



Terahertz Technologies Inc.

TTI Android OTDR Application User's Guide

**Revision B
11/2013**

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Terahertz Technologies Inc.

**TTI Android OTDR Application
User's Guide**

Chapter 1 Using This Manual

This manual contains information for the Terahertz Technologies Inc. Android OTDR Application. The application is designed to operate in concert with the Terahertz Technologies Inc. Android OTDR. References to “OTDR” pertain to the optical unit. References to the “Tablet” or “Device” pertain to the Android tablet being used to control the optical unit.

This manual covers the physical aspect and specifications of the OTDR, as well as the operation of the OTDR application on the tablet. Some operations that are available in the application require secondary applications or features be installed or activated on the user’s tablet, such as GPS for geo-tagging files.

The Android OTDR may be operated remotely via blue tooth or directly with the onboard keypad. Note, the keypad on the OTDR is disabled when an Android device is connected via Bluetooth.

This manual is written to guide the user through the Android application operation of a compatible OTDR, please see the supplied CD-ROM for the operation manual which explains the operation of the OTDR directly with the keypad.

Precautions

This manual is designed to guide the user through the operation of the application on the Android device, however, this operation requires the use of an OTDR. OTDRs are optical instruments that do emit laser radiation and though this level of radiation is not considered a danger, there are safety considerations and certain practices should be followed.

The safety information and equipment information in this manual refers to the use of the OTDR with the Android device. 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 2 Safety

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 and therefore infrared optical energy may be present.

Warning

Never look directly into the end of a connected fiber optic cable or fiber optic adapter of 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 specified by the manufacturer**
- **Do not use the charger without the 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 use any other charger than the one provided with this instrument.**

Failure to follow these cautions statements may void the warranty of 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.


Caution

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

Chapter 3 Quick Start Guide


3.1 Android OTDR Quick Start Guide

Press  to turn on the OTDR.

Touch the  icon to start the TTI application on the Android device.

Note

The auto rotation is disabled for this application and the display is locked in the landscape mode.

Touch the  icon in the top right corner of the display to open the Bluetooth dialog.

If the OTDR is not present on the Paired Device list:



Bluetooth Dialog

Note

The unit number/serial number is located just above the USB port on the top panel of the OTDR. If it is not there, remove the boot and it can be found on the serial label located back panel of the OTDR.

Touch “Scan for devices” and when the device is recognized, it will be listed in Other Available Devices list. Select it to connected the tablet with the OTDR.


Note

A password dialog may be displayed. If so, enter 1234 as the password.

If the OTDR is present on the device list:


Select the unit to be connected.

(Once connected, a “Connected Successfully” message will be displayed.)


To Enter OTDR mode, press the  icon.

Connect the fiber to be tested to the appropriate port of the OTDR.






(If the OTDR is a quad wavelength model, ensure the proper port is used. “SM Port” for single mode fiber and “MM Port” for multi mode testing.)

Touch the  icon to cycle to the desired wavelength to be tested. The wavelength is indicated in the bottom portion of the display on the right hand side.

Test Methods



The default method of testing is Expert. To change to Auto or Construction modes, long touch the  icon. The “Select Test Mode” dialog will be displayed. Select the desired test method to continue.

Expert Mode

In Expert mode, the user needs to set the range, pulse width and average time using the ,  and  icons. When all appropriate parameters have been set and the fiber is connected to the proper port, touch the  icon to start the trace. Touching the  icon will stop the trace.

Chapter 3 Quick Start Guide

Autotest

Autotest is very effective when the fiber length and condition is unknown. To test in Autotest, set the test method as described earlier in this quick start guide. Set the desired wavelength with the  icon. The range, pulse width will be determined by the application. The Default average time is short in the Autotest mode. Touch the  to start the scan.

Construction

To test in construction mode, set the test method as described earlier in this quick start guide. When construction mode is selected, a dialog will be displayed requesting the user to set some parameters for the test.

First is the Base File Name. This is the base name which will be followed by the wavelength and the number of the test. Second is the Set File Number Offset. Set this to the number of the test you want the construction mode to begin with.

Third is the wavelengths to be tested. For multimode set the test to 850/1300 and for SM, set the wavelengths to 1310/1550.

File Example:


If the base file name is "Test", first file number is "1" and the wavelengths selected are 1310/1550nm. The first file saved will be Test_1310_1.sor and the second will be Test_1550_2.sor.

Touch Save and Continue.

The pulse width, and average should be set using the appropriate icons.

To start the test connect the fiber to be tested and press .


The Application will test the fiber at the first wavelength, display the trace and save the file. It will then test at the second wavelength, display the trace with the first trace and save the file.

When The test for this fiber is complete, remove the fiber from the OTDR, insert the next fiber to be tested and press .

Event Table

The event table is entered by touching anywhere in the display area below the trace. To exit the event table touch the event table title bar (blue shaded area). Touching an event in the table will move the active cursor to that event on the trace

Saving Traces

To save a trace, touch the  icon and a file storage dialog will be displayed. Enter the file name and any desired notes. Touch Save File to continue.

4.0 Introduction

The Terahertz Technologies Inc. FTE-1700 is designed for uses with most Android tablets operating 2.2 or newer operating system that are equipped with Bluetooth. This unit is available as, dual wavelength SM, MM, or Quad wavelength with both SM and MM. Models are available with Video Scope, Loss Test Set or a Visual Fault Locator, depending on the number OTDR wavelengths. The Terahertz Technologies Inc. FTE-1700 offers many benefits. Since it uses an Android device, it can take advantage of the features found on these devices, such as, GPS capability, all traces saved on the tablet will have grid coordinates embedded in the .sor trace. Another feature is the ability to use the tablets file storage system which have a tendency of being very user friendly and powerful. Another benefit to Android phones and tablets is the ease of which file transfers may be made to computers for use with the supplied CertSoft software suite. Email may also be accessed directly from the file management system to easily send files.

This is a portable Optical Time Domain Reflectometer with the core functions required to measure optical fiber from one end during installation, repair and verification. The FTE-1700 is available with Dual and Quad Laser sources. The FTE-1700 is packaged in a rugged housing which is further protected with a rubberized boot. Operation is made possible via Android device with Bluetooth. On FTE-1700 units with the optional display and keypad, controls are accessible via weather proof membrane.

The Terahertz Technologies Inc. FTE-1700 is capable of measuring 2 point loss, splice loss, LSA splice loss, loss per/km and event ORL. The singlemode and multimode output ports use high power, 850, 1300, 1310, 1490, 1550 or 1625 nm pulsed laser sources. The back scatter receiver uses a temperature compensated avalanche photo diode for reliable, stable performance in fiber links from tens of meters to over 240Km. A high-speed micro processor, provides the N-point averaging function and control for as little as 1/2 second Real Time updates. This unit is available with an Auto-Wavelength Switching Power Meter. The power meter is calibrated at the 850,1300,1310,1490,1550 and 1625nm. The Terahertz Technologies Inc. FTE-1700 software incorporates a feature to supply loss measurement reports that may be incorporated with the OTDR trace reports. The fiber loss vs. distance in its central graph is large with easily manipulated cursors. The scales are automatically updated for expansion modes and with position changes of the A and B cursors. Individual and dual cursor measurements are displayed as well as important instrument parameters such as Index of Refraction, pulse width, wavelength, range, and scanning duration. The Android application supports Automatic (AutoTest), expert and construction modes of operation. Use the Range Finder Mode for unknown fiber length or Construction Mode to test a large number of fibers at 2 wavelengths, store the test and display the two test with the touch of just one button.

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 and 4-AA NiMH batteries installed
2. Universal AC/DC charger with interchangeable mains
3. USB cable
4. Manual on CD with Windows™ compatible software.
5. Set of interchangeable adapters, SC, ST and FC, for OTDR and PM Ports.

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 number is also located on the top plate just above the USB Port.


		Terahertz Technologies Inc. Oriskany NY 13424	
Conforms to DHHS Standards for Laser Products PER 21 CFR 1040 CE Made In The USA 315-736-3642	Model	FTE1700-1315	
	Wavelength	1310/1550nm	
	VFL Wavelength	N/A	
	Serial #	3027	
	MFG Date	10/3/2013	

Fig 5.1

5.3 Power Requirements

The TTI-FTE-1700 is equipped with a 100-240V-0.4A input and 13.6V, 0.75A, center positive output universal AC/DC battery charger. This charger is supplied with interchangeable mains for US, Great Britain, Europe and Australia. The unit is shipped with 8-AA NiMH batteries (2700mA hours). Depending on the presence of a display and usage, fully charged battery pack will typically enable approximately 4-6 hrs. of use. Fully discharged batteries require 6 - 8 hours of recharging.

Chapter 5 Inspection and Identification

5.3 Power Requirements Continued

To replace the batteries, remove the OTDR from the protective boot by pulling the bottom of the boot down and back allowing the bottom of the unit to be lift out. The battery door is located on the back side of the unit. Replace the batteries only with high quality AA NiMH batteries. Spare battery packs are available with a charging unit for extended battery operation. If you install NiMH batteries that are dead or less than 1 volt each, charge these batteries for one (1) hour before using the OTDR. For proper maintenance, batteries require a monthly periodic recharge.

Warning

To Prevent Fire or Shock Hazard:

- Do not install battery types other than those specified by the manufacturer
- Do not use the charger without the proper NiMH 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 use any other charger than the one provided with this instrument.

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

Chapter 6 OTDR Description

6.1 OTDR Physical Description

Front Panel



Fig 6.1

Top panel

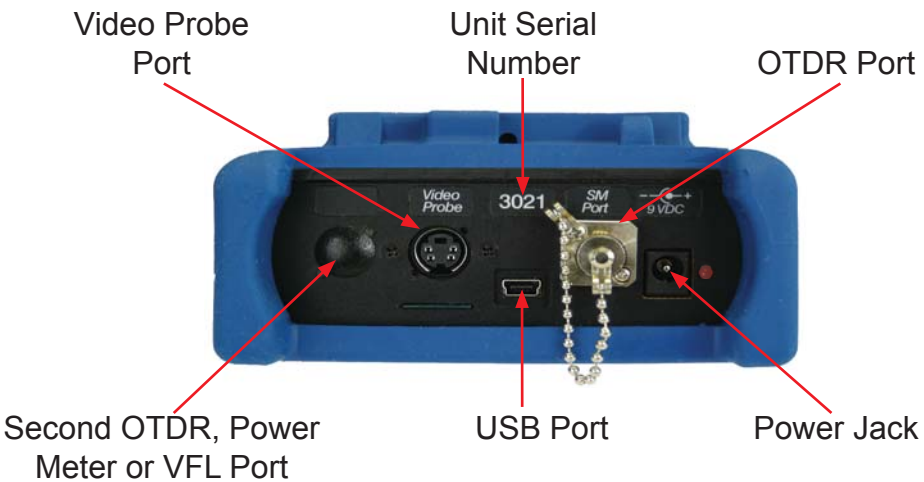


Fig 6.2

Chapter 6 OTDR Description

Instrument Enclosure

The TTI-FTE-1700 is packaged in a rugged aluminum 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.

Display

This unit is equipped with a 4" color TFT display. When operating the OTDR via Bluetooth, the actions are depicted on the display, however, the keypad is not operational when the device is being controlled with a table or phone.

Note

To operate OTDR via Bluetooth the only action required on the OTDR itself is to turn the unit on with the power button. Once the OTDR is powered on, the Android device may be paired for operation. Please refer to FTE-1700 OTDR Manual for information on operating the OTDR directly from the onboard keypad.

Product Identification

The serial tag with information such as serial number and manufacture date, are located on the back of the OTDR. To remove the boot, grasp the bottom of the boot, pull down and back allowing the bottom of the OTDR to lift out. Slide the boot the rest of the way off the unit. The serial tag is located on the back panel above the battery door. The serial number is also located on the top panel above the USB port.

Chapter 7 Application Description

7.1 Home Screen

Application Version

Bluetooth Button

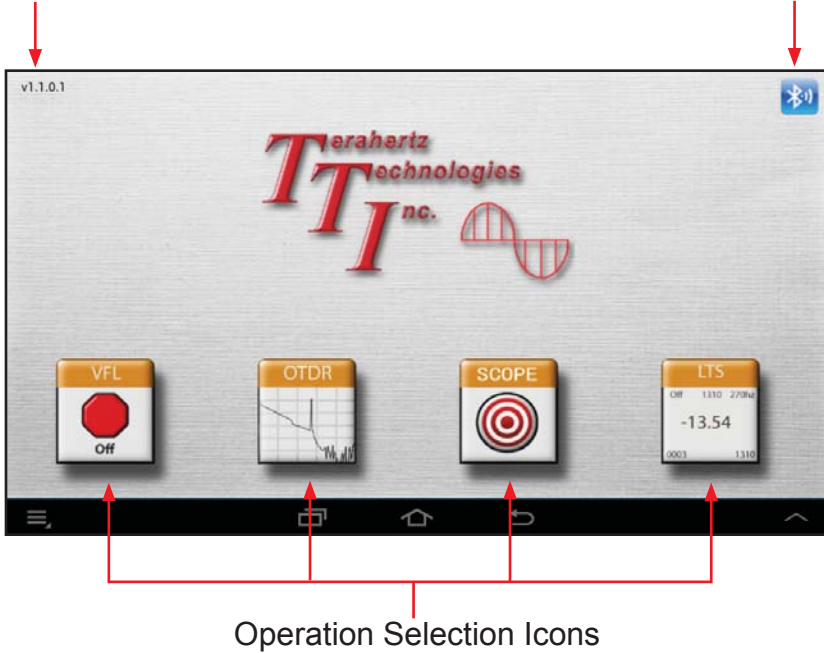


Fig 7.1

Home Screen Menu:

Pressing Menu while in the Home Screen offers the following selections.

Connect:

This is an alternative to the Bluetooth button on the home screen. Pressing Connect opens the Bluetooth screen to pair/connect a device.

Options:

At this time there are no options associated with the application.

Help:

This will open the manual for the application.

About:

Displays version information for the application.

Chapter 7 Application Description

7.2 OTDR Main Screen

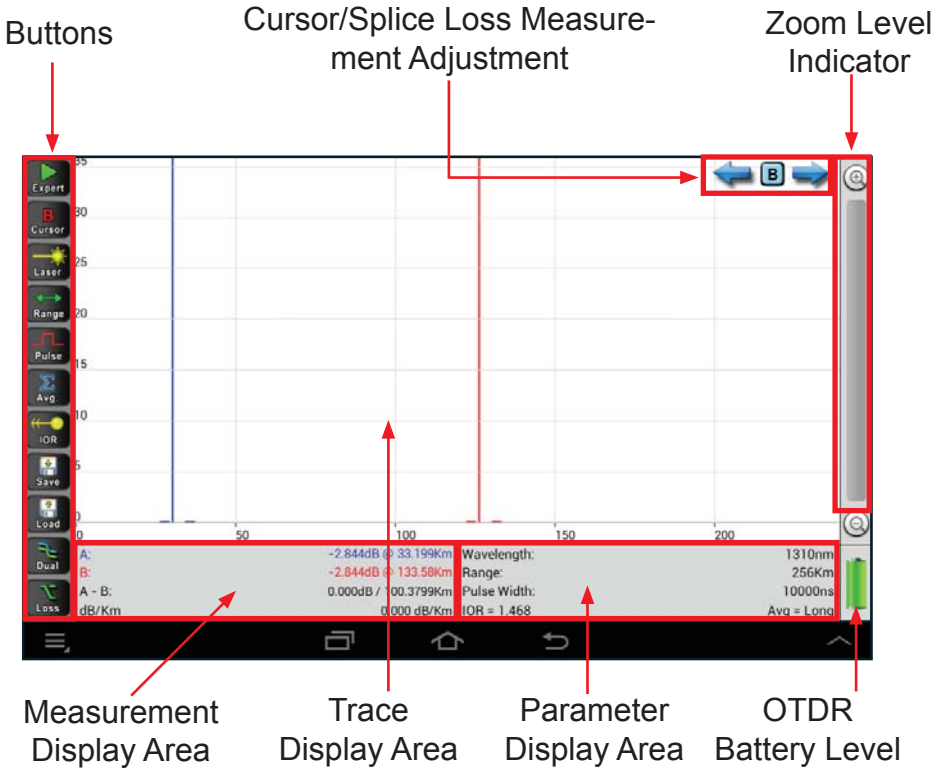


Fig 7.2

OTDR Application Menu:

Pressing Menu while in the OTDR Mode will offer the following selections.

Home:

This will return the user to the Home screen where other operations may be accessed.

Map:

If the Android tablet/phone is equipped with a GPS and the GPS is active, a map will be displayed with the current location indicated.

Help:









This will open the manual for the application.

Chapter 7 Application Description




7.3 OTDR Application Buttons / Descriptions

The list below is a list of the button and brief description of their use. More detailed explanations will be found in later sections of this chapter and in chapters to follow.

To set the operational mode of the OTDR, hold down the scan button and select the desired mode of the of operation.

	Scan Expert Mode	Used when manual adjustment to all parameters is desired.
	Scan Autotest Mode	Used when the approximate fiber length is not know. The OTDR self adjust range and pulse width for proper measurements
	Scan Construction Mode	Used to efficiently test and store many test with the same parameters and settings.
		"A / B" Cursors Toggles between the active cursor
	Select Wave-length	Cycles through the available wavelengths
	Select Range	Cycles through the available ranges
	Select Pulse Width	Cycles through the available pulse widths
	Select Averaging Time	Cycles through averaging time
	Set Index Of Refraction	Used to set the index of refraction
	Save Trace	Stores traces to Android tablet

Chapter 7 Application Description

	Load Trace	Recalls and displays stored traces
	Dual Trace	Loads secondary trace for dual trace view
	Splice Loss Method	Toggles through loss methods of LSA, average or turns off splice loss measurements

7.4 Cursor/Splice Loss Measurement Arrows



Arrows will move the "A" Cursor



Arrows will move the first LSA point

Fig 7.3

In the top right portion of the display is a set of arrows and a button between them. The button is used to cycle the focus of the arrows. The button will cycle through the "A" or "B", cursors, depending on which cursor is active and "1", "2" or "3", where 1, 2, and 3 are the splice measurement adjustment point on the trace. This is described fully in section 8.7.

Chapter 8 OTDR Application Operation

8.1 OTDR Application Operation

Pairing Android Device with OTDR

Turn on the OTDR with the power switch on the front panel of the TTI-FTE-1700. Open the TTI application on the android tablet. Touch the Bluetooth Icon in the top right corner of the display. The Pairing dialog will be displayed on the tablet.

Note

The serial number of the device is located just above the USB port on the top panel of the device.

If the serial number of the unit to be paired with is not present on the Android tablet, press the “Scan For Devices” button. Select the device when it has been recognized by the Android tablet to connect the device and the Android tablet. (If the Android tablet request a pass code to connect with the OTDR, enter 1234.

If the OTDR Device is present on the device list, select the device to connect. A “connected Successfully” message will display once the units connect.

Once the tablet and device have connected successfully, press the OTDR icon to enter the OTDR operation.

8.2 Select Test Mode

There are three modes of operation. The application defaults too the Expert mode of operation. The three modes are Expert, Auto and Construction. The current mode of operation is indicated on the bottom of the Scan button. It will be in one of the following states.

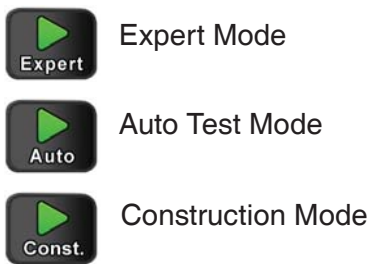


Fig 8.1

To change to mode of operation, touch and hold the Scan button until the Select Test Mode dialog box appears. Select the desired mode of operation and the Scan button with the selected mode will be displayed.

Auto Test is a useful feature when the approximate length of the fiber to be tested is unknown. To conduct an Auto Test, check the testing mode of the unit by looking at the green scan arrow.

Chapter 8 OTDR Application Operation

Warning

Before connecting to a patch cord or fiber under test, be certain the fiber has no active optical sources or instruments connected to the other end. Skin or eye damage could result from other high power sources e.g. EDFAs, or instrument damage could occur voiding the warranty.

Warning

Clean connector 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 that requires the unit be returned to the factory for repair.

Note

The first time Autotest is press upon power-up, a dialog box will be display to set the function of the button. Use the scroll wheel to move between the Range Finder and Construction Mode. Press the Select button once the desired function is highlighted. To change the function once set in a user session, press and hold the Autotest button and the dialogue box will be displayed again.

8.3 Auto Test

Auto Test is a useful feature when the approximate length of the fiber to be tested is unknown.

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 application/OTDR. To change the index of refraction, touch the IOR button, touch the entry box and the keyboard will be available to enter a new value. Once entered, touch done and then save or cancel the entry.

As with any OTDR to assist in obtaining reliable, consistent measurements, the user must be aware of the Index of Refraction of their fiber or cable. The fiber Index of Refraction (IOR) is an important parameter that must be entered by the user to maximize the distance measurement accuracy. The IOR is proportional to the speed of light in glass compared to the speed in a vacuum and can be calculated by the equation $IOR = C$ (the speed of light in a vacuum) / V (the speed of light in fiber). The IOR number can be obtained by 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 2.0.

Chapter 8 OTDR Application Operation

Set Wavelength

To select the wavelength, press the Laser button to cycle through the available wavelengths on the OTDR. The wavelength is displayed in the bottom right portion of the display

Start the Scan

Touch the Scan button and the unit will set the average time to short, the appropriate pulse width and range parameters for the fiber under test. Once the trace is displayed, it may be optimized for analysis as noted in section 8.6

8.4 Construction Mode

Construction Mode is useful when a large number of fibers need to be tested with the same settings at multiple wavelengths. This operation mode test two wavelengths, displays the traces and saves the traces to the next available storage locations.

To operate in Construction mode, use the method describe earlier in this chapter to set the Scan button to Const. mode. The Construction Mode Options dialog will be displayed.

Construction Mode Parameters

Set Base File Name:

The first field is “Set base file name”. The base file name will be followed by an indication of the wavelength and the chronological number of the test.

Set First File Number:

The second field is “Set file number offset”. This will be the number of the first trace saved during a testing session.

Select Wavelengths:

The third field is the wavelengths to be tested. Select the draw down arrow for available wavelengths.

For example: if the base file name is admin-hs, the save file name will be admin-hs_1310_1, where the “admin-hs” is the base name, “1310” is the wavelength and “1” is the number of the chronological number of the trace taken in the session.

Once finished, touch save and continue.

It is necessary to set the range, pulse width and average.

Chapter 8 OTDR Application Operation

Set Pulse Width:

It is best to set the desired pulse width first. Touch the pulse width button to cycle through the available pulse widths. (see chart below)

Set the Range:

Touch the Range button to toggle between the available ranges for the selected pulse width. (see chart below)

		Pulse Width			
		20ns	100ns	1000ns	10000ns
Range	1km	✓			
	4km	✓	✓		
	16km		✓	✓	
	64km			✓	✓
	256km				✓

Fig 8.2

AVG:

Touch the AVG button to select the desired averaging time. The available averaging times for construction mode are short average (~12 seconds) or long average (~5 minutes).

Note

Real Time is not available for this testing method.

Start A Test:

To start the test connect the fiber to be tested to the Proper OTDR port and touch the Scan button.

The Application will test the fiber at the first wavelength, display the trace and save the file. It will then test the fiber the second wavelength, overlay the second test on the first and save the file.

When done with one fiber, remove the connector from the OTDR, insert the next fiber to be tested and touch scan.

8.5 Manual/Expert Mode

Touch and hold the Scan button until the Test Mode dialog appears and touch Expert to enter that mode. Set all the necessary parameters to conduct the test as desired.

Chapter 8 OTDR Application Operation

Set Test Parameters

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 application/OTDR. To change the index of refraction, touch the IOR button, touch the entry box and the keyboard will be available to enter a new value. Once entered, touch done and then save or cancel the entry.

To calibrate the IOR for your particular fiber, take a known distance of fiber or cable (best if around 1 kilometer), and measure the distance with the TTI-3 OTDR set for 2m pulse width, changing the IOR until the measured distances closely match. An error of .001 of the IOR entry (1.468 vs. 1.469) equates to an error of approximately 0.7 meters per kilometer of distance measured.

Set Wavelength:

Touch the Laser icon to cycle through the available wavelengths.

Set Pulse Width:

It is best to set the desired pulse width first. Touch the pulse width button to cycle through the available pulse widths. (see chart below)

Set Range:

Touch the Range button to toggle between the available ranges for the selected pulse width. (see chart below)

		Pulse Width			
		20ns	100ns	1000ns	10000ns
Range	1km	✓			
	4km	✓	✓		
	16km		✓	✓	
	64km			✓	✓
	256km				✓

Fig 8.2

AVG:

Touch the AVG button to select the desired averaging time. The available averaging times are real time- ~2 pps refresh rate, Short average (~12 seconds) or long average (~5 minutes).

Start a Test

With the fiber to be tested connected to the proper OTDR port, touch the Scan button.

8.6 Trace Analysis

Unit of Measure

The distance unit of measure may be either displayed in Kilometer (Km), Kilo feet (Kf) or Miles (Mi). To change the unit of measure, touch and hold the Range button. A dialog will be displayed with the available selections. Touch the desired unit to select.

Zoom

There are six zoom levels, 1x, 2x, 4x, 8x, 16x and 32X. To increase the zoom level, swipe from the bottom of the trace to the top. The zoom level will increase one step for each swipe. To decrease the zoom level, swipe from the top of the trace to the bottom. The zoom level will be indicated for about 4 seconds at the top of the display. There is also a zoom bar on the right hand side of the display, the plus or minus buttons may also be used to increase and decrease zoom levels. The bar will change color to indicate the zoom level.

Cursor Movement

The current active cursor is indicated by the button on the left side of the display. Either an "A" or "B" will be displayed on the button. The letter displayed is the active cursor. Also, the box between the two arrows in the top right portion of the display will change with the active cursor if the cursor is indicated in that box. If the splice loss measurement point is indicated it will remain as the focus of the arrows.

8.7 Loss Measurements

Definitions:

2 Point loss:

2 Point loss method takes the difference in vertical height between where the A and B cursors cross the fiber trace to determine loss.

dB/Km:

The dB/Km (dB/Kft) loss method takes the 2 Point loss in dB and divides by the distance between the cursors in Kilometers (Kilo feet). For accurate dB/Km (dB/Kft) loss measurements, the two cursors must be on level backscatter points at least 100m apart (NA will show for distances that are too short).

Basic Splice Loss:

Basic Splice Loss method takes the loss around cursor A and B. The averaged areas before and after the splice must be level backscatter, free from defects or splices. Set a cursor at the beginning of an event and set splice loss measurement areas as directed below for accurate splice loss measurements. Splice loss measurement areas follow the undulations of the back scatter line.

Chapter 8 OTDR Application Operation

Least Squares approximation (LSA):

Least Squares Approximation (LSA) Splice loss method gives the use 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. LSA measurement areas are drawn as straight lines without regard to the undulations of the back scatter

The loss measurements are displayed in the lower left portion of the display. See Fig 8.3 below.

Splice Loss/LSA Measurement Areas

Cursor/Loss Measurement Area Adjustment Arrows



Splice Loss Measurements

Fig 8.3

Setting Basic Splice Loss Measurement Areas

The splice loss areas around the cursors are adjustable using the blue arrows in the top right corner of the display. The focus of the arrows is indicated by the letter or number in the displayed on the button between the two arrows. "A" and "B" indicators focus the arrows on the cursor movement itself. "1", "2" and "3" focus the arrows on the splice measurement points as shown in Fig 8.5.

It is necessary to set these areas in clear backscatter to acquire the most accurate measurements. For accurate measurements, these areas can not include other events such as reflective or splice events.

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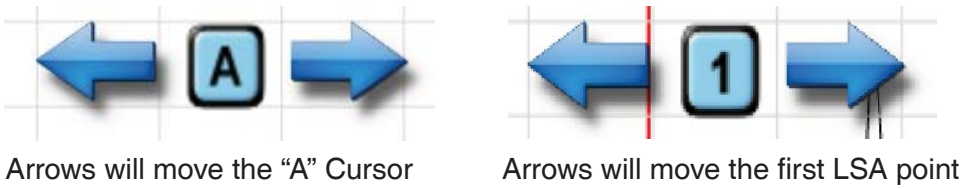


Fig 8.4

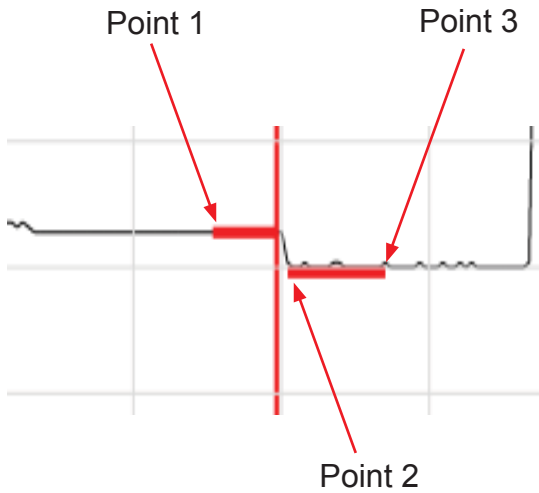


Fig 8.5

Setting Least Squares Approximation (LSA) Splice Loss Measurement Areas

The loss measurement/LSA areas may be expanded, decreased or moved along the backscatter area adjacent to the event. To adjust these measurement areas, use the arrows in the top right corner of display as shown in figure 7.1 It is necessary to set these areas in clear backscatter to acquire the most accurate measurements. The areas should not include other events such as reflective or splice events. A line is displayed to assist with setting the proper LSA areas. The LSA areas are set properly when the LSA lines overlay the backscatter sections of the trace before and after the event.

Chapter 8 OTDR Application Operation

LSA Examples

LSA Set Too Early:

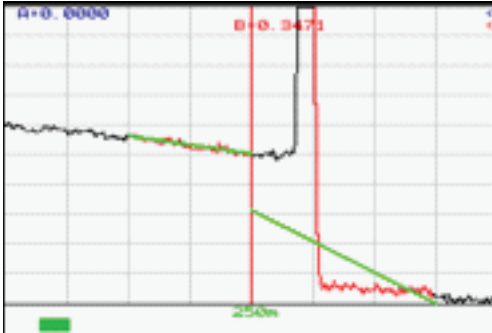


Fig 8.6

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

LSA Set Too Late:



Fig 8.7

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

Proper LSA Setting:

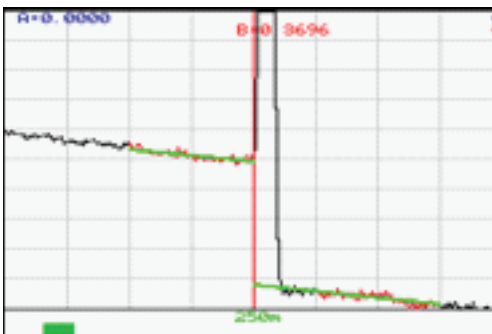


Fig 8.8

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

Chapter 8 OTDR Application Operation

8.8 Event Analysis

NOTE:

When using the event table, 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/Exit Event Analysis

To open the event analysis table, touch anywhere in the bottom shaded area of the display. To exit event analysis, touch the column title bar, or touching an event will close the event analysis and move the active cursor to that event.

3	✓	0.7734	-0.002	+0.092	-NA-	-77.6
4	✓	0.7980	-0.014	+0.003	-NA-	-77.6
5	✗	0.9176	+12.68	-0.012	-0.108	-57.4
6	✓	0.9176	-NA-	+2.408	+2.678	Link

Fig 8.9

Table Definitions

Event Number:

Indicates the event in sequence, where the higher the number the further distance from the OTDR the event occurs. “E” which is always displayed in the bottom row is the event determined to be the End of Fiber (EOF).

✓:

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

Km:

Event Location, Km for Kilometer or KF if unit of measure is Kilo-feet MI for mile. This is the distance/location that the event occurs in the respective unit of measure.

Loss:

Event Loss, where a positive number is the amount of loss and a negative number would be indicating a gain. This is a settable threshold for the Pass/Fail feature.

Chapter 8 OTDR Application Operation

2POINT:

2 Point Loss from the end of the dead zone of the previous event to the beginning of current event.

dB/Km:

dB per Kilometer if in KM unit of measure and DB/KF if in Kilo-Feet unit of measure. This is the calculated loss per Km or Kf from the end of the dead zone of the previous event to the beginning of the current event.

TYPE:

Event Type is the type of event or the ORL measurement. If the event is a splice with no reflection, "splc" will be displayed and if the event contains a reflection, the ORL value will be displayed. This is a settable threshold for the Pass/Fail feature

8.9 Sensitivity Settings

There are three levels of sensitivity while in the event table. To change the event sensitivity is changed by a long touch in the title bar of the event analysis table. Select Set Sensitivity and choose either high, medium or low. High sensitivity present events with loss down to approximately 0.1dB, Medium (Md) with events down to approximately 0.2dB and Low (Lo) for event down to about 0.5dB. Highest sensitivity settings should be used for traces with high signal level, low noise, long pulse and long average.

8.10 Pass/Fail Settings

Splice, ORL and Link are all settable thresholds for Pass/Fail purposes. To set the thresholds, long touch the title bar of the event table. Select the threshold to be adjusted. A red X will be displayed in the P/F column and the suspect threshold value will be displayed in red.

Examples:

- Splice: If a splice needs to be less then 1dB, set the threshold to <1.0. If 1.0 would be accepted, set threshold to 1.01db.
- ORL: If an ORL needs to be less then -50dB, set the threshold to <50. If 50dB is acceptable, set the threshold to <49.
- Link: If the link loss needs to be less then 20dB, set the threshold to <20. If 20db link loss is acceptable set the threshold to <21.

Chapter 8 OTDR Application Operation

8.11 Dual Trace Operations

There are three functions that can be accomplished with dual trace operation, dual trace comparison, macro bend analysis and bidirectional analysis.

Dual Trace Comparison

Load Primary Trace

Load a trace using the Load button. To do this, touch the load button and the stored traces will be displayed. Select the trace to be used as the primary trace. All of the parameter and measurement information displayed will be gathered from this trace.

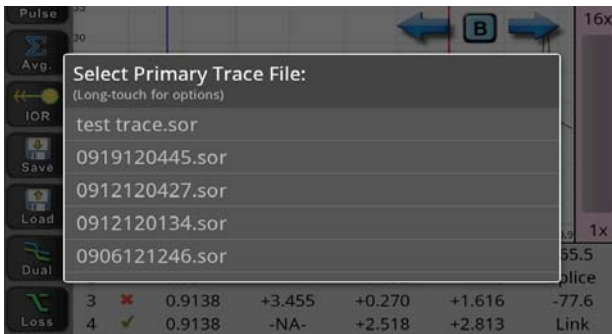


Fig 8.10

Load Secondary Trace

Touch the Dual button and the stored traces will again be displayed. Select the trace to be compared to the primary trace.

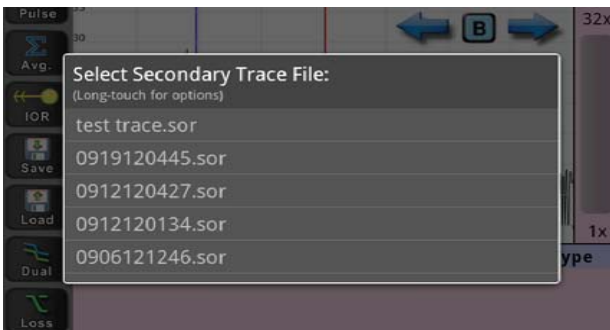


Fig 8.11

Chapter 8 OTDR Application Operation

Remove a secondary trace or Swap Primary with Secondary:

To unload the secondary trace, or to swap the primary and secondary traces, long touch the Dual button and these options will be displayed. Touch the desired option to continue.

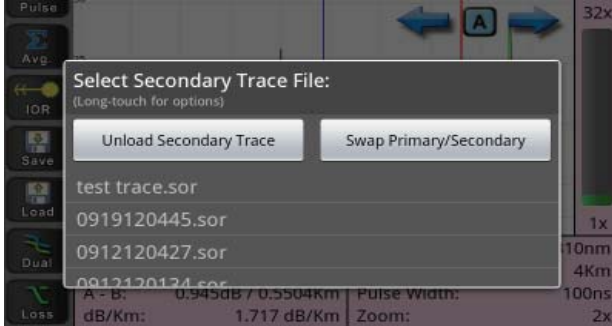


Fig 8.12

Macro Bend Analysis

Macro bend analysis offers the user the ability to have the device analyze a fiber trace at 1310nm and compare it to the same fiber tested at 1550nm. If there is a discrepancy of greater than 0.2dB between the two test, the device will display a "macro" tag in the type field of the event table on the 1550nm trace.

To use the macro bend analysis, load either of the traces to be compared with the load button. To load the second trace press the dual button, find and long touch the trace to be compared. The dialog shown in Fig. 8.13 below will be displayed. Select "Perform Macro Bend Analy" and the two traces will be displayed. The 1550nm trace will be display as the primary trace in black and the 1310 trace will display as secondary trace in green. The event table on the 1550nm trace will have a second line displayed on any event that is deemed to be a macro bend with "Macro" displayed in the Type column.

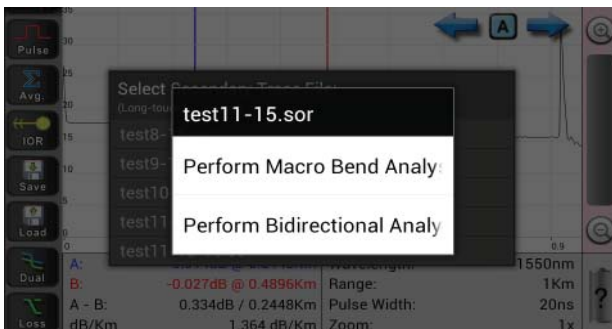


Fig 8.13

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Bidirectional Analysis

Bidirectional analysis offers the user the ability to average loss of test taken in both directions. Test to be averaged must have the same parameters.

To use the bidirectional averaging capabilities, load one of the trace take of the fiber to be tested with the load function as described earlier in this section. Touch the dual button and find the file of the test conducted in the opposite direction of the first trace loaded. Long touch the file and the dialog show in figure 8.13 will be displayed. Select "Perform Bidirectional Analy" and the "Enter a File Name to Save Results" dialog will be displayed. Touch the file name area and enter a name for the file that will be stored with both traces and averaged results.

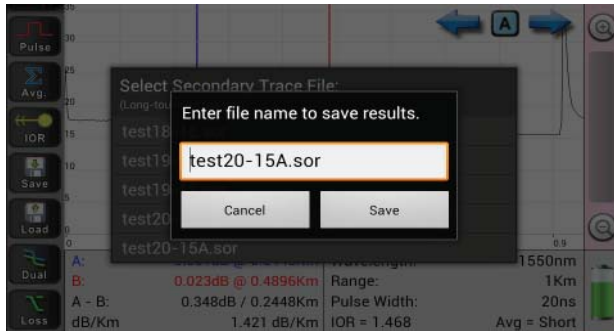


Fig 8.14

Chapter 9 File Management

9.1 Saving a Trace

To save a file, touch the Save button. The following dialog will be displayed. Touch the File Name box and the on screen keyboard will be available. Enter the desired file name and touch next. The focus of the keyboard is moved to the notes section. Enter notes if desired and touch Save File. The file name structure is the same as that available on the tablet. All files are stored in SR4731 file format with a .sor extension. If that file name already exist a message will be display stating the fact and a new name will be required.

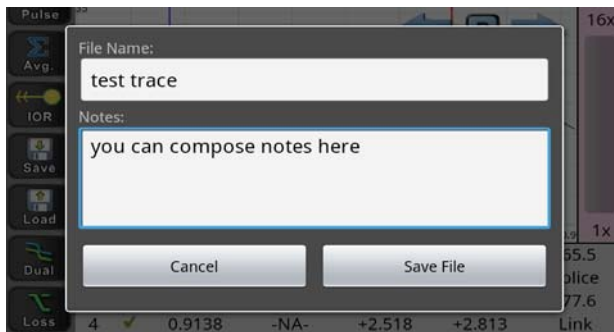


Fig 9.1

9.1 Loading a Trace

Touch the load button and the following dialog will be displayed. Touch the desired file for viewing. This will also be the primary file if dual file viewing is going to be used. A long touch on a file will display an options menu. These options include Edit Notes, Rename File, E-Mail File and Delete File.

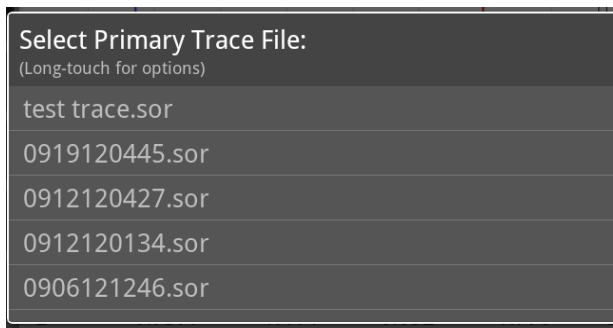


Fig 9.2

Chapter 9 File Management

Editing Notes:

To edit notes associated with a file, touch the load button and long touch the file to which the notes are associated. Make the desired change, touch Done and save or cancel the changes.

Rename File:

To rename a file, touch the load button and long touch the file that needs to be renamed. Make the desired change and save or cancel the action.

E-Mail File:

Touching the E-Mail File option, the phones e-mail options associated with you tablet will accessed.

Deleting a File:

To delete a file, touch the load button and long touch the file to be deleted. Touch delete from the options menu and confirm desire to delete the file.

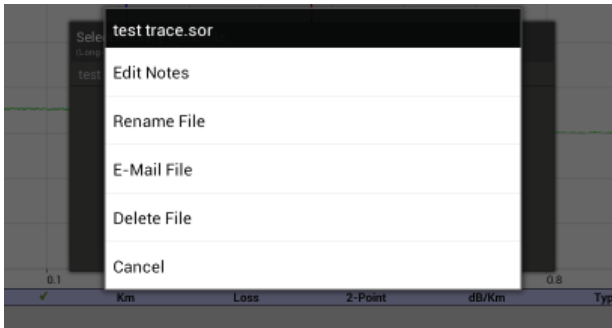


Fig 9.3

10.1 Entering Loss Test Set Mode

The LTS application is entered from the Home Screen. Touch the LTS button to enter Loss Test Set Operation.

10.2 Loss Test Set Display

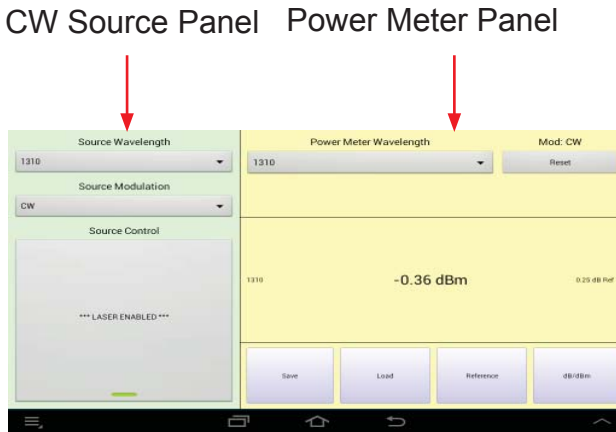


Fig 10.1

10.3 Source Operation

CW Source Display Panel

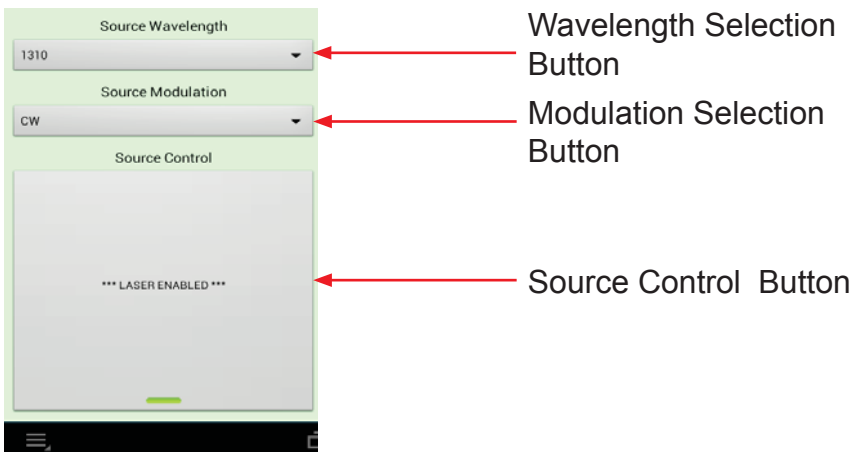


Fig 10.2

Wavelength Selection Button

Touch the Source Wavelength drop down bar to show available CW light sources.

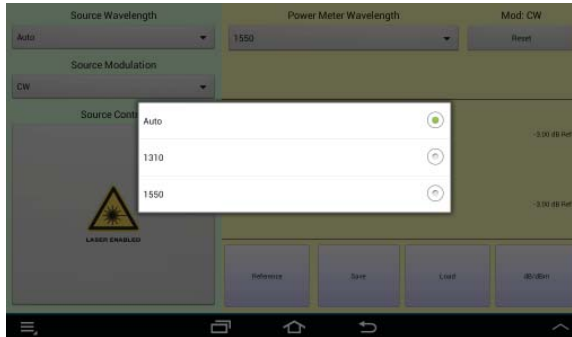


Fig 10.3

AutoTest

Along with the standard wavelengths, Auto is one of the selections available in the drop down for the wavelength selection button. Auto is used to test a connector/fiber at up to three wavelengths at a time. The loss test set will cycle through the selected wavelengths and temporarily store the loss measurements.

Once the unit has cycled through the selected wavelengths, press the save button to store the test.

NOTE:

The wavelengths available are determined by the installed wavelengths on OTDR. These wavelengths may be turned on or off (selected) with the λ (Lambda) icon in the icon menu on the OTDR itself. The Android device must be disconnected from the OTDR and the Filter operation is completed with the operation panel of the OTDR.

NOTE:

A reference measurement is not used in the Auto Test Mode. The Source is modulated and has a power level of -3dBm (-6dBm@1625). This method of measurement does not take into account the launch condition, thus the manual method of testing should be used when highly accurate measurements are required such as when testing the loss of an individual connector. The Auto Test annunciator will be displayed during Auto Test loss measurements. Two or more loss measurements are best viewed in the Zoom mode where all the selected wavelengths will be displayed at one time on the display.

Fig 10.4

Source Modulation Button

The modulation function is useful for fiber identification and for general purpose optical component testing. If the The Android unit that receives one of the modulated frequencies will flash the received frequency in the top right corner of the display.

There are four source modulation settings. 270 Hz, 1000Hz, 2000Hz and CW (constant wave). To change the modulation setting, touch the Source Modulation bar and select the desired modulation speed from the drop down menu.

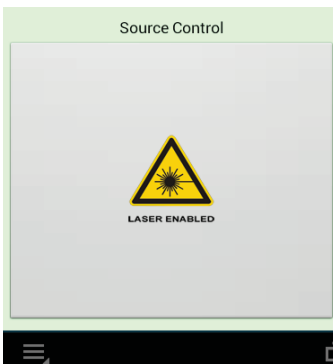


Fig 10.5

Source Control Button

To turn the laser on and off, touch the Source control button. When the source is enabled, the Laser icon will show a yellow laser icon enabled.

Source Active



Source Inactive

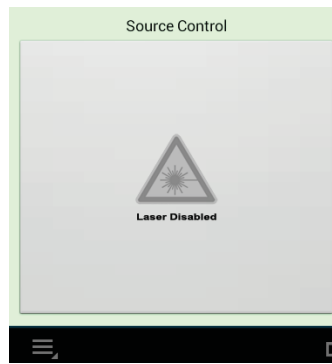
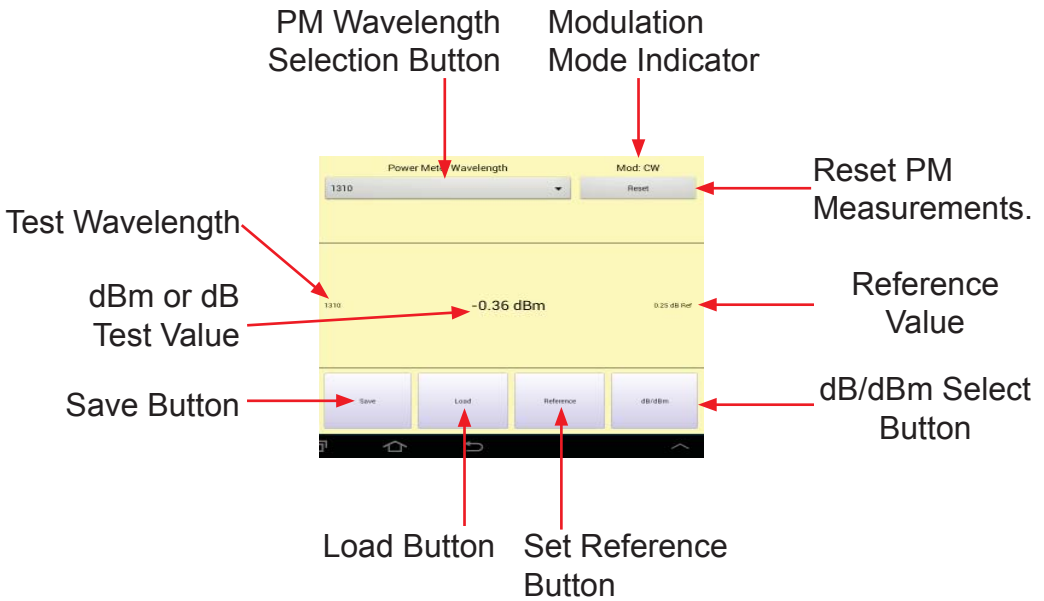


Fig 10.5

10.4 Power Meter Operation

Power Meter Display Panel



Load Button

Fig 10.6

Power Meter Wavelength Selection

Touch the Power Meter Wavelength bar and select the desired wavelength from the drop down menu. Up to three wavelengths may be displayed and stored at one time on the power meter display.

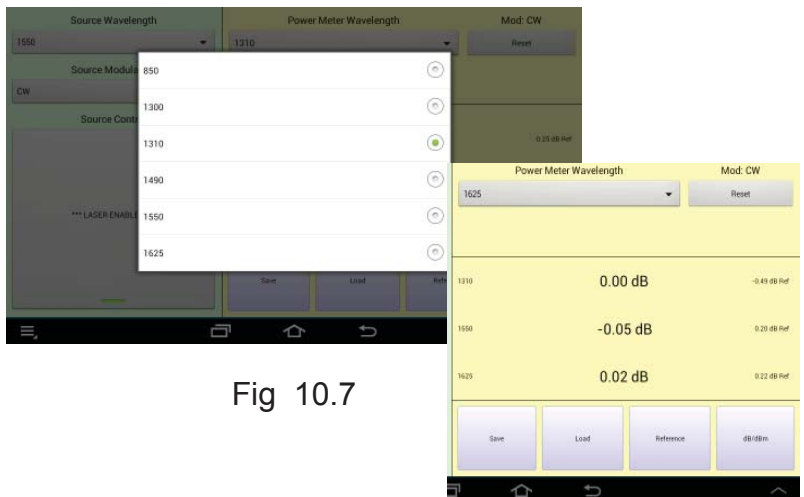


Fig 10.7

Display with Three Wavelengths

Reset Button

To clear any test displayed on the screen, touch the reset button. This only clears the displayed test values from the screen. It does not erase any stored values or remove reference settings.

Reference Button

Use the reference button to store a reference value to conduct relative loss measurements for the selected power meter wavelength. In order to alleviate accidental reference changes, if a reference is stored and the reference button is touched, a dialogue will be displayed asking for confirmation of the change.

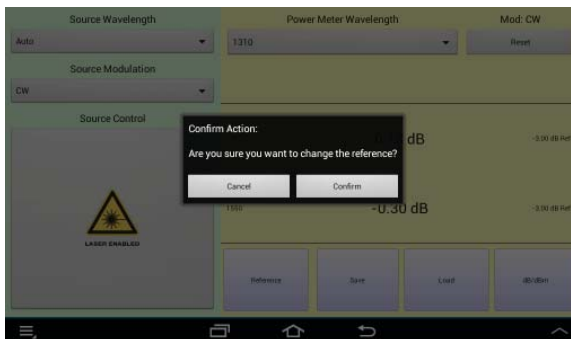


Fig 10.7

Relative Measurements

To make a relative power measurement you must first save the reference power level. To store a reference level, attach reference cord/s to the source and meter. Energize the light source, make sure the correct source and power meter wavelengths are selected. (If using a compatible source with this power meter, the power meter will be selected by the unit based on the light source signal) touch the Reference button and confirm the change in reference. The reference is now stored in nonvolatile memory and displayed at right side of the display next to the dB reading. The units of the display will now change to dB. Subsequent readings will now be displayed in terms of dB relative to the stored reference value. A reference memory location is available for each selected wavelength.

Remove the connector from the power meter port and place the fiber under test in line between the reference cord and the power meter port. The reading displayed will be the loss of the fiber under test relative to the reference. Once all wavelengths for this fiber have been tested, touch the Save button to store the results.

Save Button

To save the test values displayed on the screen, touch the Save button. A dialogue will be displayed to enter a file name. Standard Android file naming convention applies.



Fig 10.9

Load Button

To load saved test, and view it on the display, touch the Load button and select the desired test from the file list.



File List

Selected LTS File Displayed

Fig 10.10

dB/dBm Button

Touch the dB/dBm button to toggle between dB and dBm.

11.1 Video Scope Operation

Note

The Android device is used to store the images to be save with testing results its does not display the scope image in real time. Use the OTDR for real-time viewing.

Connect the Video probe to the proper port on the top panel of the OTDR. Touch the Scope button on the home screen of the Application. The tablet/phone will immediately begin to update the image. This is indicated by a progress bar at the bottom of the display.

Refresh a Scope Image

Once the image is focused in properly, touch the Menu button and then the refresh button on the Android tablet/phone. The image will refresh and the status will be indicated with the progress bar.

Save an Image

To save an image, use the menu button and touch save. A dialog box will be displayed to enter the file name. Touch the name entry box and the keyboard will be displayed. Enter the file name and touch save file.

Load an Image

To load and image, enter the menu by touching the menu button. Touch load and a dialog will be displayed with the stored Scope files. Touch the desired file and it will be displayed.

Exit Video Scope Feature

To exit the Video Scope Feature, touch the menu button on the Android device and touch home when the menu is displayed.

12.1 Visual Fault Locator Operation

Connect a fiber connector to the Visual Fault Locator port on the top panel. Touch the VFL button on the home screen of the Android device. The VFL indicator on the button will show CW for continuous wave. Touch it a second time and the indicator will show MOD for the modulation mode. Touch the button a third time to turn off the VFL.

There is no need to exit the VFL mode. It will be deactivate is any other feature is entered from the home screen

OTDR Specifications	
Wavelength	850, 1300, 1310, 1550, ± 20 nm
Dynamic Range	27/26dB MM, 32/30dB SM
Pulse Width	20 - 10,000 ns
Units of Measurement	km, kf
Event Dead zone	2m
Attenuation Dead Zone	5m
Resolution	.25 - 64m
Distance Uncertainty	$\pm(0.75m + 0.005\% \times \text{distance} + \text{sampling resolution})$
Full Scale Distance Range	1-64km MM , 1-240km SM
Typical Real-time Refresh Rate	4 Hz
Group Index of Refraction (GIR)	1.024 - 2.048
Linearity	$\pm .05$ dB/dB
Memory Capacity	1000
Memory Type	Internal
Power Supply / Charger	Universal
Battery	4hr
Storage Temperature	-20 to 60 C
Operating Temperature Range	-10 to 50 C
Dimensions (without rubber boot)	7.62" L x 3.88" W x 1.56" H (194mm L x 99mm W x 40mm H)
Weight	1.6 lbs.
Communications ports	USB
Connector Styles	FC, ST or SC Interchangeable
Accessories Provided	Universal Power Adapter w/US, UK, CE, and AU Plugs, Interchangeable FC Standard (ST or SC upon request), Windows/Telcordia SR4731 Software, Rubber Boot, USB Cable, Manual

TTI reserves the right to change specifications without notice.

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
Units of Measurement	dBm, dB
Resolution	.01 dB
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
Power input Range	+5 to -77dBm
Autotest Range	0 to -40dB

TTI reserves the right to change specifications without notice.

Light Source Specifications

Wavelengths	850, 1300, 1310, 1550 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

TTI reserves the right to change specifications without notice.

Visible Light Source Specifications

Emitter Type	Laser
Wavelength	650nm ± 5 nm
Laser Safety Class	Class IIFDA21 CFR1040.10 & 1040.11 IEC 825-1: 1993
Connector Type	2.5mm Universal
Output Power	1mW Max.

TTI reserves the right to change specifications without notice.

14.1 Repair Information

If repair is required, simply call the factory for return instructions and a RMA number.

14.2 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 at “turn-on”. The version is displayed on the bottom right-hand corner of the display. The version changes and approximate release dates are as follows.

OTDR	V1.0.0.2 - 11/2012 - Original release
	V1.1.1.0 - 11/2013 - Bidirectional averaging and Macro Test feature
Application	V1.0.0.2 - 11/2012 - Original release
	V1.1.1.1 - 11/2013 - Bidirectional averaging and Macro test feature