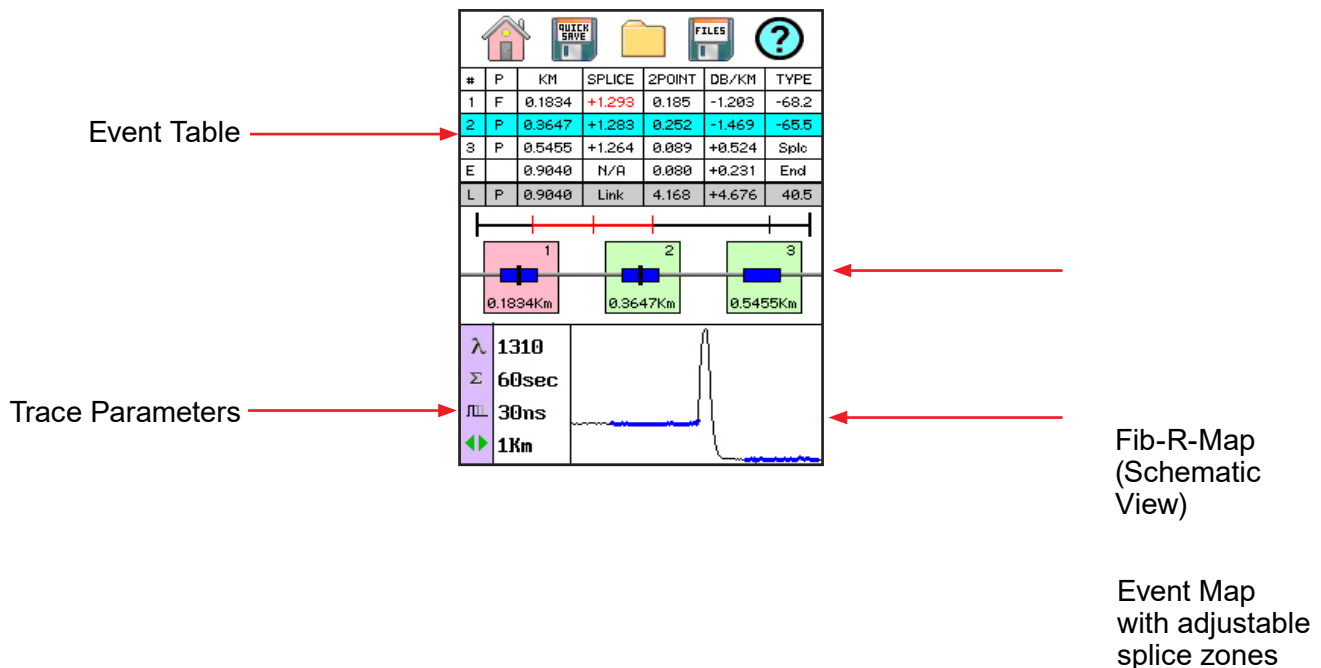


Fig 7.2

Chapter 7 Fault Locate Operation

Fib-R-Map

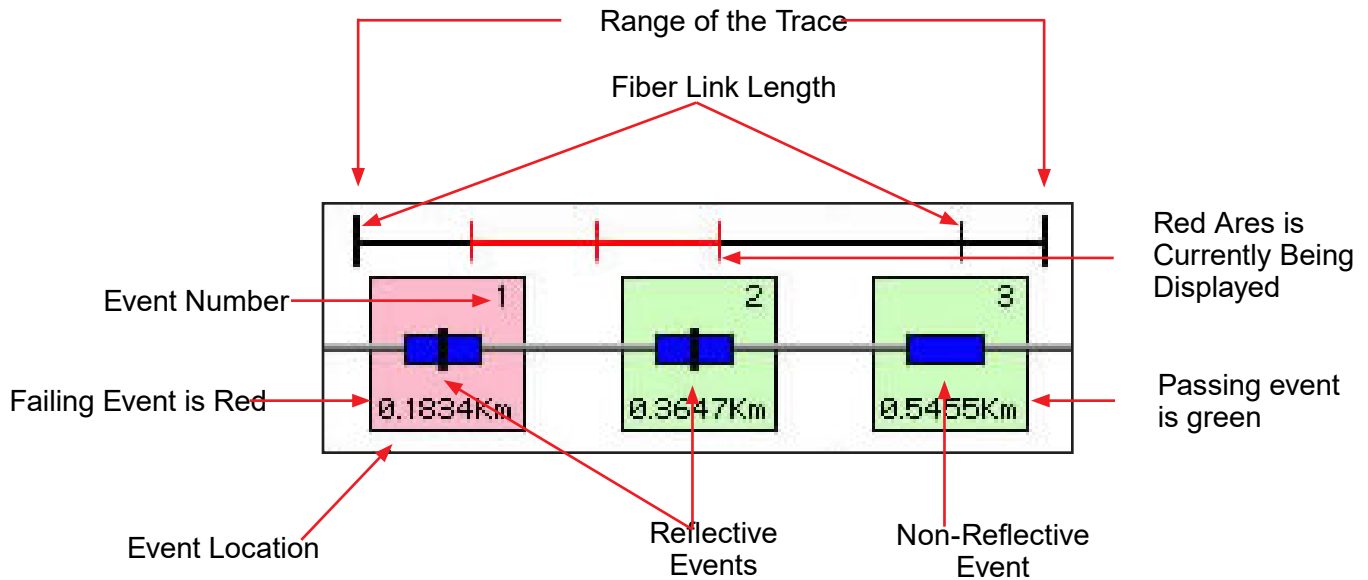


Fig 7.3

Note

The End of Fiber is the last item in the schematic view. It is labeled E in the event number position and displays a vertical bar instead of horizontal.

Event Table

	#	P	KM	SPLICE	2POINT	DB/KM	TYPE
Event Location	1	F	0.1834	+1.293	0.185	-1.203	-68.2
Event Number	2	P	0.3647	+1.283	0.252	-1.469	-65.5
EOF Event Information	3	P	0.5455	+1.264	0.089	+0.524	Splc
	E		0.9040	N/A	0.080	+0.231	End
Link Information	L	P	0.9040	Link	4.168	+4.676	40.5

Event Loss in dB

Loss Between Previous and Current Events

dB Per/Km, Kf or Mi Between Events

Pass/Fail

Event Type or Reflectance Value

System ORL

Link Loss

Link dB Per/Km, Kf or Mi

Fig 7.4

Chapter 7 Fault Locate Operation

Event Table Field Description

Event Number:

Indicates the event in sequence, where the higher the number the further distance from the OTDR the event occurs. "E" (End) which is the event determined to be the end of the fiber under test. The last column is labeled "L" the row included data that is relevant to the link (full fiber under test).

P:

Pass/Fail, if any one of the thresholds are not met for an event, the P/F column will display an F. The parameter that failed will be displayed in red. If all the parameters are met, this column will display a P. There is no Pass/Fail threshold for the last event labeled "E" (End) and the Pass/Fail for the "L" (Link) row includes the 2POINT column, which for the link is the total link loss and the TYPE column which for the link row is the system ORL.

Km or KF or MI:

Event Location (Distance from OTDR), labeled Km for Kilometer or KF if unit of measure is Kilo-feet MI for mile. This is the distance/location that the event occurs along the fiber link. This data should be the same for the End of Fiber and Link.

Splice:

SPLICE is the dB loss at the event at this location on the fiber. Loss is represented as a positive number. (A positive number is the amount of loss and a negative number indicates a gain normally due to mismatched index of refraction.) This is a settable threshold for the Pass/Fail purposes. The "E" event will display LINK as this is not an event that would have meaning. The event that is deemed the EOF will normally display a large loss as this loss will be greater than the threshold set to determine the end of the fiber.

2POINT:

2 Point Loss is the loss measured from the end of the dead zone of the previous event to the beginning of current event. The value in the "L" line of the table for this column is the link loss. The loss from the beginning of the trace to the event determined to be the EOF. This is the value used to determine if the fiber link passes or fails its loss threshold.

dB/Km:

dB per Kilometer if in KM and DB/KF if in Kilo-Feet and DB/MI if in mile unit of measure. This is the calculated loss per Km, Kf or Mi from the end of the dead zone of the previous event to the beginning of the current event. The value in the "L" line of the table for this column is the dB Per/KM, Kf or Mi for the total link.

TYPE:

Event Type is the type of event or the return loss of an event. If the event has no reflection, "splc" will be displayed and if the event is reflective, the reflectance value will be displayed. For the last event which is labeled "E", there is no value displayed, it simply shows "End" and in the "L" row, the Optical Return Loss for the link is displayed (System ORL).

7.3 Exit Fault Locator

Touch the home icon in the top menu.

Chapter 8 OTDR Operation

8.1 Entering OTDR Function

Press the power button to turn on the FTE-7100 OTDR.

Touch the OTDR icon to enter the OTDR function.

8.2 Menu and Menu Icon Definitions

To open the menu, touch the top of the display and the menu will drop down to be viewed. Below is the list of icons and their meaning.

	Home	Brings the user back to the home page
	Quick Save	Saves the current trace to the current folder, with chronological numeric suffix using last base named file
	Quick Load	Recalls the next file, in reverse order, chronologically in the current folder
	Tool Menu	Opens tool Menu
	Project Folder	Opens project management
	File Manager	Opens file management
	Event Analysis	Opens the event analysis screen w/Fib-R-Map
	Settings	Opens the parameters setting page.
	Splice Zone Setting	Turns on LSA/Splice markers
	Help	Opens the context sensitive help menu
	Index of Refraction	Opens the Index of Refraction entry screen

Chapter 8 OTDR Operation

8.3 Main OTDR Screen

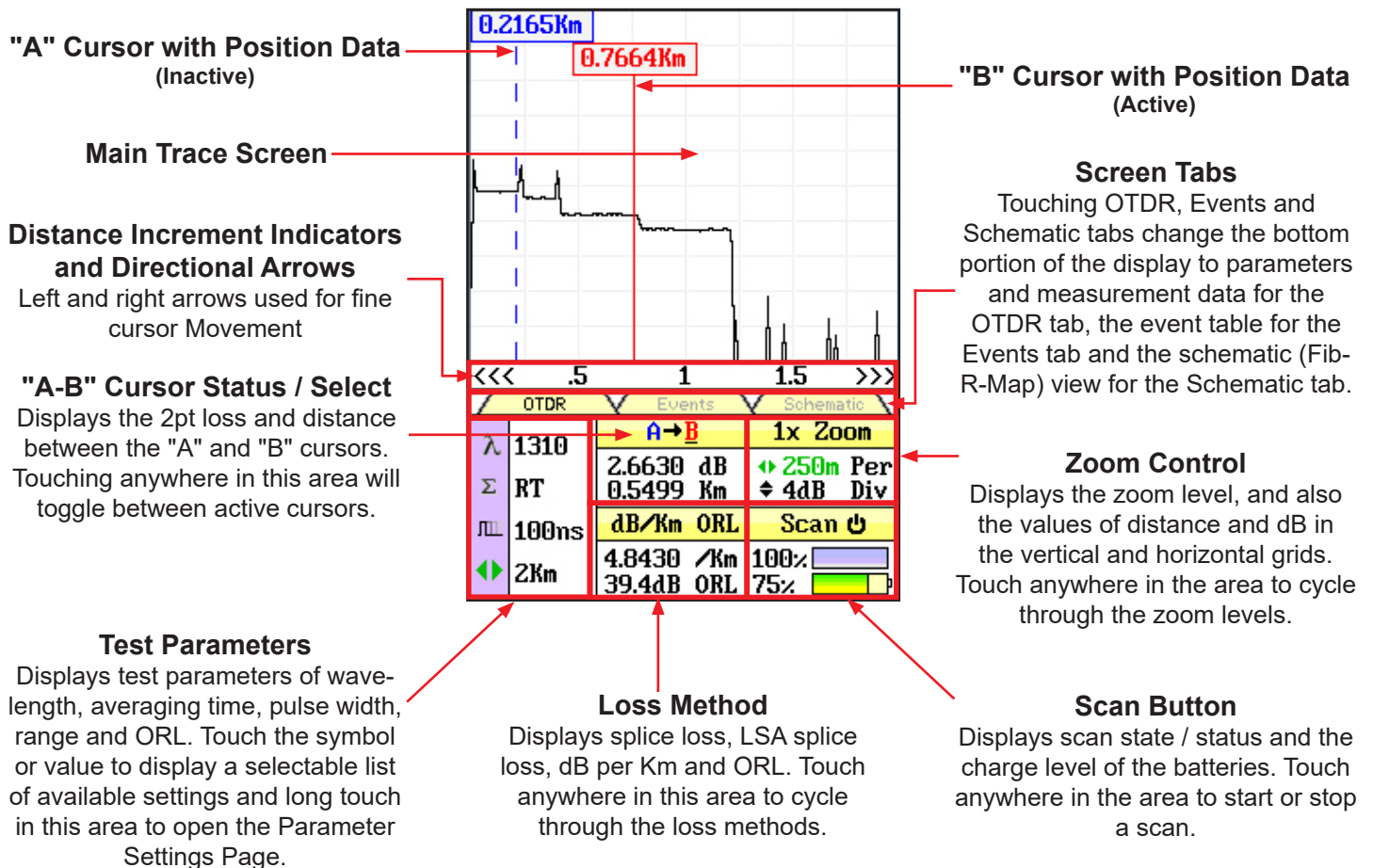


Fig 8.2

Chapter 8 OTDR Operation

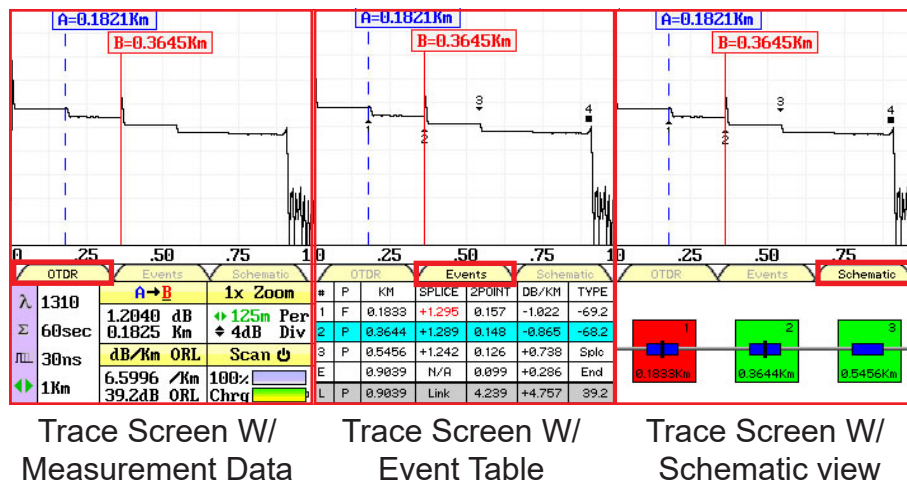


Fig 8.3

There are three tabs on the main OTDR screen. OTDR, Events and Schematic. Use the OTDR tab to view the trace with the loss and distance measurements. Use the Events tab to view an interactive event table with the trace and numbered events or the Schematic tab to view an interactive schematic view of the events with the trace and numbered events.

8.4 OTDR Parameter Settings Screen

To open the settings page, either long touch the test parameter section of the main OTDR screen or pull the menu down from the top of the display and touch the Settings icon.

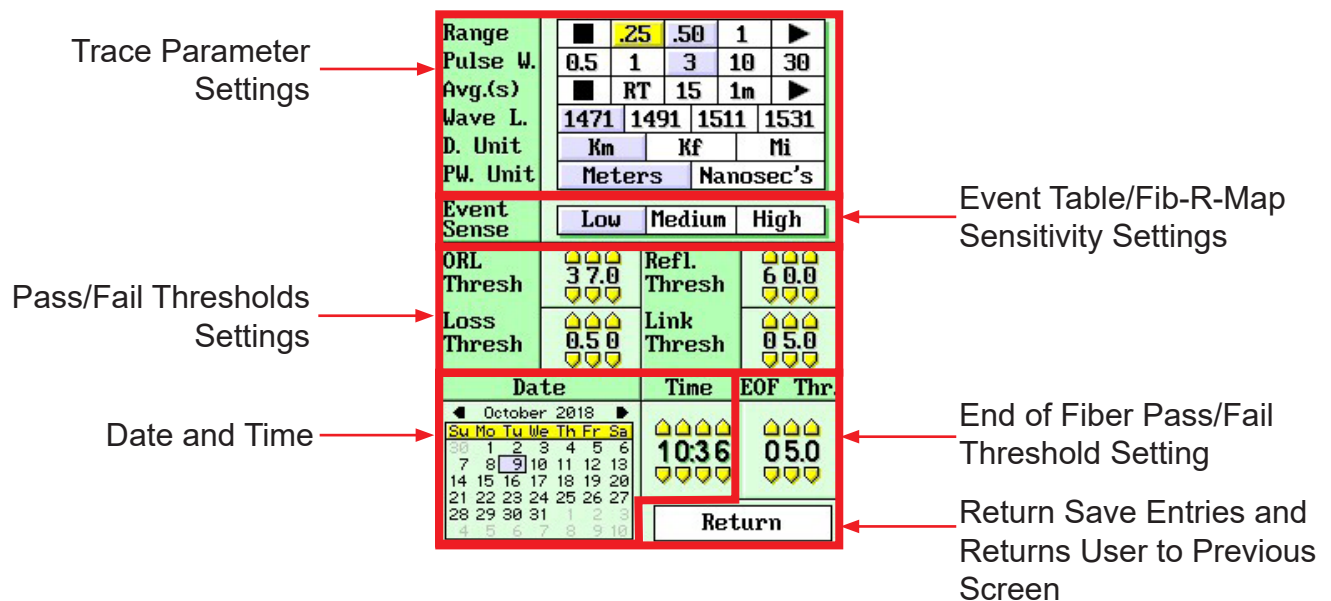


Fig 8.4

Chapter 8 OTDR Operation

Trace Parameter Settings

The trace parameters of range, pulse width, averaging time, wavelength, distance units and pulse width units are listed at the top of the screen. If there are more values than can be listed across the screen, a black square marking the end of the selections or a black arrow indicating more options to the left or right of the list. Touch the arrows to the left or right of the remaining available settings.

To select a parameter, touch the desired value once displayed in the list.

Note

An arrow at the beginning or end of a list indicates additional settings are available. A black square at either end indicates the end of the list.

Event Table/Fib-R-Map (Schematic) Sensitivity Settings

There are three sensitivity settings used by the event table and Fib-R-Map, they are low, medium and high. Low sensitivity should be used when working with a noisy trace and high may be used when working with clean traces that utilize long pulse widths and range and averaging times.

Pass/Fail Threshold Settings

ORL, Reflectance (Refl.), Loss, Link and End Of Fiber (EOF) are settable pass/fail parameters on the event table and Fib-R-Map (schematic) views. To set the thresholds, touch the yellow arrows above and below the appropriate digits until the desired values are displayed.

For more information on threshold settings for event analysis, refer to section 8.11 of this manual.

Note

There is an ORL and a Reflection Threshold setting. The ORL is the return loss for the entire link/system and Reflection threshold is the return loss value of an event.

Date/Time Settings

Touch the arrows on either side of the month to set the month then touch the correct date.

Touch the up and down arrows for each digit to set the time. Once the correct time is entered, press select.

Exit Parameter Setting Screen

Touch Return to exit the parameter screen.

Chapter 8 OTDR Operation

Warning

Before connecting a fiber to the OTDR, be certain the fiber has no active optical sources or instruments connected to the other end. Skin or eye damage could result from high power sources such as EDFAs, and instrument damage could occur voiding the warranty.

Warning

Clean all connectors in use thoroughly prior to connection to the appropriate port of the OTDR. Failure to ensure the connectors used with the OTDR are properly cleaned can result in poor launch conditions at the minimum or damage to the optical interface that requires the unit be returned to the factory for repair.

8.5 Auto Test

Auto Test is a useful feature when the approximate length of the fiber to be tested is unknown. To use the Auto Test, only the IOR and Wavelength need to be set by the user.

Note

To assist in obtaining reliable, consistent measurements, the user should be aware of the Index of Refraction of their fiber. The proper Index of Refraction (IOR) will maximize the distance measurement accuracy. The IOR is proportional to the speed of light in glass compared to the speed of light in a vacuum and can be calculated using the equation $IOR = C$ (the speed of light in a vacuum) / V (the speed of light in fiber). The IOR number can be obtained from the fiber or cable manufacturer or can be calculated with a known length of cable. IOR numbers generally fall around 1.468 SM, 1.486 MM. These are the default values in the OTDR, but can be adjusted from 1.0 to 2. If this is unknown it is best to use the default setting on the OTDR.

Set IOR

It is necessary to have the Index of Refraction set as close as possible to the actual IOR of the fiber. If this is unknown it is best to use the default setting on the OTDR. To view the current IOR for a wavelength, open the menu use the right button to highlight the IOR Icon. Touch the icon and the IOR will be displayed. If and adjustment needs to be made, touch the back arrow on the on-screen keyboard, enter the appropriate value and touch save.

Set Wavelength

Touch the (Lambda) icon on the display to open the wavelength list and choose the desired wavelength for the test. Use only the single wavelength settings for the Auto Test feature. Dual wavelength indicators, such as 850/1300 or 1310/1550 are used for construction mode operation.

Note

The wavelengths selections for dual MM OTDR are 850nm, 1300nm and 850/1300nm, for SM OTDR they are 1310nm, 1550nm and 1310/1550nm. For the Quad wavelength OTDR, they are 850, 1300, 850/1300, 1310, 1550 and 1310/1550nm. The 850/1300nm and 1310/1550nm settings are for Construction Mode operation where the OTDR will test both wavelengths in one operation. Construction mode is covered in section 8.7 of this guide.

Start Auto Test

Short touch the Range icon and the top selections in the available ranges will be Auto. Touch auto and the unit will be set for Auto Test. Touch Scan to start the test. The OTDR will conduct a test at the selected wavelength with a 60 Sec. average time, unit selected pulse width and range parameters appropriate for the fiber under test.

Warning

Before connecting a fiber to the OTDR, be certain the fiber has no active optical sources or instruments connected to the other end. Skin or eye damage could result from high power sources such as EDFAs, and instrument damage could occur voiding the warranty.

Warning

Clean all connectors in use thoroughly prior to connection to the appropriate port of the OTDR. Failure to ensure the connectors used with the OTDR are properly cleaned can result in poor launch conditions at the minimum or damage to the optical interface that requires the unit be returned to the factory for repair.

8.6 Manual/Expert Mode

Note

To assist in obtaining reliable, consistent measurements, the user should be aware of the Index of Refraction of their fiber. The proper Index of Refraction (IOR) will maximize the distance measurement accuracy. The IOR is proportional to the speed of light in glass compared to the speed of light in a vacuum and can be calculated using the equation $IOR = C$ (the speed of light in a vacuum) / V (the speed of light in fiber). The IOR number can be obtained from the fiber or cable manufacturer or can be calculated with a known length of cable. IOR numbers generally fall around 1.468 SM, 1.486 MM. These are the default values in the OTDR, but can be adjusted from 1.0 to 2. If this is unknown it is best to use the default setting on the OTDR.

Set IOR

It is necessary to have the Index of Refraction set as close as possible to the actual IOR of the fiber. If this is unknown it is best to use the default setting on the OTDR. To view the current IOR for a wavelength, open the menu use the right button to highlight the IOR Icon. Touch the icon and the IOR will be displayed. If and adjustment needs to be made, touch the back arrow on the on-screen keyboard, enter the appropriate value and touch save.

Note

The settings of wavelength, average, pulse width and range may be made by short touching the setting itself on the OTDR screen, or a long touch on any of these parameters will bring up the parameter screen giving access to all of the settings.

Set Wavelength

Touch the (λ) icon on the display to open the wavelength list and choose the desired wavelength for the test.

Note:

Dual wavelength indicators, such as 850/1300 or 1310/1550 are used for construction mode operation.

Chapter 8 OTDR Operation

Note

When setting the range and pulse width, it is necessary to keep in mind that it may not be beneficial to use certain pulse widths with some ranges. For this reason not all pulse widths are available for use with all ranges. The chart below indicates the pulse widths that are available with each range.

Range	Pulse Width									
		5ns	10ns	30ns	100ns	300ns	1μ	3μ	10μ	20μ
	250m	✓	✓	✓	✓	✓				
	500m	✓	✓	✓	✓	✓				
	1km	✓	✓	✓	✓	✓				
	2km		✓	✓	✓	✓	✓			
	4km		✓	✓	✓	✓	✓			
	8km			✓	✓	✓	✓	✓		
	16km			✓	✓	✓	✓	✓		
	32km					✓	✓	✓	✓	✓
	64km					✓	✓	✓	✓	✓
	128km					✓	✓	✓	✓	✓
256km						✓	✓	✓	✓	

Set Range

Touch the Range indicator on the display to open the list of ranges and choose the desired range for the test.

Set Pulse Width

Touch the Pulse Width indicator on the display to open the available pulse widths for the selected range and choose the desired setting for the test.

Set Averaging Time

Touch the Averaging Time indicator on the display to open the list of averaging setting and choose the desired time for the test.

Scan

Once all the proper settings have been entered, touch Scan to take the trace. To stop the trace touch Scan again.

8.7 Construction Mode

Construction Mode is useful when a large number of fibers need to be tested with the same settings at multiple wavelengths. This mode tests a fiber at two wavelengths, saves the traces and displays them in dual trace mode.

Create or Open a Project

Open the menu, use the right or left buttons on either side of the menu to highlight the Project Management (Folder icon) and touch it to open. Use the up and down buttons to move the desired project into the highlighted area and touch it to open that project, or create a new project once you have established all the desired parameters for testing. Create the new project by pulling the file management menu down from the top of the screen and touch the File tab and then touch the new New and use the onboard QWERTY keyboard to enter the project name then touch save.

Note

Refer to Chapter 9 of this manual for detailed project management operating procedures.

To enter project details, touch the Details section at the bottom of the projects screen. A dialog will be displayed that allows the user to set the Customer, Date, Operator along with 'to and from' locations if desired. Touch Close at the bottom of the dialog to go back to the projects screen

With the project enter and in the highlighted position, touch it to open the file management screen.

Set Base File Name

Once the project folder has been created and or opened, the files folder for that project will be displayed. A base file name for the test should be established. Pull the file management menu down, touch file and then save. Use the on-screen keyboard to enter a base file name.

When testing in construction mode, files will be save in numeric order with the first two digits of the wavelength added to the end of the file name. For example, if the base file name of SAMPLE is entered, the first test in construction mode (If the test were at 1310/1550nm) would be a test at 1310nm with a name of SAMPLE.1.13 and the second test would be the same fiber at 1550nm with a name of SAMPLE.1.15. The next tests would be SAMPLE.2.13 and SAMPLE.2.15, etc. If a fiber number other than one was to be tested, the base file name should have a .X added. For example, if the test was to start at fiber 15, the base file name should be SAMPLE.14. When the construction mode test is completed, the files saved will be SAMPLE.15.13 and SAMPLE.15.15.

Once the base file name is set, exit the file manager by pulling down the file menu, touch the file tab, and touching exit.

Chapter 8 OTDR Operation

Set the Wavelengths

On the main trace screen in the OTDR tab the wavelength settings are accessible. Construction mode is not selectable from the parameter screen, it must be selected by touching the wavelength value and selecting either 850/1300 or 1310/1550 from the wavelength list. Dual wavelength OTDRs will have one extra setting of a combination of the two wavelengths. For example, if the OTDR is a 1310/1550nm dual wavelength unit, there will be three available selection here. 1310, 1550, and 13/15. The 13/15 is used for constructions mode. This needs to be selected anytime construction mode is to be used. Quad wavelength units will have 850, 1300, 1310, 1550, 85/13 and 13/15, where either 85/13 or 13/15 may be use for construction mode testing. Use the touch screen to cycle through these wavelength settings.

Start A Test

To start the test connect the fiber to be tested to the proper OTDR port and press Scan.

The OTDR will test the fiber at the shorter wavelength, display the trace and save the file. It will then test the fiber the longer wavelength, The longer wavelength will become the primary trace and the two test will be displayed in dual trace mode.

When the test is complete for the first fiber, remove the connector from the OTDR, connect the next fiber to be tested and press Scan. Continue until all tests are complete.

Note

Macrobend tests are automatically conduct with construction mode. Simply enter the Events tab on the OTDR screen or open the event analysis screen through the icon menu. For information about marobend analysis, please refer to section 8.11 of this guide.

Exiting Construction Mode

To exit construction mode, set the wavelength to a single wavelength.

8.8 Trace Analysis

Unit of Measure

The distance unit of measure may be displayed in Kilometer (Km), Kilo feet (Kf) or Miles (Mi). To set the unit of measure, open the parameter screen select the desired value.

Zoom

There are six zoom levels, 1x, 2x, 4x, 8x, 16x and 32X. To change the zoom level, touch Zoom display. This will cycle through the six levels. When viewing the trace at a zoom level other than 1x, the active cursor is centered on the trace display and when the cursors are moved, the trace moves and the cursor will remain centered.

Cursor Movement

The active cursor is displayed as a solid line and the non-active cursor as a dashed line. Touch the A/B area on the screen to toggle between the two cursors as the active cursor. The active cursor will snap to the position touched on the screen or fine adjustments may be made using the left or right triple chevron indicators in the scale bar just below the trace.

8.9 Loss Measurements

2 Point loss

2 Point loss measurements take into account the difference in vertical height between where the A and B cursors cross the fiber trace. This information is located on the main OTDR screen in the A-B section of the trace information as shown in Fig. 8.2. This is a quick method of checking the loss between any two points on a fiber optic link.

dB/km

The dB/Km (dB/Kft or dB/Mi) loss method takes the 2 Point loss in dB and divides by the distance between the cursors in Km (Kilometers), Kf (Kilofeet) or Mi (Miles). For accurate dB/... loss measurements, the two cursors must be on level backscatter points at least 100m apart. (NA will show for distances that are not sufficient for measurement).

Optical Return Loss

This Optical Return Loss (ORL) is separate from the event ORL (Reflectance) that is displayed in the event analysis under the TYPE header for an individual event. The measurement displayed in the loss measurement area of the main OTDR screen and in the L (Link) row in the TYPE column is an optical return loss based on the entire link. It is the total accumulated light reflected back to the source along the fiber optic link.

Chapter 8 OTDR Operation

Basic Splice Loss

Splice Loss method is meant to be used in noisy environments when it is difficult to attain an LSA area that lays flat on the back scatter before and after the cursor. This method takes an average of the selected points before and after the active cursor and uses this average to make a good estimation of the event loss. This is an estimation but this method may be more accurate than LSA Splice Loss method in noisy environments.

When using the splice loss It is necessary to set the splice loss areas in clear backscatter (areas that do not consist of other events). For accurate splice loss measurements, set a cursor at the beginning of an event and set splice loss measurement areas as shown in Fig. 8.6. Splice loss measurement areas will follow the undulations of the back scatter line unlike LSA areas.

Least Squares Approximation (LSA)

Least Squares Approximation (LSA) Splice loss method gives the user a visual aid in setting splice loss areas. This method can be more accurate by affording the ability to see the slope of the splice loss areas, however: it can also supply a reading with greater error if not used properly. The splice loss lines must be set to overlay the backscatter of a trace without over lapping any other events. Unlike basic splice lose, LSA measurement areas are drawn as straight lines without regard to the undulations of the back scatter

8.10 Loss Measurement Settings

Setting Splice Loss Measurement Areas

To set the basic splice loss measurement/ LSA areas, the OTDR must be in Splice AVG or Splice LSA mode. To adjust the splice loss areas around the cursors the display must be in a zoom level greater than 1X. Pull the menu down from the top of the display, highlight the LSA icon and press select. The splice loss adjustment screen will be displayed. There will be four vertical dashed lines on the display. To set point number one, touch and hold the stylus on the first splice loss point. Drag point number one to the desired location. Continue with the remaining splice loss points. See Fig. 8.6 for proper positioning of splice loss points. To close the splice loss adjustment screen, touch in an open area of the display well away from the cursors.

Note

It is necessary to set these areas in clear backscatter to acquire the most accurate measurements; they must not include other events.

Chapter 8 OTDR Operation

Splice Loss Measurement Areas

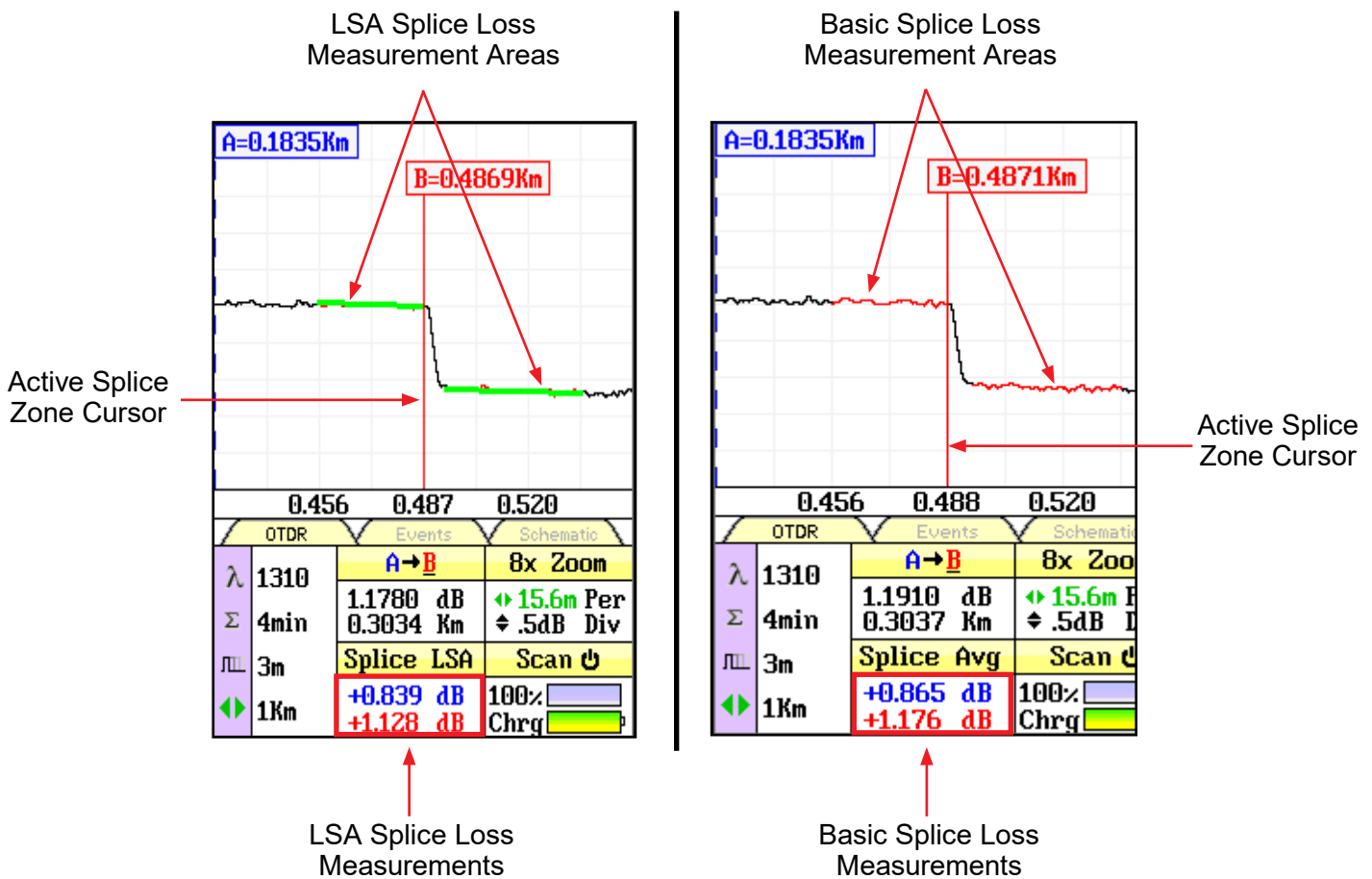


Fig 8.5

Splice Loss Adjustment Positions

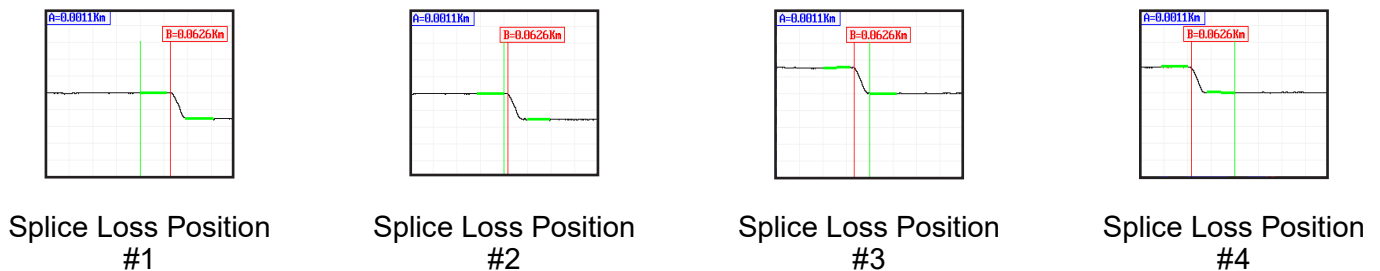


Fig 8.6

Note

The vertical green line is used to show which point of the LSA measurement areas is the focus of the left and right buttons. To move to the next point, press the Select button.

Chapter 8 OTDR Operation

LSA Examples

LSA Set Too Early:

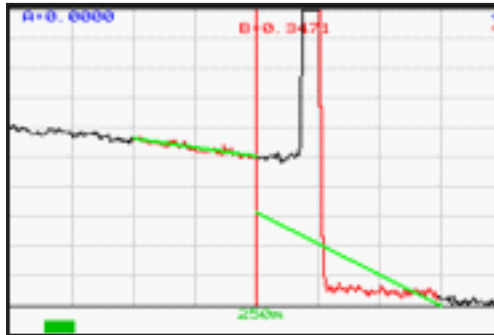


Fig 8.7

The LSA area and cursor are set too early. The right green LSA indicator line is not over laying the back scatter of the trace properly.

LSA Set Too Late:

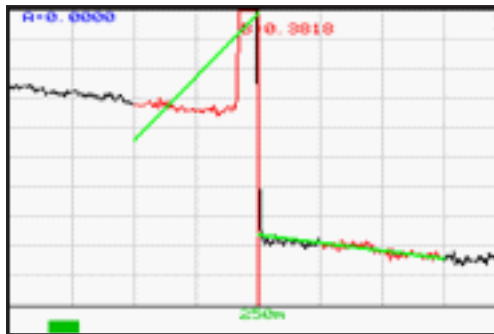


Fig 8.8

The LSA area and cursor are set too late. The left green LSA indicator line is not over laying the back scatter of the trace properly.

Proper LSA Setting:

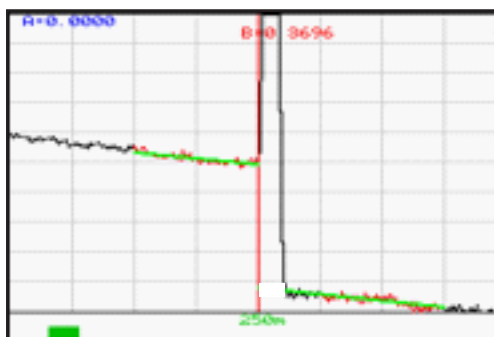


Fig 8.9

The LSA area and cursor are set properly. The green LSA indicator line is over laying the back scatter of the trace properly.

8.11 Event Analysis

NOTE:

When using the event table and the Fib-R-Map (schematic view), it is necessary to keep in mind that event analysis provides approximate loss and distance measurements to quickly assist in network evaluation. Automatic detection results are not guaranteed and have their limits, possibly causing erroneous readings or detection failure. User interaction by interfacing with the trace display is recommended for final qualitative and quantitative analysis.

Enter Event Analysis

To enter event analysis, pull the menu down from the top of the screen, move left or right through the menus and touch the Event Analysis icon.

Threshold Settings

There are five threshold settings, ORL, Loss, Reflectance (Refl.), Link and End OF Fiber (EOF). (See Fig 8.4) The EOF is not a true Pass/Fail threshold, but is used to set a loss value to determine the end of fiber. If the EOF threshold is set for 3dB, then the first event that has a loss of 3dB or greater will be determined to be the EOF.

To set thresholds, open the parameter screen by pulling the menu down from the top of the display, highlighting and touching the Settings icon. Touch the yellow arrow above or below a digit to be set until the desired value is displayed.

NOTE:

Thresholds are "pass thresholds", a value entered as a threshold is a passing value.

Examples of these settings are as follows:

- | | |
|-------|---|
| Loss: | If a 1.00dB splice/event loss is acceptable, set the threshold to 1.00. If a splice loss of 1.00 is the fail point, set the threshold to 0.99 |
| ORL: | If a system ORL of -35.dB reflectance is acceptable, set the threshold to 35. If -35dB is the fail point, set the threshold to 35.1. |
| Refl: | If a -45dB, event reflection is acceptable, set the threshold to 45. If -45db link loss is the fail point, set the threshold to 45.1. |
| Link: | If a 20dB, link loss is acceptable, set the threshold to 20. If 20db link loss is the fail point, set the threshold to 19.5. |
| EOF: | If an event loss of 3dB, should trigger the end of fiber, set this to 3.0 if the end of fiber should be anything greater than 3 dB loss, set it to 3.1. |

Chapter 8 OTDR Operation

Sensitivity Settings

There are three levels of sensitivity for the event table and Fib-R-Map. (See Fig 8.4) To set the event sensitivity, pull the menu down from the top of the display, move the Setting icon in the highlighted position and touch to open. Event Sensitivity setting are located in the center of the screen. Select the desired setting and touch Return.

The lowest setting possible should be used to help filter out any false events that may be caused by short pulse widths, but are not true perturbations in the optical signal. High sensitivity settings present events with loss down to approximately 0.05dB, Medium with events down to approximately 0.2dB and Low for events down to about 0.5dB. Longer pulse widths, and averaging help to lower the number of false events. Highest sensitivity settings should only be used for traces with high signal level, low noise, long pulse width and long average.

Macro Bend Analysis

Macro bend analysis is performed with the dual trace operation and displayed in the event table. The traces to be compared must have been performed at the same range and the primary trace must be of the longer wavelength.

To conduct a macro bend analysis, open the file manager as described in chapter 10. Highlight the first trace to be loaded (the trace of the longer wavelength) and select to open. Open the file manager again and highlight the trace to be compared (the trace of the short wavelength), open the drop-down menu under the file tab and touch dual. Open the event analysis screen to check for macro bends. If an event on the longer wavelength trace has 0.25db or greater loss than the same event on the shorter wavelength trace, a macro bend event will be generated on the event table, identified by a Macro label in the Type column. This event will immediately follow the event it is related to. For example: If event number one was 5 dB at 1550nm and .5 dB at 1310nm, the second event will be blank for location, +4.5dB for splice, blank for 2point and DB/KM. The type field will be listed as Macro.

To exit dual trace and macro bend analysis, start a new scan.

Event Analysis Screen

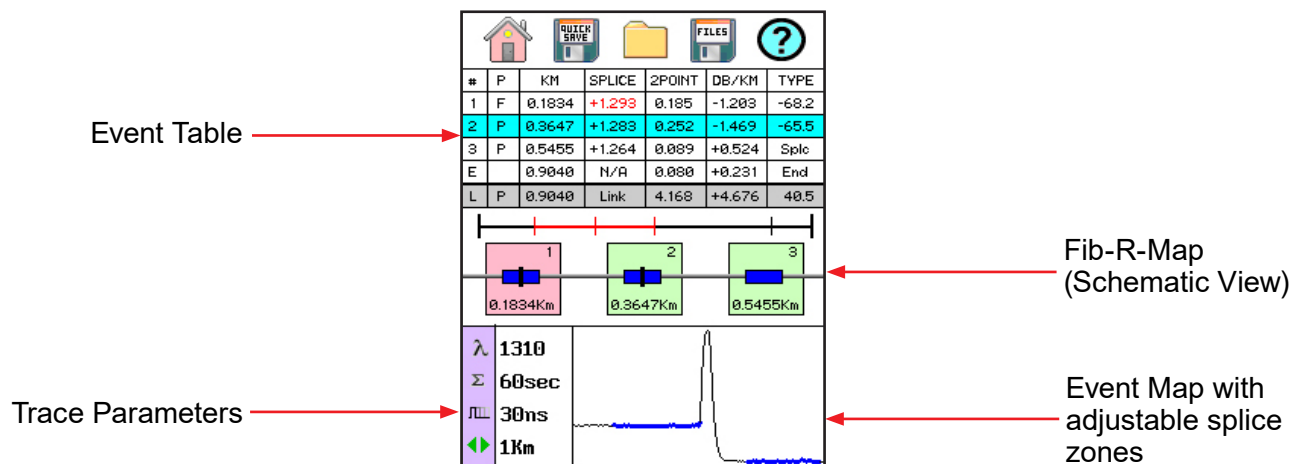


Fig 8.10

Chapter 8 OTDR Operation

Fib-R-Map

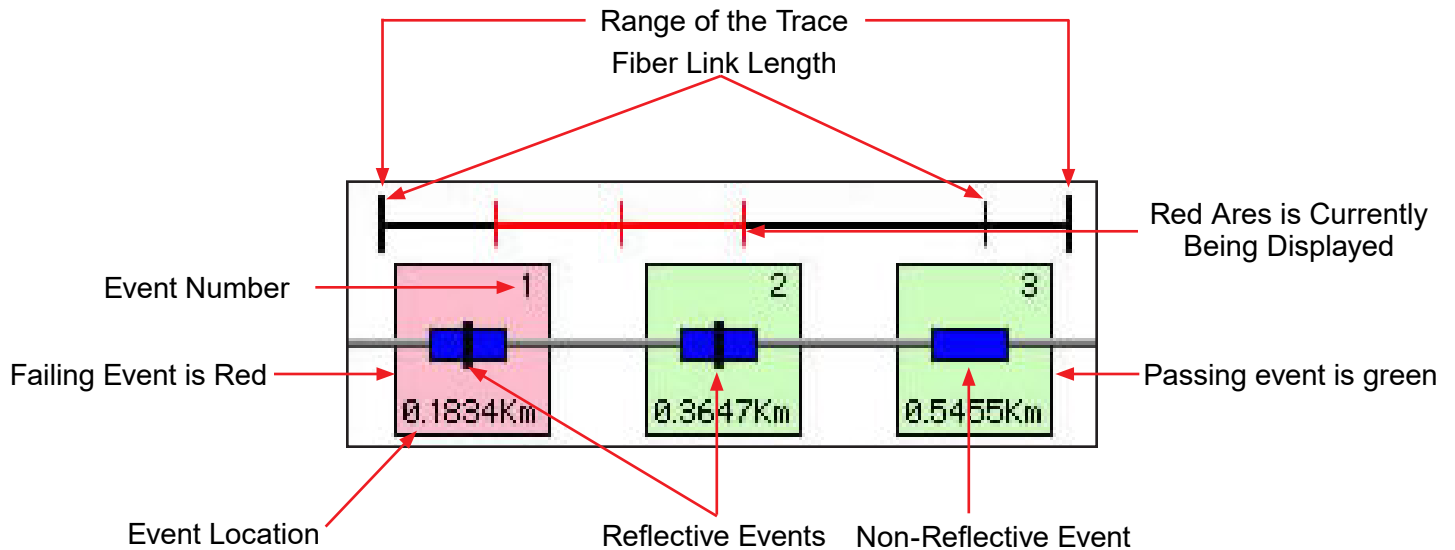


Fig 8.11

Note

The End of Fiber is the last item in the schematic view. It is labeled E in the event number position and displays a vertical bar instead of horizontal.

Event Table

#	P	KM	SPLICE	2POINT	DB/KM	TYPE
1	F	0.1834	+1.293	0.185	-1.203	-68.2
2	P	0.3647	+1.283	0.252	-1.469	-65.5
3	P	0.5455	+1.264	0.089	+0.524	Splc
E		0.9040	N/A	0.080	+0.231	End
L	P	0.9040	Link	4.168	+4.676	40.5

Fig 8.12

Chapter 8 OTDR Operation

Event Table Field Description

Event Number:

Indicates the event in sequence, where the higher the number, the further distance from the OTDR the event occurs. "E" (End) is the event determined to be the End of Fiber (EOF). "L" (Link) is the information relative to the full fiber trace.

P:

Pass/Fail, if any one of the thresholds are not met for an event, the P/F column will display an "F". The parameter that failed will be displayed in red. If all the parameters are met, this column will display a "P".

Km or KF or MI:

Event Location per unit of measure, Km for Kilometer, KF for Kilo-feet and MI for mile. This is the distance/location that the event occurs along the fiber link.

Splice:

Event Loss is the loss of the splice, mated pair, or other effect of the fiber considered an event. A positive number is the amount of dB loss and a negative number indicates a gain normally due to mismatched index of refraction. This is an adjustable threshold for the Pass/Fail feature. The "E" event will display N/A and the "L" Link displays Link, as these are not an event that would have meaning as a loss value.

2POINT:

2 Point Loss is the loss measured from the end of the dead zone of the previous event to the beginning of current event. The value in the "L" line of the table for this column is the link loss. The loss from the beginning of the trace to the event determined to be the EOF. This is the value used to determine if the fiber link passes or fails its link threshold.

dB/Km or Kf or Mi:

dB per Kilometer if in KM and DB/KF if in Kilo-Feet and DB/MI if in mile unit of measure. This is the calculated loss per Km, Kf or Mi from the end of the dead zone of the previous event to the beginning of the current event. The value in the "L" line of the table for this column is the dB Per/KM, Kf or Mi for the total link.

TYPE:

Event Type lists Splice for non-reflective events and displays a reflectance value for reflective events. The "E" end event is marked End and the "L" event displays the System ORL.

Chapter 9 Project Management

9.1 Project Management Description

Project Management allows the user to save a set of parameters to be recalled for use at a later time. It also incorporates the file management system to save traces to the active project folder. When the OTDR is turned on, the default project is [Default]. If an existing project is not open or a new one not set, all traces will be saved to the [Default] folder.

Note

It is necessary to create the project prior to taking a trace as the file will not be available to save after going through the project creation sequence.

Project Management Screen

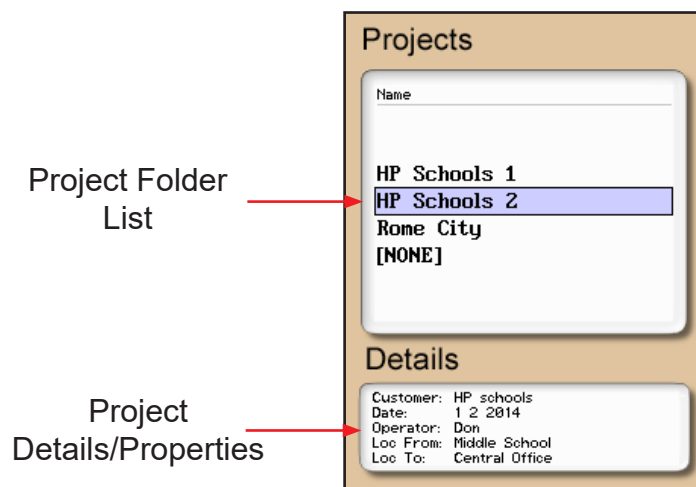


Fig 9.1

Project Management Menu To open project management, pull the menu down from the top of the display, move the Folder icon into the highlighted area and touch it to open. Pulling down from the top of the project management screen will open the file management menu. There are four tabs available, File, Edit, View and Help.



Fig 9.2

Chapter 9 Project Management

Project Management File Tab Selecting new will open a new project folder using the current parameter settings. Open will make the highlighted project active, dual is not operational in the project management and therefore greyed out, and delete permanently removes the highlighted project. (The delete button must be held for at least one second to remove projects.) **Once delete is selected, the project and all files associated with that project are permanently deleted and cannot be restored.** Use exit to leave the project manager and return to the trace screen.

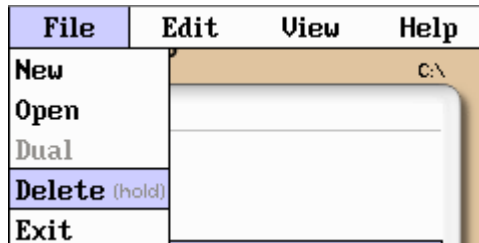


Fig 9.3

NOTE:

Once a project is established the settings cannot be permanently changed. They may be changed Temporarily, but the original setting will be defaulted every time the project is opened.

Project Management Edit Tab

Upload is used to transfer files to the CertSoft software. Rename allows the highlighted folder name to be modified while maintaining all settings and associated files. Properties allows the user to edit the details/properties displayed at the bottom of the project window.

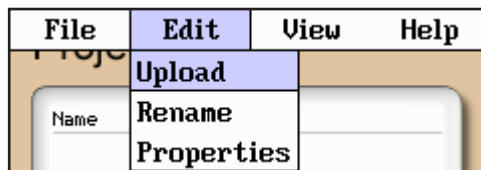


Fig 9.4

Project Management View and Help Tabs

View offers the user the opportunity to move to the file manager from the projects page. For onboard help pages, highlight the help tab and press select.

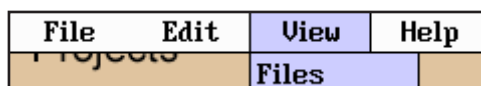


Fig 9.5

9.2 Project Management Operation

Create a New Project

The parameters that are stored for a project are range, pulse width, average, wavelength, distance units, pulse width units, event sensitivity and the thresholds. To create a new project, with project management open, pull the file menu down from the top of the display and touch File and New. Enter the new project name and touch save. This creates the folder with current setting as listed above. The folder names are limited to 16 characters.

To enter details about the project, move up and down in the Project Name window until the desired project is in the highlighted area. Touch the Details window to open the details list. Touch the detail to be entered and once entered, the onboard keyboard will open, enter the information and touch save. Continue until all necessary details are entered and touch close. Up to 24 characters may be entered for these fields.

Open an Existing Project

To open a project, with the project in the highlighted position, pull down the file menu and touch File then Open. This will display the file management screen. To go back to the OTDR screen, open an existing trace or pull down the file management menu, touch File and Exit. All traces will now be performed with the parameters set in that project and all items saved will be saved to that project folder.

Delete a Project

To delete a project, with the project to be deleted highlighted, pull down the file menu, touch File then Delete. ***Ensure the proper project is selected, as once delete is selected, the project and all files associated with that project are deleted and cannot be recalled.***

NOTE:

Delete must be held for approximately 2 second to complete the delete function.

Upload a Project to CertSoft

To upload a folder and all it's associated files from the OTDR to the computer, open the CertSoft software and ensure the OTDR is connected to the computer with the USB cable.

NOTE:

On the computer screen, the two plugs in the top right corner of the CertSoft screen should show as connected and green.

With the project to be uploaded in the highlighted position, pull down the file manager menu, touch Edit and then Upload. The folder with all files will be uploaded to the target folder selected on the computer.

NOTE:

With CertSoft 2 the files can be pulled from the equipment to the computer using the CertSoft 2's file management feature.

Chapter 9 Project Management

Rename a Project

To rename a project, position the project to be renamed in the highlighted area. Pull down the file management menu, touch Edit then Rename. Use the on-screen QWERTY keyboard to rename the project and touch save.

Modify Properties

To modify details about the project, move the projects up and down in the Project Name window until the desired project is in the highlighted area. Touch the Details window to open the details list. Touch the detail to be updated, enter the information with the on-screen keyboard and once entered, touch save. Continue until all necessary details are entered and touch close. Up to 24 characters may be entered for these fields.

Temporary Modification of Parameters

Test parameters may be temporarily changed by selecting new settings, such as wavelength, average time, pulse width, and range directly on the main OTDR screen or open the parameter settings screen, set the new parameter and save. All subsequent test will use the new settings until the original settings are returned or the folder is closed and reopened resetting the project parameters. To make temporary changes to event sensitivity or thresholds, open the parameters settings page.

Exit Project Management

To exit the project management, pull down the file menu, touch File and Exit.

Chapter 10 File Management

10.1 File management Description

File Management is used to save and recall OTDR traces, loss test Set (LTS) files and Video Inspection Scope (VIS) images. It operates in conjunction with the projects manager in that, whichever project folder is open/active, all files saved and listed in the file manager are associated with that project. When the OTDR is first turned on, the default folder is [Default], therefore, any files saved without opening a project will be saved to the [Default] folder. Any files saved with the LTS or Video Inspection functions will also be associated with the open folder. The active project when the unit is turned off is remembered and will be the active/open project upon startup.

File Management Screen

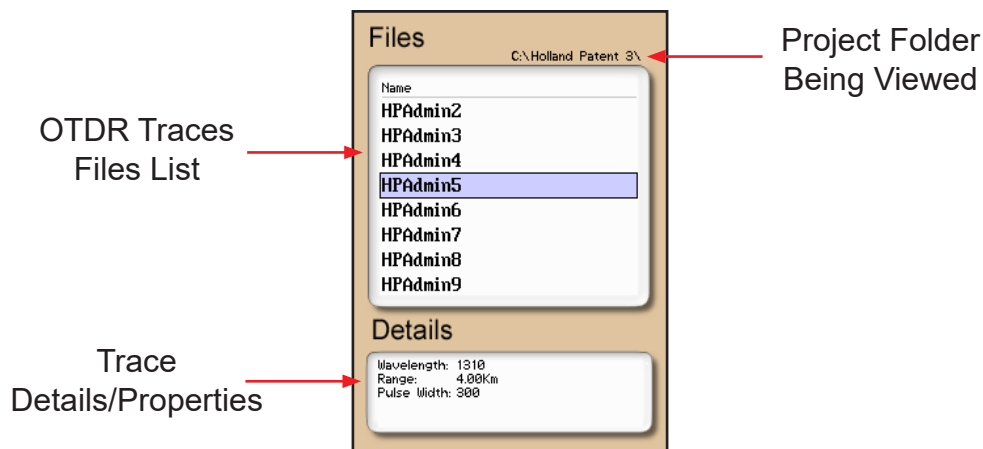


Fig 10.1

File Management File Menu

To open file management, pull the menu down from the top of the display, move the File (Disc) icon into the highlighted area and touch it to open. Pulling down from the top of the file management screen will open the file management menu. The available tabs for file management are File, Edit, View and Help.

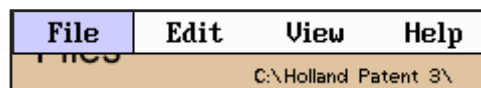


Fig 10.2

Chapter 10 File Management

File Management File Tab

Touch File to open the drop down menu for file tab operations of Save, Open, Dual, Delete and Exit. Save stores the current trace, Open displays the trace that is currently highlighted, Dual opens the trace currently in the highlighted area as the secondary trace, Delete permanently removes a file and Exit closes the file management screen. **Once delete is selected, files are permanently deleted and cannot be restored.**

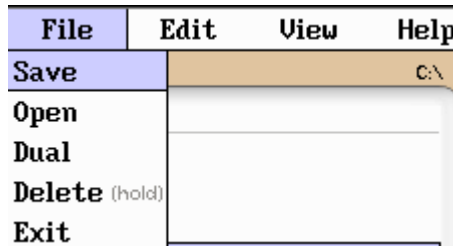


Fig 10.3

File Management Edit Tab

Touch edit to open the drop down menu for the edit tab operations of Upload, which is used to transfer the highlighted file to the CertSoft software. If CertSoft2 is being used, the Upload tab is not required and the files are pulled down from the by the software. Rename allows the highlighted file name to be modified. Properties is grayed out and not accessible from this location.

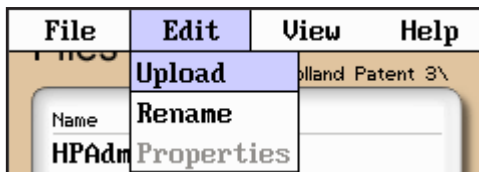


Fig 10.4

File Management View and Help Tabs

The View tab presents the opportunity to to move to the projects management page from the file management page. Touch view then Projects to switch to the project management functions.

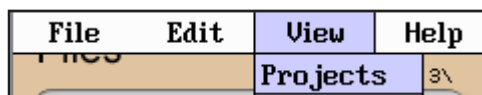


Fig 10.5

10.2 File Management Operation

Save a Trace

To save a trace using the last named trace as the base file name, pull the menu down from the top of the screen and touch the Quick Save icon while in the highlighted area. To save the trace with a new name, pull the menu down from the top of the screen, position the File icon in the highlighted area and touch it to open file management. Pull the file management tabs down from the top of the display, touch File and Save. This will open file naming window with the on screen keyboard. Name the trace as desired and touch save. The file names are limited to 16 characters. This method should be used to set the base file name for a group of traces. These file names are save exactly as entered. To save files with a chronologically numbered suffix, use the quick save. Quick Save uses the last enter base file name. If a base file name of SAMPLE is saved, the first Quick Save file will be SAMPLE.1, next SAMPLE.2 etc.

Chapter 10 File Management

Open/View a Trace

To open a trace, with the desired project active, pull the menu down from the top of the display, position the File Management icon in highlighted position and touch to open the file list. Move the desired file into the highlight position and touch it to open. Any file may be opened, loss test and video inspection file will open in the appropriate function.

Dual Trace Mode

Dual trace mode may be used to view and compare two traces. Both traces must be of the same range setting. To utilize dual trace feature, first open the primary trace as you would a normally, by highlighting the trace in file management and touch it to view. Then open file management again, highlight the trace to be compared, open the drop-down menu use the File down and touch dual. The trace opened using the dual feature is the secondary trace and all information displayed is that of the primary trace. To exit the dual trace mode, start a scan with Scan.

Delete a File

To delete a file, with the file to be deleted highlighted, pull down the file management menu, touch file and then touch and hold Delete for approximately 2 seconds. ***Ensure the proper file is selected as once deleted, the file cannot be recalled.***

NOTE:

Delete must be held for approximately 2 seconds to complete the delete function.

Upload a Trace to CertSoft

To upload a trace from the OTDR to the computer, Open the CertSoft software and ensure the OTDR is connected to the computer with the USB cable.

NOTE:

The two plugs in the top right corner of the computer software screen should show as connected and green.

Highlight the file or project to be uploaded, pull down the file manager tabs, touch the Edit tab and then Upload. The file or project will be uploaded to the target folder on the computer.

NOTE:

When using CertSoft2, the file upload function is completed using the Software only once the OTDR is connected to the computer.

Rename a Trace File

To rename a trace file, highlight the file to be renamed. Pull the file tabs down from the top of the display touch edit and Rename. The file name will be displayed with the on-screen keyboard. Use the keyboard to rename the project and touch save.

Exit File Management

To exit the file management, pull the file management tabs down from the top of the display, touch File and Exit.

Chapter 11 Video Scope

11.1 Entering Video Scope Function

To operate the video scope, from the home screen, touch the Scope icon. If a probe is not connected already, connect the VIS300 video probe to the video probe port on the top of the OTDR.

11.2 Video Scope Display

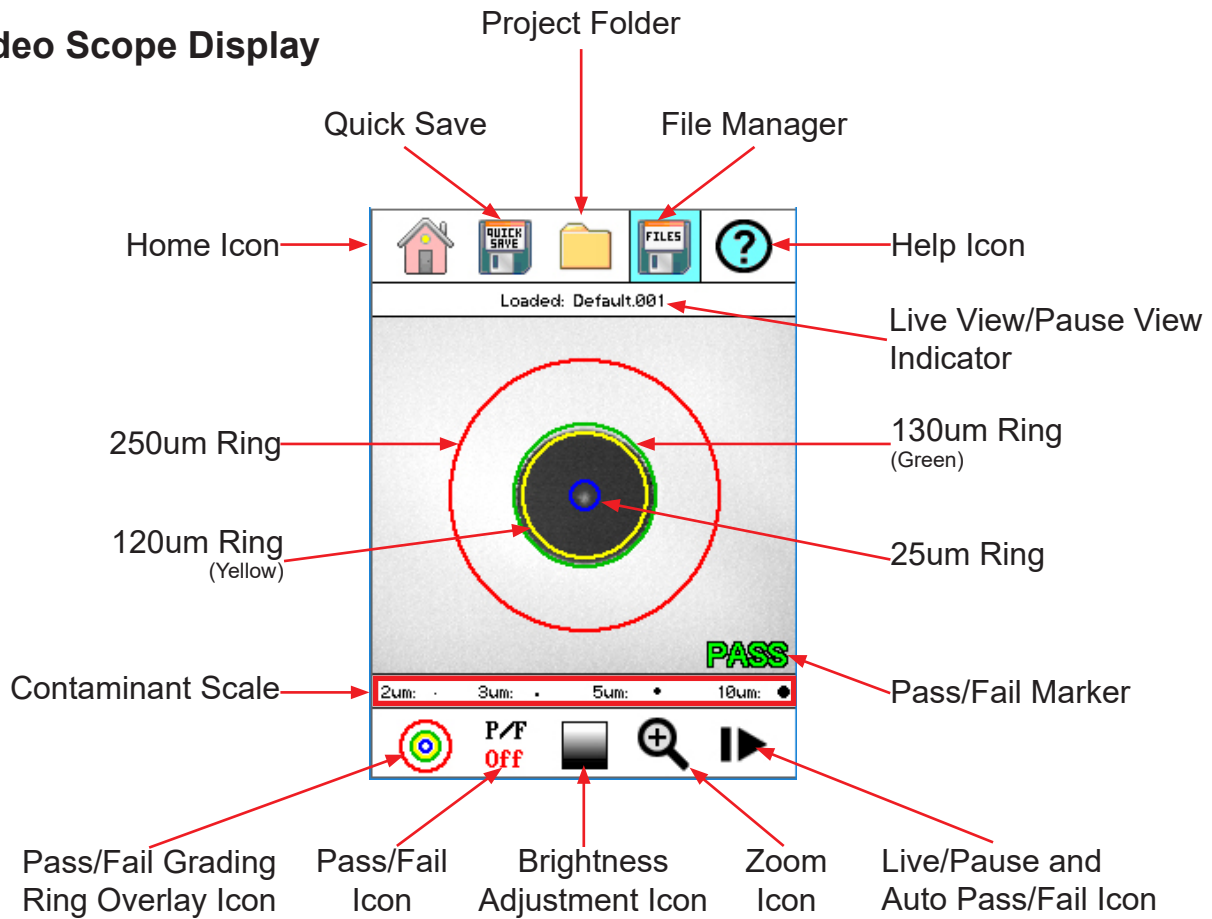


Fig 11.1

11.3 Video Scope File/help Icon Menu

The icons at the top of the display are Home, File Save, Project Management, File Management, and Help.

Home

Touch this icon to return to the Home screen.

Chapter 11 Video Scope

Quick Save

Touch Quick Save icon to save the current scope image with the same base file name as the last save scope image. Scope files will be preceded by a target icon.

Project Management

Touch the project management folder and highlight the project in which the scope images are to be stored. When entering the video scope function, the active folder will be the one last used in the OTDR or LTS. For more information about the project management system, please refer to Chapter 9 of this guide.

File Management

Touch the file management icon to view a list of saved files or to open a stored image. File types are identified by the preceding icon. Trace files are indicated by a trace icon, LTS file by an LTS icon and scope files are preceded by scope (target) icon.

Help

Press the menu button, use the left and right buttons to highlight the help icon and press select to view the help information.

11.4 Video Scope Operation Icon Menu

The following functions are only available for use when the video scope is in live scan mode.

Grading Rings

Used to turn on and off the rings that indicate the IEC61300-3-35 grading zones.

Use Pass/Fail Criteria Tables from page 44 to grade the connector end face. 2, 3, 5 and 10 micron contaminant examples are displayed just below the connector image on the video scope display.

Pass/Fail Label

Used to set the pass/fail indicator by cycling through P/F (Pass/Fail) Off, P/F Man (In Red "Fail"), P/F Man (In Green "Pass") and P/F auto. To set the pass/fail indicator, touch the Pass/Fail Icon and set to: off, fail, pass and auto. Once in Auto, with the image centered as close as possible, touch the Live/Pause - Auto Pass/Fail icon to conduct and auto test of the connector.

NOTE:

If the connector shows all red or the test fails to complete, maneuver the probe tip to allow for centering of the image and retry the test.

Brightness

Touch the Brightness icon to cycle the brightness levels for best image quality.

Chapter 11 Video Scope

11.5 Video Scope Operation

To operate the video scope, touch the Scope icon on the Home Screen. If a probe is not connected already, connect the VIS300 Video Probe to the video probe port on the top of the OTDR.

Video Probe Tips

There are a number of video probe tips available. To remove a tip from the Probe, grasp the probe tip and unscrew the tip retention nut from the tip. Pull the tip straight up from the probe. To place a tip on the probe, ensure the lens is clean, slide the tip on to the end of the probe and tighten the tip retention nut. Do not overtighten the retention nut.

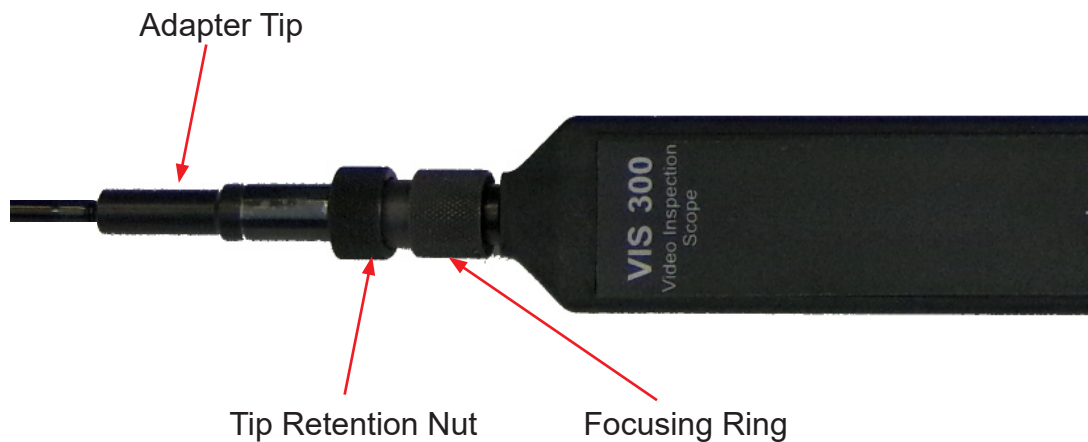


Fig 11.1

Viewing/Focusing a Connector

With the video scope turned on and the video probe plugged into the OTDR, insert a connector in to universal tip or insert the panel adapter tip into the appropriate port. The scope must be in the live scanning mode to make focus adjustments. Use the focus ring to get the connector image as sharp as possible. When using panel adapters it is possible to turn the body of the probe to while the adapter is inserted into the panel to make focus adjustments.

NOTE:

To auto center the image, touch the center of the connector image and the connector will move as close as possible to the center of the display.

Chapter 11 Video Scope

Centering a Connector Image

Once the image is stable and focused, use the stylus to touch the approximate center of the connector to snap the image as close as possible to the center of the display and the center of the grading rings. It may be necessary to adjust the adapter tip if centering is not possible.

Pausing Image Scan

To freeze an image in position and focus level for inspection, Touch Live/Pause-Auto Pass/Fail Icon while in manual Pass/Fail or Pass/Fail Off mode. This will pause the image at the current position and focus level. Touch Live/Pause-Auto Pass/Fail press again to set the operational mode back to live mode for focus and position adjustments

Grading Rings

Touch the Grading Ring Icon to turn off and on the grading rings. The unit must be in live scan mode to turn the rings off or on.

Pass/Fail

Use the pass/fail criteria tables on the next page to determine if the connector passes the IEC61300-3-35 standard. There is a guide to contamination size located at the bottom of the image. To manually mark a connector as Pass or Fail, touch the Pass fail icon and cycle to the desired state. Once the pass fail status has been entered, the scan may be paused with the Live/Pause-Auto Pass/Fail icon to allow for marking the contamination points.

Marking Points of Contamination

To mark the points of contamination the unit must be in paused mode. Pick up the contamination marker by using the stylus and touching the contamination sample size that is required. Touch the image to place the marker. The marker may be fine-tuned with the stylus to cover the contamination point on the image to be marked. Once the marker is positioned properly, touch the area just below the image that states "Place marker, touch here to apply" to lock the marker in place. Repeat this as necessary to mark all the points that need to be indicated for the pass/fail status. At this point the image should be saved.

NOTE:

Marking the points of contamination should be done last, just before saving the image. Once the unit is returned to live mode the markers are removed.

Auto Pass/Fail

Once the image has been centered as close as possible in the grading rings, set the P/F icon to Auto and touch Live/Pause-Auto Pass/Fail icon. The video scope will evaluate the image and grade it with Pass or Fail. Contamination will be displayed on the image.

Exiting Video Scope Operation

Touch the Home icon to return to the home screen.

Chapter 11 Video Scope

11.6 Pass/Fail Criteria Tables

Fiber End Face Criteria Table for Angled PC Polished Connectors

Zone	Description	Diameter	Allowable Scratches (Width)	Allowable Defects (Diameter)
A	Critical Zone	0 μ m to 25 μ m	$\leq 4\mu$ m	None
B	Cladding Zone	25 μ m to 120 μ m	No limit	No Limit < 2 μ m 5 from 2 μ m to 5 μ m None > 5 μ m
C	Adhesive Zone	120 μ m to 130 μ m	No limit	No limit
D	Contact Zone	130 μ m to 250 μ m	No limit	None $\geq 10 \mu$ m

Fiber End Face Criteria Table for Ultra PC Polished Connectors

Zone	Description	Diameter	Allowable Scratches (Width)	Allowable Defects (Diameter)
A	Critical Zone	0 μ m to 25 μ m	None	None
B	Cladding Zone	25 μ m to 120 μ m	No limit $\leq 3\mu$ m None > 3 μ m	No Limit < 2 μ m 5 from 2 μ m to 5 μ m None > 5 μ m
C	Adhesive Zone	120 μ m to 130 μ m	No limit	No limit
D	Contact Zone	130 μ m to 250 μ m	No limit	None $\geq 10 \mu$ m

Fiber End Face Criteria Table for SM PC Polished Conn. (Single Mode Fiber, RL $\geq$ 26 dB)

Zone	Description	Diameter	Allowable Scratches (Width)	Allowable Defects (Diameter)
A	Critical Zone	0 μ m to 25 μ m	2 $\leq$ 3 μ m None > 3 μ m	2 $\leq$ 3 μ m None > 3 μ m
B	Cladding Zone	25 μ m to 120 μ m	No limit $\leq 3\mu$ m None > 3 μ m	No Limit < 2 μ m 5 from 2 μ m to 5 μ m None > 5 μ m
C	Adhesive Zone	120 μ m to 130 μ m	No limit	No limit
D	Contact Zone	130 μ m to 250 μ m	No limit	None $\geq 10 \mu$ m

Chapter 12 Loss Test Set

12.1 Entering Loss Test Set Function

The FTE-7100 OTDR may be equipped with a Loss Test Set which includes the power meter and CW source. On the home screen, touch the LTS icon. All OTDRs will support the stable Light Source, though not all OTDRs will support the Power Meter.

12.2 LTS File/Help Icon Menu

Home

Touch the home icon to exit the LTS function and return to the home screen.

Quick Save

Quick Save: Touching this icon will save the value on the display to the active project folder with an LTS label and files will be automatically incremented to the next numbered suffix.

Project Management

Project Folder: Opens the project management screen. For a full description of project management operation, please refer to Chapter 9 of this user's guide.

File Management

File Manager: To open file manager touch the file manager icon. For a full description of project management operation, please refer to Chapter 10 of this user's guide.

Help

Press the menu button, use the left and right buttons to highlight the help icon and press select to view the context sensitive help information.

12.3 Light Source Operation

Selecting Light Source Wavelength

The light source is located in the top left portion of the display. Touch the source indicated or the OFF indicator and a list of available sources will be displayed. Touch the desired wavelength to turn on that light source, or Disable to shut the light source off.

Selecting Light Source Modulation

Modulation is located in the top right portion of the display. Touch the modulation value indicated and the list of available modulation values will be displayed. Touch the desired value to modulate the source or touch CW for a continuous wave. The available modulation values are CW, 270Hz, 1000Hz and 2000Hz.

Chapter 12 Loss Test Set

12.4 Power Meter Operation

Set Power Meter Wavelength

The Power Meter wavelength being tested is indicated in the bottom left of the display. To change the wavelength, touch the indicated value below Power Meter and a list of calibrated wavelengths will be displayed. Touch the wavelength to be tested and begin the test. Available wavelengths are 850/1300/1310/1490/1550/1625nm for standard OTDRs and PON OTDRs. The CWDM OTDR has the standard wavelengths calibrated plus 1431-1611nm.

NOTE:

The reference indicator in the bottom right portion of the screen is where a reference and the units of measure may be set with either Absolute or Relative measurements.

Set Reference

Connect the reference cable/s to the appropriate ports and touch reference in the bottom right of the display. Touch the Set Reference tab, and a non-volatile reference value will be displayed below the reference indicator in the bottom right of the display.

Set Measurements Units

The power meter displays measurements in dB (Relative) or dBm (Absolute) units of measure. dB measurements are used with a set reference as described above. dBm measurements do not take into account the reference and display the absolute power value received by the detector.

12.5 LTS Project Management

To save loss measurements to a project, touch the project management icon, highlight the project to be used and touch it again to open the projects folder. A list of files associated to that folder will be displayed. OTDR files are preceded with trace icon, the LTS file will have an LTS icon and scope files will be preceded by a target icon. To return to the LTS screen exit the file management screen by drawing down the file management menu, touching file to open the drop-down menu and touch the exit tab. For a full description of project management operation, please refer to Chapter 9 of this user's guide.

12.6 LTS File Management

To open file manager touch the file manager icon. To save a file using the file manager, with the test data on the display, open the file management, open the drop-down menu under file by touching the file tab and touch save. Name the file as desired with the on-screen keyboard. Touch the file tab with Save highlighted press SELECT. Use the on-screen keyboard to enter a file name. For a full description of project management operation, please refer to Chapter 10 of this user's guide.

NOTE:

File names will be saved exactly as entered using this method. To have the files saved with incrementally number suffixes, use the file manager to save the base file name with the suffix number as the first file to be save in a sequence and then use the Quick Save icon moving forward. Example: Use file manager to save the file test as test.001 and when you use quick save for the next test, the file name will be test.002 then test.003

12.7 Exiting Lost Test Set

Touch the Home icon to exit the loss test set function and return to the home screen

Chapter 13 Visible Fault Locator

13.1 VFL Safety



Caution

This Visual Fault Locator is classified as a Class II laser system and must be used with all commensurate safety precautions. Never view the light emanating from the fiber directly. Place a white piece of paper at the end of the fiber and look for the presence of a red spot on the paper.

13.2 VFL Description

The Visual Fault Locator emits visible (red) light at the 650 nm wavelength. Its intended function is to allow an operator to identify the exact location of a break, micro bend, or other discontinuity in a fiber optic cable. As the radiation is visible, light emanating from a break or micro bend enables the user to locate the exact position of a fault even at very short distances that would not be detectable by conventional means such as an Optical Time-Domain Reflectometer, (OTDR). It is also useful for identifying a particular fiber in a cable by exciting the fiber to be located with visible radiation.

13.3 VFL Operation

The Visual Fault Locator is access from the Home screen.

The fiber to be tested is connected to the VFL port of the OTDR by means of a standard 2.5 mm fiber optic connector. The source may be used in one of its two modes, Modulated or Continuous. In the modulated mode the laser is turned on and off at a 6 Hz rate. The laser is on for approximately one third of the cycle. This mode is helpful in permitting the user to identify the source radiation in the presence of high levels of ambient light. It also aids in conserving battery life.

The usable range for fault location depends on many factors, the type of fiber, the type of cable, the overall loss.

To activate the VFL, tap the VFL icon to cycle through the available states of off, Continuous and Modulated.

Chapter 14 Specifications

14.1 OTDR Specifications

Specifications	
Wavelength	850, 1300, 1310, 1550 and 1625 ± 20 nm (CWDM Wavelengths 1471-1611nm ± 3 nm)
Dynamic Range	26/27dB MM, 34/33dB SM, (1310/1550/1625 PON 37/38/38dB) (CWDM wavelengths 35dB)
Pulse Width	5 - 20,000 ns
Units of Measurement	km, ft, kf, mi
Event Dead zone	1m
Attenuation Dead Zone	4m
Resolution	.125 - 32m
Distance Uncertainty	$\pm(0.75\text{m} + 0.005\% \times \text{distance} + \text{sampling resolution})$
Full Scale Distance Range	0.25-260km SM
Typical Real-time Refresh Rate	2 Hz
Group Index of Refraction (GIR)	1.024 - 2.048
Linearity	$\pm .05$ dB/dB
Memory Capacity	~40,000
Memory Type	Internal
Power Supply / Charger	Universal
Battery	Li-ion 6hr typ.
Storage Temperature	-20 to 60 C
Operating Temperature Range	0 to 40 C
Dimensions (w/out rubber boot)	6.25" L x 4.125" W x 1.875" H (159mm L x 105mm W x 48mm H)
Weight	1.5 lbs (0.7 kg)
Communications ports	USB and Bluetooth
Connector Styles	Choice of FC, SC
Accessories Provided	U.S. USB Power Adapter, Choice of FC or SC Adapters, Android Application, Windows Compatible Software, Rubber Boot and Manual on CD

TTI reserves the right to change specifications without notice

14.2 Power Meter Specifications

Detector Type	InGaAs
Connector Type	2.5mm Interchangeable
Dynamic Range	+5 to -77dB (CATV - +25 to -57dB)
Calibrated Wavelengths	850, 1300, 1310, 1490, 1550, 1625nm (standard units) + 1431-1611nm (CWDM units)
Power Measurement Uncertainty	± 0.18 dB under reference conditions, ± 0.25 dB from 0 to -65 dBm, ± 0.35 dB from 0 to +5 dBm and from -65 to -77 dBm
Units of Measurement	dBm, dB
Resolution	.01 dB

TTI reserves the right to change specifications without notice

Chapter 14 Specifications

14.3 Light Source Specifications

Fiber Type	Single mode, Multimode
Wavelengths	850, 1300, 1310, 1550, 1625 nm ± 20 nm *
Output Power	0 dBm (-3dBm @ 1625nm)
Laser Safety Classification	Class I Safety Per FDA/CDRH and IEC-825-1 Regulation
Modulation Modes	CW, 270 Hz, 1000 Hz, 2000 Hz

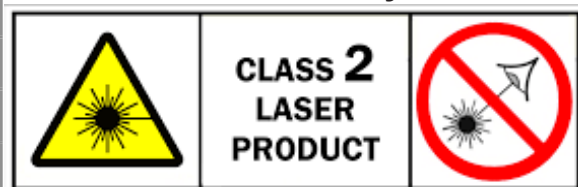
* Light source wavelengths present are determined by the OTDR configuration

TTI reserves the right to change specifications without notice.

14.4 Visible Fault Locator Specifications

Emitter Type	Laser Photo diode 1100 - 1700nm InGaAs -70-+9dBm with interchangeable FC Adapter
Wavelength	650nm ± 5 nm
Connector Type	2.5mm Universal
Output Power	1mW Max.

Laser Safety



TTI reserves the right to change specifications without notice.

15.1 Repair Information

If repair is required, simply call the factory at 315-739-3642 for return instructions and a RMA number.

15.2 Warranty Information

This product, including all mechanical, electrical, and optical parts and assemblies are unconditionally warranted to be free of defects in workmanship and material for a period of one (1) year from the date of delivery.

This warranty does not apply to expendable parts such as batteries or optical panel connectors, nor to any instrument or component which has been subjected to misuse, alteration, or fiber connector damage. It is the customer's responsibility to understand all the instructions and specifications prior to operating this instrument. This warranty does not extend to any loss or damage consequent to the failure of the warranted product.

15.0 Version Control

Through a Program of continuous improvement the upgrade of the features and performance of this instrument are an on going process. The instrument firmware version is accessible in the lower right corner of the home screen. The version changes and approximate release dates are as follows.

FTE-7100 OTDR	V1.0.0.0	11/2018 - Original release
FTE-7100 OTDR	V1.0.2.0	11/2018 - Add Touch Screen Calibration