



## **FTE-7500A-CWDM-OTDR**

### **Operating Instructions**

#### **Avoid Exposure**

#### **Laser Radiation Emitted From Equipment Aperture.**

*This product conforms to CDRH standards for laser product  
Per 21 CFR 1040.10 & 1040.11*



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## 1.0 OTDR Quick Start Guide


Press  to turn on the OTDR.

The OTDR function will be highlighted. Press  to initiate the OTDR application.



Connect the fiber to the appropriate port. (Select Multi Mode or Single Mode if OTDR is a quad wavelength unit)

Press  to enter the Menu mode.

Use the Scroll Wheel to highlight the  in the icon list.



Press  to cycle to the desired wavelength. The OTDR will start a scan at the parameters displayed.



### If approximate fiber length is not known:



Press the  button after selecting the wavelength, (Press  on Range Finder) the Auto Test feature will start and set an appropriate pulse width and range automatically.

### If approximate fiber length is known:

Press  and scroll to:


 Press  to cycle through the averaging times of - R/T for real-time, Short for a 10 second average time or Long for a 5 minute averaging time.

 Press  to cycle through the pulse width - select 2m for fibers up to 4 kilometers, 10m for fiber up to 16 kilometers, 100m for fibers up to 64 kilometers or 1k for fibers up to 240 kilometers.


 Press  to toggle between to available range settings.

Press  to exit the menu mode.



To manually start a scan:

Press  while the unit is idle.


To stop a scan:


Press  while the unit is scanning.

To view the Event table:

Press  to enter Menu mode and use the Scroll Wheel to highlight the Show Event soft key and press the  button to change to the event analysis mode.





## 2.0 Loss Test Set Quick Start Guide


Press  to turn on the OTDR.

Use the Scroll Wheel to highlight the LTS function icon and press .

Connect a properly prepared reference cord to the power meter port and the light source port. (If the unit is a quad wavelength unit, ensure the proper port is connected)

Press  and use the Scroll Wheel to highlight the Source soft key at the top left of the display.


Press  to energize the first wavelength. Once stabilized, use the Scroll Wheel to highlight the  icon on the right side of the display. Press  to set the reference for that wavelength. If a second wave length is going to be tested, scroll back to the Source soft key and press  to cycle to the next desired wavelength and repeat the step to set the reference.


Press  to exit the Menu mode.

### To conduct a Manual Test

If using the OTDR as the light source, perform reference procedure as above and place fiber under test in line between the reference cord and the power meter port.

Ensure you are in Menu mode and Scroll to Source soft key.



Press  to cycle through the wavelengths and choose the wavelength to be tested.

Press  to exit Menu mode.

Press select to store the measurement to the location indicated in the bottom left of the display.

### To conduct an Auto Test

**Note:** Setting a reference in Auto Test mode is not necessary. The source is modulated and a Reference of -3dBm (-6dBm-1625) is assumed.

Connect fiber to be tested, press the  button and the light source will cycle to test each wavelength, the power meter will read the signal and hold test in temporary memory until the  button is pressed and the test is stored into the memory location indicated at the bottom left corner of the display.

Ensure that the unit has cycled through all the desired wavelengths prior to pressing the select button.

Auto Test will be displayed at the bottom of the display to indicate the Auto Test Mode.

## 3.0 Introduction

The Terahertz Technologies Inc. Cobra OTDR is a low cost portable Optical Time Domain Reflectometer with the core functions required to measure optical fiber from one end during installation, repair and verification. This Advanced OTDR is equipped with a 4" TFT color graphic presentation of fiber loss vs. distance, with up to four wavelengths. It is available standard in dual triple and quad configurations and also available in CWDM configurations and an active 1625nm source in a triple wavelength configuration for PON Network, in-service testing.

This Advanced OTDR is packaged in a rugged aluminum housing which is further protected with a rubberized boot. All controls are accessible via a 7 key weatherproof membrane with a capacitive touch/scroll wheel, offering simple, straightforward functionality.

This OTDR 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 1625nm pulsed laser sources. The CWDM OTDRs can house up to 12 CWDM sources between 1271nm and 1611nm. The backscatter receiver uses a temperature compensated avalanche photodiode for reliable, stable performance in fiber links from tens of meters to over 240Km. A high-speed microprocessor, provides the N-point averaging function and control for as little as ½ second Real Time update rates.

The TTI OTDR is available with an Auto-Wavelength Switching Power Meter. The power meter is calibrated at the 850,1300,1310,1490,1550 and 1625nm, and CWDM wavelengths for the CWDM OTDRs. It will store up to 10,000 power meter tests. The Advanced OTDR software incorporates a feature to supply loss measurement reports and a real-time graph.

The color TFT LCD display provides a powerful yet simple set of fiber parameters and control indications to view an entire fiber link or zoom in and analyze a splicing point or defect in the fiber. The display shows all or just the desired loss information. 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, scanning speed, and a battery gauge.

The 7 key panel provides simple straightforward commands to take a scan, make measurements or navigate the soft-key and Icon menus. A new scan is accomplished as easily as pressing the Scan button, within ¼ second fiber trace data is accessible. With the use of the Auto Test button the OTDR can automatically adjust for an unknown fiber length (Range Finder Mode) or test a large number of fibers at 2 wavelengths, store the test and display the two test with just the press of just one button. (Construction Mode) The soft-key menus are navigated pressing the menu button and scrolling to the soft key bar located at the top of the display. Instrument setup is easily accomplished with the use of the Icon menu located down the right-hand side of the display when the Menu button is press and the unit is in Menu Mode.

The Advanced OTDR also supports the VIS-300 Video Probe and displays a digital image of the connector end face that can be zoomed and centered on the display. The image can also be stored for later review or printed with trace documentation.



## 4.0 Preparation for Use

### 4.1 Inspection

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

#### The shipping carton contains the following:

- OTDR, with protective boot and 8-AA NiMH batteries installed
- Universal AC/DC charger with interchangeable mains
- CD with Windows™ compatible software
- USB cable
- Set of interchangeable adapters, ST/SC and FC Adapters for each OTDR port and FC/ST/SC/univ. 2.5mm and univ. 1.25mm adapters for the Power Meter Port

### 4.2 Identification/Configuration

The instrument's Model, Part Number, Serial Number, Date of Manufacture and Configuration are indicated on a label located on the bottom plate of the unit. The instrument's history is filed at the factory by part number and serial number.



Fig 4.1

### 4.3 Power Requirements

The instrument is equipped with a 100-240V-0.4A input universal battery charger with 13–.6V, 0.75A, center positive output AC/DC charger that is supplied with interchangeable mains for US, Great Brittan, Europe and Australia which recharges the unit's internal NiMH batteries (8 - AA, 2000mA hours). Depending on usage, fully charged battery pack will typically enable 8 to 10 hrs. of use. Typical fully discharged batteries require 6 - 8 hours of recharging.

Battery replacement is not recommended however if you must replace the batteries follow these procedures. Carefully remove unit from protective boot and remove the two screws from top plate and bottom plate that retain the back cover. Carefully remove back cover and remove the two screws that hold the battery covers in place. Replace only with 8 AA NiMH 2000mAh batteries. If you install NiMH batteries that are dead or less than 1 volt each, charge these batteries for one (1) hour before using the Precision Rate Optics OTDR. For maintenance, batteries require a monthly periodic recharge.

**WARNING:** To Prevent Fire or Shock Hazard: Do not install other battery types; 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. Any other condition will void the warranty.

### 4.4 Laser Safety

The OTDR has been configured with laser diodes having central wavelengths of 850nm, 1300nm, 1310nm, 1490, 1550, 1625 or up to twelve CWDM wavelengths from 1271-1611nm . The unit has been designed to comply with 21 CFR (Code of Federal Regulations) 1040.10 and 1040.11, for Class I emission limits. Although the CDRH does not consider Class 1 levels to be hazardous, we suggest limiting exposure by not looking directly into the laser aperture. Also, **do not under any circumstance** view or inspect the laser output fibers, connectors or the fiber under test through collimating or focusing optics unless the unit is turned off, batteries are removed and power adapter is disconnected.

The VFL is equipped with a 650nm Class II laser.

**WARNING:** Never clean or look directly into the fiber optic connector or the end of fiber attached to the OTDR or VFL unit while they are energized, to do so will expose the user to laser radiation and could result in personal injury or instrument damage.

**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.

## 5.0 FTE-7500A-CWDM Description

### 5.1 Mechanical Description

#### Enclosure

The Precision Rate Optics OTDR 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, electrical connectors, and the glass display. Use a mild cleaning agent and damp soft cloth to clean 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.

#### Packaging

The instrument is shipped in a protective cardboard container, universal charger with interchangeable mains, FC/ST and SC interchangeable fiber adapters, USB Cable and a CD with Windows™ compatible software. Save the protective packaging for storage and shipment.

### 5.2 Physical Description

#### Bottom Plate

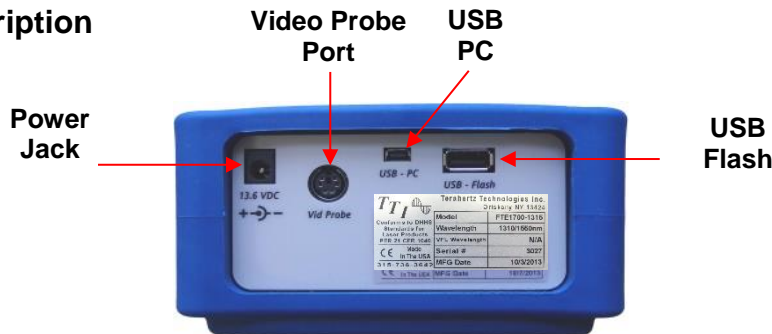


Fig 5.1

#### Power Jack Port

100-240V-0.4A center positive input, 13.6V, 0.75A, output AC/DC charger port.

**WARNING:** To Prevent Fire or Shock Hazard: Do not install other battery types; 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. Any other condition will void the warranty.

#### Video Probe Port

Six Pin DIN connector for use with TTI's VIS300 Video Probe.

#### USB Flash Drive Port

Located on the bottom panel is the USB Flash Drive port. Files may be downloaded to or uploaded from the external memory device. Screen Shots are stored directly to the USB flash drive.

**Note:** When uploading files from a Flash Drive, the characteristics of the file must be supported by the OTDR being used. For example: the OTDR must support the wavelength of the trace file from the flash drive. MM traces cannot be viewed on an OTDR that only supports SM operation.

**Note:** Do Not Remove USB Flash Drive While Accessing.

#### USB/PC Port

Located on the bottom panel is the USB/PC port which is used to connect the OTDR with a computer for downloading stored data and for operation of the remote VI application, with the supplied Windows™ compatible software.

## Physical Description (Continued)

### Top Plate

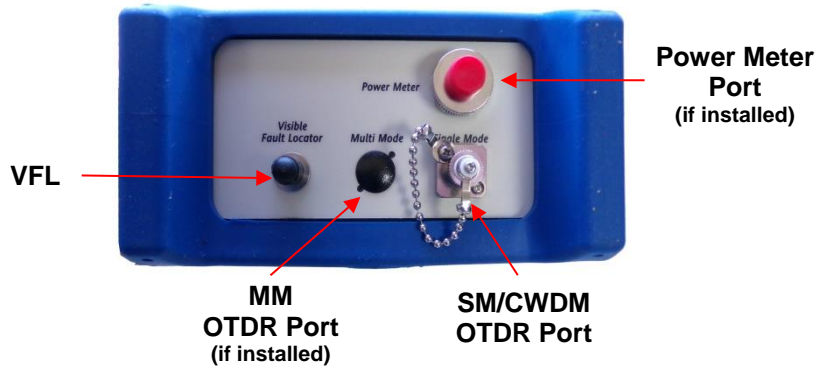


Fig 5.2

### VFL Port

The Visible Fault Locator (VFL) port is a 2.5mm universal port with a 650nm visible laser.

**WARNING:** Never clean or look directly into the fiber optic connector or the end of fiber attached to the OTDR or VFL unit while they are energized, to do so will expose the user to laser radiation and could result in personal injury or instrument damage.

### Power Meter Port

The Power Meter Port is a universal port that accepts ST, FC, SC, 2.5mm and 1.25mm screw on adapters.

### OTDR Ports

Depending on the model OTDR, there is either one or two OTDR Ports. These ports have 2.5mm interchangeable adapters that are held in place by m2 screws. If the adapter is equipped with a chain adapter cap, the retaining screw

### Front Panel

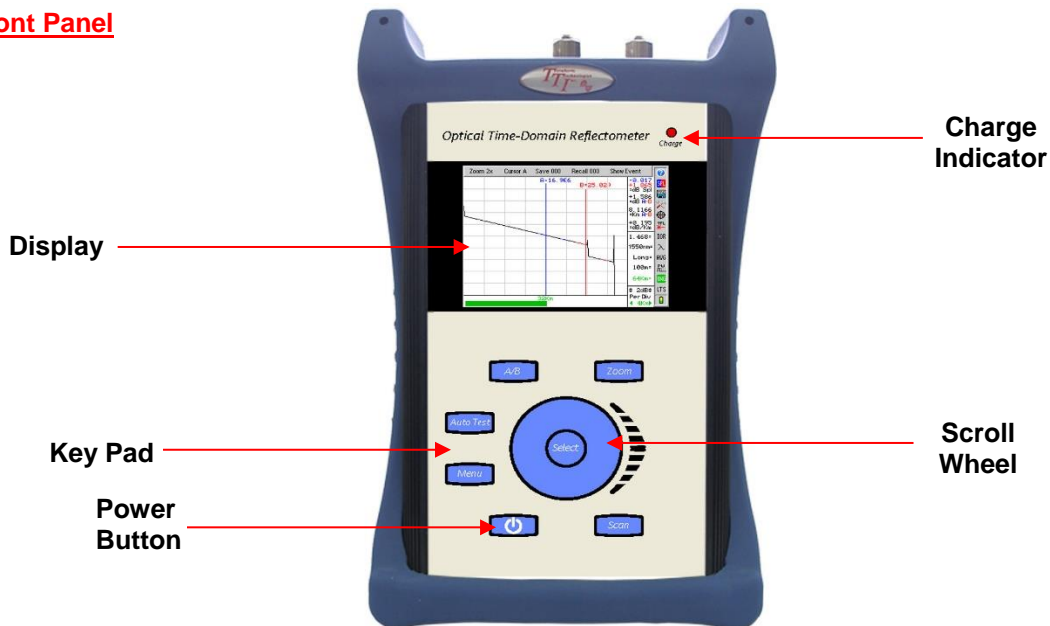


Fig 5.3

Front View (Continued)

### Display

This units is equipped with a 4" color TFT display

### Charge Indicator

The charge indicator glows bright when charging and dims when the batteries are fully charged.

### Key Pad

The FTE7500 is equipped with a 7 button key pad. For a full description of functions, please see sections 7.1 and 10.1

### Scroll Wheel

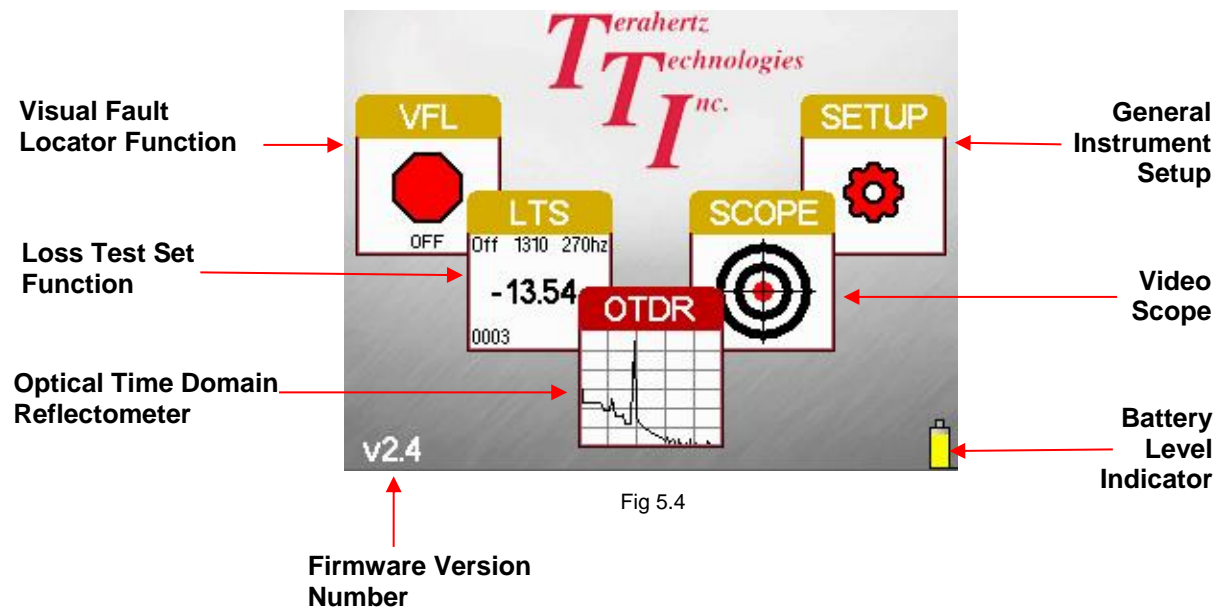
The scroll wheel is used to navigate through menus, move cursors and make adjustments to settings.

### Power Button

The power button is used to power on and off the FTE7500A

## 5.3 Home Screen

Use the scroll wheel to highlight and then the select button to open the desired function. There is a Home icon or Home soft key in each application used to return to this Home Menu Page.



## 6.0 Settings and Features

This section covers the settings and features that are universal in nature. These settings are accessible by selecting the Settings Tab on the Home Screen. Those setting or features that are limited to one function are covered in dedicated sections of this manual.

When the desired changes have been made, scroll to the Home icon at the bottom of the screen and press select to return to the home Screen.

### 6.1 Settings Tab

#### Date/Time

The OTDR applies a date/time stamp to saved files. The date and time are set at the factory with a MM/DD/YY date and 24 hour clock. To change the date and time, highlight the Date/Time settings tool and press the Select button. A dialog box with the date and time will be displayed. Use the scroll wheel to change each segment, use the Select button to move between segments and then to Redo option. Use the scroll wheel to select Save, Redo or Cancel then press the Select button again to complete the process.

#### Brightness

The Display has a high and low brightness settings tool. To toggle between the two settings, highlight Brightness feature and use the Select button to toggle between the two settings.

#### Sound

Button press and scroll sounds may be turned on or off as desires. To turn sound on and off, highlight the Sound settings tool and use the Select button to toggle the sound on and off.

#### Power Save

The Precision Rate Optics OTDR incorporates a Power save feature that allows for maximum utilization of the battery life. If set to ON, the unit keeps track of the keypad activity and if no key presses are detected for a period of approximately 15 minutes, the unit will automatically turn itself off, storing the current mode settings. To set this feature, highlight the Power Save settings tool and press the Select button to toggle the feature on or off.

#### Communications Baud Rate

It may be necessary to set a com port speed for communication with a computer. To set the baud rate, highlight the COM Baud Rate settings tool, press the Select button and a dialog with the available settings will be displayed. Use the scroll wheel to select baud rates from 115k to 892k. Press the Select button again to complete the process

#### Pass Code Protection

The FTE-7500A-CWDM may be protected from unauthorized use with a 4 digit pass code. Enter the Tool Menu, scroll to the Pass code Protection settings tool and press the Select button. Use the Scroll Wheel to set the first digit from 0 to 9 and press Select. Continue until all four positions are entered. Press Select on the last digit to move the focus to "Enter" or "Cancel". Press Select on "Enter" to complete the setting of the pass code or use the Scroll Wheel to highlight "Cancel" and press Select to abandon any changes.

#### Live Fiber Detection

Liver fiber detection is a On/Off toggle. When a fiber with live traffic is connected to the OTDR and an OTDR scan is attempted, the Warning (Live traffic is detected. Please disconnect the fiber. Press select to continue) will be displayed.

#### Home

When the desired changes have been made, scroll to the Home icon at the bottom of the screen and press select to return to the home Screen. the Menu button may also be used to return to the home screen.

## 6.2 Battery Level/Power Indicator

The bottom right hand corner of the LTS, Scope and OTDR screens shows the battery level and charge indicator. In the final hour of operation the battery will change to red. A warning indicator will sound a few minutes before the instrument automatically turns off.

**Note: Ensure the unit is turned off when plugging in the Battery Charger.**

When the OTDR is plugged in to an AC power supply, the charge indicator will be illuminated. The charge indicator will dim when the battery is fully charged. The battery level indicator section on the display (Fig 5.3) will either have a yellow lightning bolt overlaid on the indicator or an AC Plug alongside, indicating AC power.

## 6.3 USB Ports

### USB Flash Drive

Located on the bottom panel is the USB Flash Drive port. Files may be downloaded to or uploaded from the external memory device. Screen Shots are stored directly to the USB flash drive.

**Note: When uploading files from a Flash Drive, the characteristics of the file must be supported by the OTDR being used. For example: the OTDR must support the wavelength of the trace file from the flash drive. MM traces cannot be viewed on an OTDR that only supports SM operation.**

**Note: Do Not Remove USB Flash Drive While Accessing.**

### USB/PC

Located on the bottom panel is the USB/PC port which is used to connect the OTDR with a computer for downloading stored data and for operation of the remote VI application, with the supplied Windows™ compatible software.

## 6.4 Help Feature

The Precision Rate Optics OTDR has an onboard help feature. This feature is accessible in all functional modes except the VFL. While operating in any of these functions, press the Menu button, scroll to the Help Icon and press Select. Scroll to the desired topic and press the Select button. Use the scroll wheel to move down the help page if necessary. Press the Menu button to exit the help feature.

## 7.0 OTDR Operation

### 7.1 Key Pad



Power button, turns the unit On and Off. (Hold for 1 second)



This key will start a scan or stop the current scan.



This key starts the auto test/range finder and construction mode scans. The range finder checks test conditions and start a scan at the wavelength selected by the user but allows the OTDR to determine the pulse width and range parameters. The AutoTest button is also used operate the construction mode. The first time this button is selected in a user session, a dialog box will be displayed asking the user to choose between range finder and construction mode. Holding this button down for greater than one second will bring the selection dialog back to the screen allowing the user to change the function of the button.



Toggles between the Trace Mode where the focus of the Scroll Wheel and the Select Button are on the active cursor and the Menu mode where the Scroll Wheel moves through the Soft Key Menu and the Side Icon Bar.



Toggles between A and B as the active cursors.



Selects the Zoom level, each press increments through the levels of 1x, 2x, 4x, 8x, 16x and 32x.



While in Trace Mode the Select button will move the "Active" cursor to the next event. While in Menu Mode, the Select button actuates highlighted item.



While in Trace/Graph Mode the capacitive scroll wheel moves the A and B cursors. While in Menu Mode it highlights soft keys and icons and while in Table Mode it highlights files and events.



Fig 7.1



Trace Display

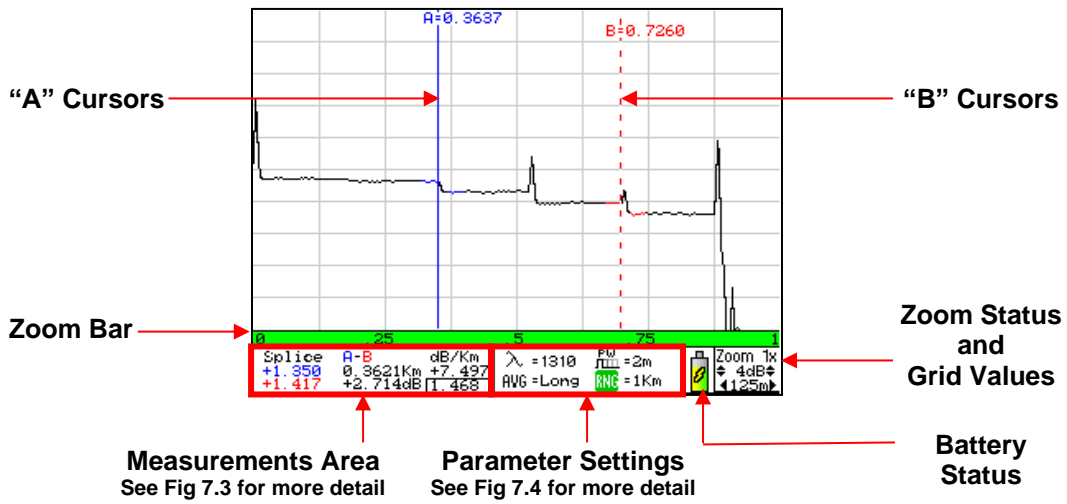


Fig 7.2

Trace Measurements

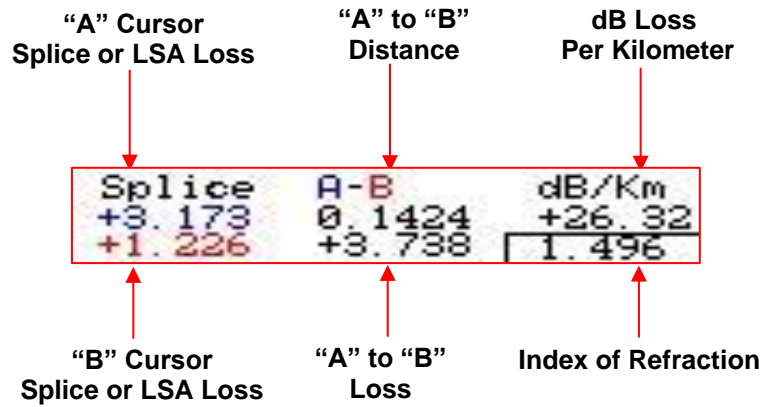


Fig 7.3

Trace Parameters



Fig 7.4



## 7.2 OTDR Display (continued)

### OTDR Display with Menu Open

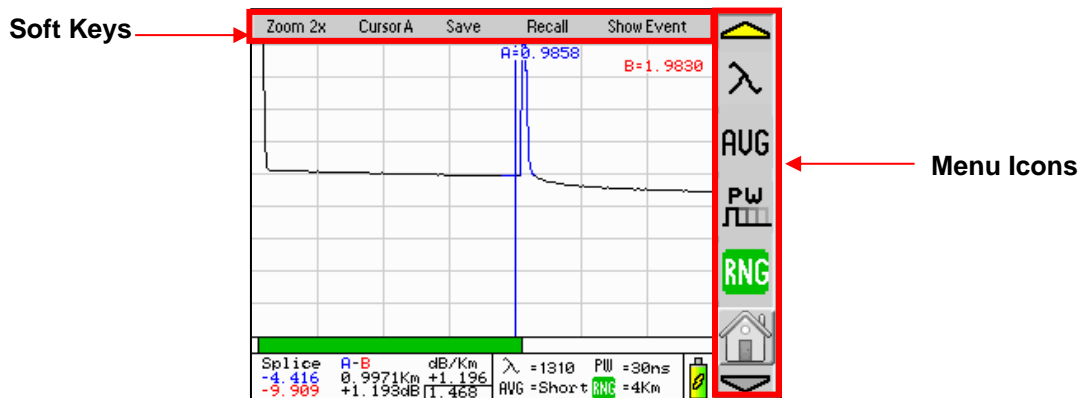


Fig 7.5

## 7.3 OTDR Tools Menu

Below is a list of the settings available through the Tools Menu in the OTDR mode. Press the Menu button to open the Menu mode, scroll to the Tools icon and press the Select button. Scroll to the desired setting and press Select to open.

### Resolution

The resolution tool should be highlighted. Use the Select button to toggle between Low and High. This resolution feature affects the ranges of 4km and 16km. At low resolution 4km range, data points are ¼ meter apart and at high resolution, the data points are 1/8 meter apart. At 16km range, the low resolution data points are 1 meter apart and at high resolution the data points are 1/8 meter apart.

### Unit of Measure

The distance unit of measure may be either displayed in Kilometer (Km), Kilo feet (Kf) or Mile(Mi). Scroll to Unit of Measure icon and use the Select button to toggle between Km, Kf or Mi. Press the Menu button to return to the trace display.

### Cursor Lock

The cursors may be lock for accurate measurements. To lock the cursors press the Menu button, scroll to the Tools icon and press the Select button. Scroll to the Cursor Lock icon and press Select to toggle the lock cursor mode on and off. In the lock cursor mode, with the A cursor as the active cursor, both A and B cursors move and with the B cursor as the active cursor, the B cursor will move independently in order to set the distance between the two cursors.

## OTDR Tools Menu (continued)

### Screen Shot



The FTE-7500A-CWDM OTDR is equipped with a Screen Shot tool. This feature writes files directly to the flash drive. To write a .bmp to the flash drive, highlight the Screenshot tool. Press the Select button, the display will revert to the previous screen and progress will be shown by the inverse color pattern progressing from the bottom to the top of the screen. The process is complete when the display returns to the normal color. The file name will be hhmmss.bmp, where h = hour, m = minute and s = second. If no flash drive is detected, an error message will be displayed.

**Note: Do Not Remove USB Flash Drive While Accessing.**

**Note: This method is not used with the Video Probe. The video probe has its own method of saving & copying files.**

### Splice Mode



The FTE7500A allows the user to set which loss should be used for splice loss measurements. The selection is Splice Mode, LSA Mode or Off. For more information about the different methods of determining splice loss, refer to section 7.8, Loss Measurements.

### Set Wavelength Filter



Set wavelength filter allows the user to disable unwanted wavelengths, and to set the operational wavelengths in the Construction mode. For Example: if the OTDR is a quad wavelength version and only singlemode fiber is being tested, the user may want to disable (shut off) the multimode wavelengths to eliminate having to cycle through 850nm and 1300nm is only 1310nm and 1550nm are being used. This is important for the construction mode where the OTDR may be set to conduct scans at as few as two or as many as 12 wavelength (CWDM OTDR). The last two traces will be displayed in a dual trace overlay. Grayed out wavelengths are turned off. To select wavelengths, scroll to highlight the wavelength and press the Select Button. To complete the process, scroll to Save and press select. Press Menu again to close the Tools dialogue box.

**Note: There are two uses for the Lambda icon with the OTDR. In the tools menu it is use to disable and enable each wavelength for use. In the regular use of the OTDR, in main menu list, it is used to change wavelength being tested.**

### Enter Calibration



This tool is for factory use.

## 7.4 Auto Test

**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 disolved again.

### Range Finder

This is a useful feature when the approximate length of the fiber to be tested is unknown. The Range Finder feature tests at the wavelength selected by the user. To set the wavelength, press the Menu button, scroll to the Lambda icon and use the Select button to cycle to the desired wavelength. Press the Autotest button, the unit will set the average time to short, starts a scan and flashes Auto in the pulse width and range parameters. When Auto stops flashing the unit has set the pulse width and range, then completes the test and displays the trace.

### Construction Mode

This is useful when a large number of fibers need to be tested with the same settings at multiple wavelengths. To operate in construction mode, set the Autotest button to construction mode in the manner described above. The construction mode tests two (dual and QUAD wavelength OTDRs) or up to 12 (CWDM OTDRs) wavelengths at one time, displays the last two traces in dual trace mode and saves the traces to the next available storage locations.

### **Follow these procedures to test in Construction mode:**

#### Set The Wavelengths:

Set the wavelengths to be tested by pressing the Menu button, scrolling to the Tools icon and pressing Select. Scroll to the Set Wavelength Filter tool and press Select. Grayed out wavelengths are turned off. The wavelengths in black text are active. To select wavelengths, scroll to highlight the wavelength and press the Select Button. To complete the process, scroll to Save and press select. Press Menu again to close the Tools dialogue box.

#### Set Test Parameters:

Check the Average Time, Pulse Width and Range to ensure they are set properly. Refer to section 7.5 for instructions on setting these parameters.

**Note:** Real Time is not a valid averaging time for Construction mode.

#### Set The File Name

It is necessary to set the base file name prior to starting the test. To establish the file name, press the Menu button and scroll to the File Management icon and press Select. Scroll to an empty file location and press Select. Name the file by using the scroll wheel to display the desired letter or number and press Select to move to the next Character. **Do not** press select to enter the last character. Once it is displayed, press the Menu button and Save Changes soft key will be highlight, press Select or use the Scroll Wheel to select Discard Changes and press Select. All future files will use the new base file name until it is change. The file that was just created may be deleted if desire by following the procedures in section 10.9.

## Auto Test (continued)

### Set Default Notes:

To enter default notes for trace files, enter the File management as above and scroll to any empty location. Press the Menu button, scroll to the Notes soft key and press Select. The first Character of the note box is highlighted. Use the Scroll Wheel to select the desired character and press select. Continue on until the note is complete. To erase the characters and move forward, use the "blank". To quickly return to the beginning of a note, press the Menu button and then the Select button on the Notes soft key. To exit the Notes box, press the Menu button. This note will now be the default note for all traces until it is changed or removed. To remove notes, Press Select on the "blank" character until all characters have been removed.

### Conduct The Tests:

Connect a fiber to the proper test port and press the Autotest button. The OTDR will conduct the test at the first wavelength and store the trace in memory using the base file name given with default notes attached. The second wavelength is then started and once complete the traces stored to memory, and then both traces are displayed for review.

The CWDM OTDR displays one trace at a time and stores that trace using the base file name and chronological numeric extension.

Once all wavelengths are tested, disconnect the fiber, connect the next fiber and press Autotest. The tests will be completed stored and displayed. Continue on until all fibers are tested.

## 7.5 Manual Scan Setting

After powering on the OTDR, Enter the menu mode by pressing the Menu button and scroll to the parameter keys to set all the necessary parameters to the appropriate values.

These parameters include:

Resolution 

Enter the Menu mode, scroll to highlight Tools icon and press Select. The resolution tool should be highlighted. Use the Select button to toggle between Low and High. This resolution feature affects the ranges of 4km and 16km. At low resolution 4km range, data points are ¼ meter apart and at high resolution, the data points are 1/8 meter apart. At 16km range, the low resolution data points are 1 meter apart and at high resolution the data point are 1/8 meter apart.

**Note:** The resolution setting does affect speed and internal storage capability. At the 16km range, high resolution vs. low resolution, the trace could take up to 8 times longer to complete and trace file sizes could be up to 8 times larger, decreasing file storage capability. High resolution mode at the 4km range could cause the trace time to double as well as the file size. To determine the amount of trace memory available, enter file management, scroll to the view tab and select "Stats" from the drop down menu. This will show the number of traces saved and the number of traces that can still be saved in the internal memory.

**Note:** To determine the amount of trace memory available, enter file management, scroll to the view tab and select "Stats" from the drop down menu. This will show the number of traces saved and the number of traces that can still be saved in the internal memory.

### 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 change the IOR, highlight the IOR icon and press the Select button. Use the Scroll wheel to change the IOR value. When the desired value is reached, press the select button again and the OTDR will prompt the user to save or cancel the changes. Use the scroll Wheel to highlight desired action and press the Select button.

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Wavelength



Use the scroll wheel to highlight the Lambda key, press select to cycle through the available wavelengths.

### AVG

Use the scroll wheel to highlight the Average (AVG) icon and use Select button to cycle through, Real-time averaging, with a up to 2 pps refresh rate, Short average (~30 seconds) or long average (~10 minutes). Changing this setting will also initiate a scan.

### Pulse Width

Use the scroll wheel to highlight the PW icon and use the Select button to cycle through the available pulse widths for the selected range. The pulse widths are listed in the table below.

### Range

Use the scroll wheel to highlight the RNG icon and use the Select button to choose the desired range. Available ranges are listed in the table below.

		Pulse Width								
		5ns	10ns	30ns	100ns	300ns	1µs	3µs	10µs	20µs
Range	1km	✓	✓	✓	✓					
	4km			✓	✓	✓	✓			
	16km				✓	✓	✓	✓		
	64km						✓	✓	✓	✓
	256km							✓	✓	✓

## 7.6 Viewing Traces

### Zoom

There are five zoom levels, 1x, 2x, 4x, 8x, 16x and 32x. The current level is indicated in the bottom right corner of the display with the values per division. Press the Zoom button to cycle through the zoom levels. When in the Menu mode, pressing select while the Zoom soft key is highlighted will also cycle through the zoom levels.

**Note: The values per division change with each change of the zoom level and are indicated in the lower right corner of the display**

### Zoom Bar

The bottom most portion of the trace is a Zoom Bar. This represents the entire range of the trace being viewed. The green bar within the area represents the amount of the trace that is being viewed while the zoom function. While in Zoom level 1x the green bar will fill the zoom bar area meaning the entire range of the trace can be viewed and in Zoom level 2 the green bar will fill only half of the zoom bar area, meaning half of the entire range of the trace can be viewed. As the zoom levels increase, the green zoom bar will decrease in size to indicate the amount of the trace that can be views at one time. As a cursor is moved with the Scroll Wheel, the green zoom bar moves to indicate what portion of the trace is being seen. For example, if the green bar is to the left of the zoom Area, the beginning portion of the trace is being viewed and if the green bar is to the right of the zoom Area, the end of the trace is being viewed.

### Cursor movement

The active cursor is shown as a solid line while the inactive cursor is a dashed line. When in the Menu mode an "A" or "B" will be displayed next to the Cursor soft key as in indication Press the A/B button to toggle between the cursors. When in the Menu mode, pressing select while the Cursor soft key is highlighted will also toggle the active cursor.

**Note: To quickly move the active cursor to the next event, press the Select button while the unit is in the trace view mode.**

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Cursor Lock



The cursors may be lock for accurate measurements. To lock the cursors press the Menu button, scroll to the Tools icon and press the Select button. Scroll to the Cursor Lock icon and press Select to toggle the lock cursor mode on and off. In the lock cursor mode, with the A cursor as the active cursor, both A and B cursors move and with the B cursor as the active cursor, the B cursor will move independently in order to set the distance between the two cursors.

## 7.7 Unit of Measure



The distance unit of measure may be either displayed in Kilometer (Km), Kilo feet (Kf) or Mile(Mi). To change the setting, enter the menu mode, scroll to highlight the Tools icon and press the Select button. Scroll to Unit of Measure icon and use the Select button to toggle between Km, Kf or Mi. Press the Menu button to return to the trace display.

## 7.8 Loss Measurements



### Set Viewable Measurements

The Precision Rate Optics OTDR allows the user to set which loss measurements will be displayed. The loss measurements seen are splice loss for both cursors, dB value between cursors, distance between cursors and dB per Km or Kf. If any of these measurements are not of importance for a Series of test, one or more may be turned off for ease of viewing. To accomplish this, highlight Set Viewable Measurements icon and press Select. A box will be drawn around the splice loss measurements. Use the Scroll wheel to cycle the measurement between Splice Loss, LSA Splice Loss or off. Press Select to move to A-B Loss and distance. Again use the Scroll Wheel to turn these settings on or off. Press Select again to move to the dB/KM (KF) and use the Scroll Wheel to turn this value on or off. Press the Menu button at any time to exit this feature.

### Loss Mode Definitions

- 2 Point loss method takes the difference in vertical height between where the A and B cursors cross the trace to determine the amount of loss in that section of fiber.
- The dB/Km (dB/Kf) 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/Kf) loss measurements, the two cursors must be on level backscatter points at least 100m apart (NA will be shown for distances that are too short).
- 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. See section 7.8 - Setting Splice Loss Measurement Areas. 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.
- Least Squares Approximation (LSA) Splice loss method gives the user a visual aid in setting splice loss areas. The splice loss lines must be set to overlay the backscatter of a trace without over lapping any other events. The LSA areas are set properly when the LSA visualization lines overlay the back scatter sections of the trace before and after the event. 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. Please see Fig 7.3, 7.4 and 7.5 for examples of LSA settings. In Noisy environments the LSA Lines will have an exaggerated movement making the Basic Splice Loss Measurement potentially more accurate.

## 7.9 Setting Splice Loss Measurement Areas



The splice loss measurement areas around the cursors are adjustable. This feature is used for both Basic Splice Loss and LSA Splice Loss. To access this feature, press the Menu button and scroll to the SPL icon. An arrow will be displayed above the point of the measurement area to be adjusted with the Scroll Wheel. There are three points that may be adjusted. The left hand most point of the measurement area before the cursor and the left or right hand point of the area after the cursor.

## Setting Splice Loss Measurement Areas (Continued)

### LSA Set Too Early

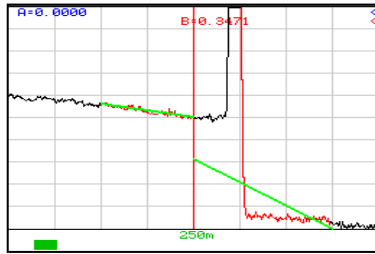


Fig 7.6

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

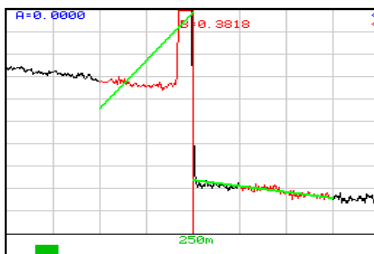


Fig 7.7

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

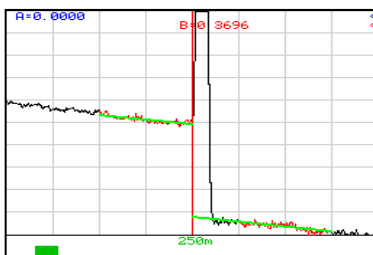


Fig 7.8

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

## 7.10 Quick Save/Recall

### Quick Save

To use quick save, press the Menu button, scroll to the Save soft key and press the Select button. The trace will be saved to the storage location shown. The file will be stored with the same base file name as the last save stored trace. If the storage location indicated already contains a file, the user will be prompted to either "Overwrite" the location, Save to the "Next" available location or "Cancel" the action. Scroll to the desired action and press Select. The storage location will increment accordingly.

**Note:** There are sample traces stored on the OTDR at the factory. These traces are saved in the with the base file name of default.

### Quick Recall

To quickly recall a trace, press Menu, scroll to the Recall soft key and press the Select button to display the trace that is saved in the memory location indicated and the next memory location with a trace will be displayed.

## 8.0 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

### 8.1 Enter Event Analysis Mode

To open the event analysis table, press the Menu button, scroll to highlight Show Event soft key and press the Select button. Use the Scroll Wheel to move through the events. If the Select button is pressed while an event is highlighted, The OTDR will revert to the Trace Screen with the active cursor positioned at the selected event. An alternative method to return to the trace view is to press the Menu button, scroll to the Show Trace soft key and press the Select button.

### 8.2 Event Analysis Table

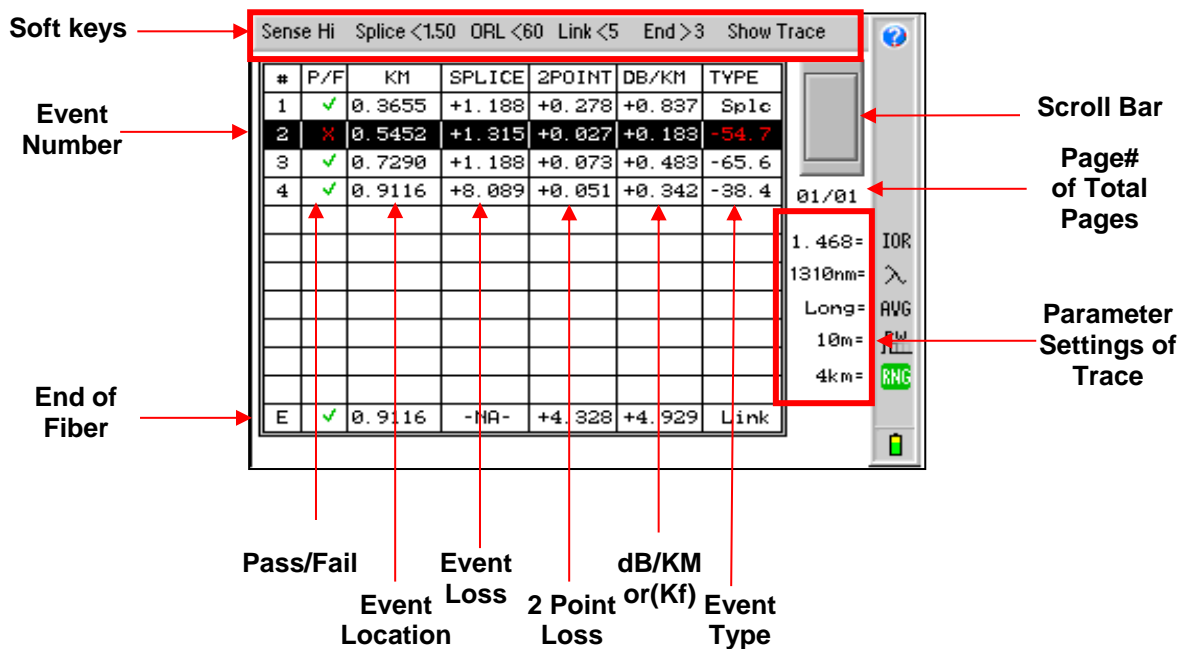


Fig 8.1

### 8.3 Field Descriptions

#### # (Event Number)

Indicates the events in sequence, higher numbers are further distances from the OTDR. "E", which is always displayed in the bottom row is the event determined to be the End of Fiber (EOF).

#### P/F (Pass/Fail)

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)

Event Location, Km for Kilometer or Kf for Kilo-feet or Mi for Mile. This is the distance/location that the event occurs in the respective unit of measure.

#### SPLICE (Event 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.

#### 2POINT (2 Point Loss)

2 Point Loss, which is measured from the end of the dead zone of the previous event to the beginning of current event.

#### DB/KM (dB Loss Per Km/Kf)

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/ORL)

Event Type is the type of event or the ORL measurement. If the event is 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

#### E (End Event)

The bottom row of the table is the loss and distance information as it pertains to the entire fiber link. KM column is the end of fiber distance measurement, Splice column is not used, 2 Point is the measurement from the origin (OTDR) to the determined end of fiber in the KM column. The dB/km column is that measurement for the entire link and in the Type column Link will be displayed.

#### Other Display Elements

To the right of the table is a scroll bar which will be active if the amount of events exceeds one page and below the scroll bar is an indication of what page is display per number of pages. Also on the Event Table display are the parameter settings for the current trace.

### **8.3 Sensitivity Settings**

There are three levels of sensitivity while in the event table. The sensitivity is set via the Sense soft key. Press the Menu button and Scroll Wheel to highlight the Sense key. Press the Select button to cycle through "Lo" (Low) for event with loss as low as approximately 0.5dB, "Me" (Medium) with events with loss down to approximately 0.2dB and "Hi", for events with loss as low as approximately 0.1dB. Medium and High sensitivity settings should be used for high signal level, low noise, long pulse, averaged traces.

### **8.4 Pass/Fail Settings**

Splice, ORL and Link are all settable thresholds for Pass/Fail purposes. To set the thresholds, press the Menu button, scroll to highlight the desired soft key, press the Select button and use the Scroll Wheel to reach the desired value. Press Select button again to lock in the settings. If the trace fails any of the three thresholds, 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.

End: This threshold setting is the first test to determine the end of fiber. If set to 3dB, the first event that meets this threshold will be identified as the end of fiber.

To return to trace view, press the Menu button, scroll to the Show Trace soft key and press the Select button.

## 9.0 File Management

### 9.1 Display

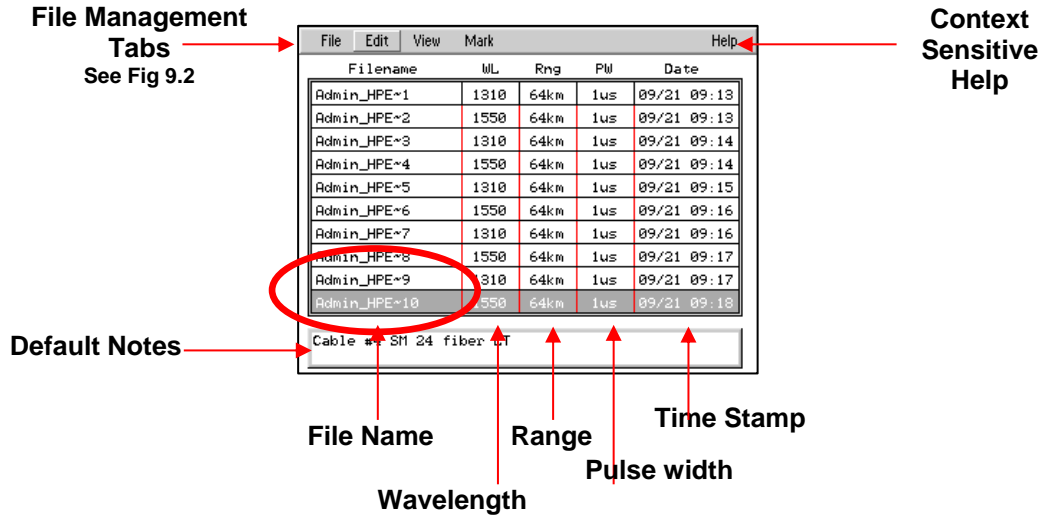


Fig 9.1

### File Management Drop Down Menus

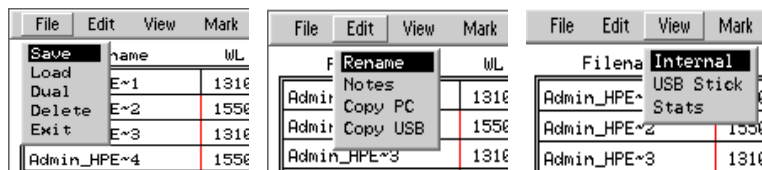


Fig 9.2

### 9.2 Entering/Exiting File Management

Press the Menu button, scroll to highlight the TRC (Disc) icon and press the Select button. For each test/file saved, an indication of wavelength, range, pulse width and a time stamp are stored. The file name can have up to 16 characters using the following; 0-9, A-Z, a-z, \_ (underscore) or blank. To close the File Management System, press the Menu button, scroll to highlight the File Tab, scroll to Exit and press Select.

### 9.3 Saving a Trace

There are two methods to save traces. The first is the Quick Save method described in section 8.8. The second method is to enter file management with a trace on the display, press the Menu button, scroll to the File Management icon and press Select. Press the Menu button to shift the focus of the scroll wheel to the file management tabs. Highlight the File tab, press Select and with Save highlighted in the dropdown menu, press select again. Use the scroll wheel to change the highlighted character. With the desired character displayed, press Select to enter that character and the next character will be highlighted. Continue until the desired file name is entered and press the Menu button. Use the scroll wheel to highlight Cancel, Redo or Save and press Select.

### 9.4 Renaming a Trace

Highlight the file to be renamed using the scroll wheel. Press the Menu button and scroll to highlight the Edit tab. Press Select and with Rename highlighted in the dropdown menu, press select again. To leave a character unchanged, simply press Select on the highlighted character. To change a character, use the scroll wheel to make the change and press select with the desired character displayed. Continue until the name is entered, press the Menu button, scroll to select Save Changes or Discard Changes, and press Select.

## 9.5 Viewing Saved Trace

To view a saved trace from internal memory, use the scroll wheel to highlight the desired trace and press the Select button. The OTDR will revert to the trace view with the selected trace displayed and directly below the trace will be the trace name. "Load" located in the File dropdown menu may also be used to load a trace to the trace screen. With the desired trace highlighted, press menu, scroll to the File tab, press select, use the scroll wheel to highlight Load and press Select.

## 9.6 Dual Trace

**Note:** To compare two traces, they must have the same range and resolution settings.

With a trace on the display, enter the file management, highlight the trace to be placed in the background, press the Menu button, scroll to the File tab highlighted, press Select, scroll to Dual on the dropdown menu and press select again. Both traces will now be displayed. The primary or first trace loaded is the black trace and the secondary trace is the green trace. All values displayed are the values associated with the primary trace. If the trace for the background does not have the same range or resolution as the main trace, a range mismatch message will be displayed. Press the Select button to clear the message.

To exit the Dual Trace mode, start a new scan or open a new main trace from file management.

## 9.7 Marking Traces for Mass Coping and Deleting

Scroll to highlight the first trace to be copied or deleted. Press the Menu button, scroll to the Mark tab and press Select. To mark 1 or 2 files for mass copying, press the Select button and the highlighted trace will be displayed in red font. Pressing select again will mark the highlighted trace and the next trace will be highlighted. (The highlighted file is not marked.) Only those files in displayed in red are marked. To mark a large number of files use the scroll wheel. Scrolling down (clockwise) will mark a file and scrolling up (counter clockwise) will un-mark a file. Files may be skipped by shutting off the marking feature, scrolling ahead and turning the feature back on. To do this, once the last trace of a section has been marked, press the Menu button, scroll to the next file to be marked, press Menu again, press Select or scroll to continue marking the files. Once all the desired traces are marked they may be deleted or copied as necessary.

## 9.8 Copying Traces

**NOTE:** *Limit flash drives to 4 gigabytes. It is suggested that new flash drive sticks be tested prior to use. Save traces to the flash drive from the OTDR and test them on the computer with the supplied software to ensure they operate properly.*

**NOTE:** *Do Not Remove USB Flash Device While The OTDR Attempts To Read Or Write To That Port.*

**NOTE:** *Do Not Remove USB Flash Device While The OTDR Attempts To Read Or Write To That Port.*

Traces may be copied to the USB flash drive or to a PC for use with the certification software. The Certification Software is required to copy trace files to a computer through the USB/PC Port. With a trace highlighted or a group of traces marked, press the Menu button and scroll to the Edit tab, press Select, chose either Copy PC or Copy USB from the dropdown menu and press select.

## 9.9 Deleting Traces

Traces may be deleted from the internal memory or USB flash drive. With a trace highlighted or group of trace marked, press the Menu button, scroll to the file tab, choose Delete from the dropdown menu with the scroll wheel and press Select. Use the scroll wheel to highlight Cancel or Confirm Delete and press Select.

## 9.10 Adding Default Notes

A note may be saved with a trace. With a file highlighted, entering a note will save that note for that one trace. With an empty file storage position highlighted, enter a note and this note will be stored with all traces until the note is changed or deleted. To enter notes, while in the file management screen, press the Menu button, scroll to the Edit tab and press Select. Use the scroll wheel to choose Notes from the dropdown menu and press Select. The first character of the notes field will be highlighted. Use the scroll wheel to choose a character and press Select. To erase a character or enter a space, scroll back to the "blank" which is the first character available. If a mistake is made, it may be best to exit the Note field by pressing the Menu button, and reenter the notes field from the Edit dropdown. Once you have completed the note, press Menu to exit.

## 9.11 Accessing Flash Drive

**NOTE: Do Not Remove USB Flash Device While The OTDR Attempts To Read Or Write To That Port.**

To access the flash drive, while in file management, press the Menu Button and scroll to the View tab, press Select and choose USB Stick from the dropdown menu. To return to the internal memory, press the Menu button, return to the View dropdown and choose Internal. All of the Tab functions available for the internal memory are also available for the Flash drive.

## 9.12 Internal Memory Statistics

The amount of storage available in the onboard memory is found in the Internal Memory Statistics screen. To view this screen; while in file management, press Menu, scroll to the View tab and select Stats from the dropdown menu. This will indicate the percentage of memory used and how many more traces of a specific range may be saved.

## 10.0 Loss Test Set Description

### 10.1 Entering Loss Test Set Mode

The LTS application is entered from the Home Menu. Use the Scroll Wheel to highlight the LTS application Tab and press Select. From the OTDR application, press the Menu button, scroll to the Exit Icon and press Select to return to the Home Menu. When in the Scope application, Press the Menu button, scroll to highlight the Return soft key and press Select to return to the Home Menu.

### 10.1 Key Pad Operation



Power button, turns the unit on and off.



Resets any temporarily memory values before they have been stored with the select button.



Starts the Auto Test function. The light source will be turned on and cycle through the wavelengths selected with the  $\lambda$  icon.



Toggles between the Test mode and the Menu mode where the focus of the Scroll Wheel and the Select Button are on the soft keys and icons.



Cycles through the power meter wavelengths selected with the  $\lambda$  Icon. When in the File Selection Screen this key will toggle through save values for a particular storage position.



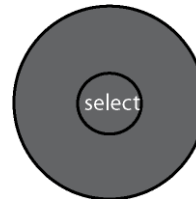
Changes the display to the zoom screen where all stored test for a memory location are display. There can be up to 4 test stored per location.



Fig 10.1



The Select Button will store all measurements in the temporary memory to the storage position shown the lower left corner of the display while in the Test Mode and while in the Menu mode it will activate an icon item or soft key.



#### Scroll Wheel

When the Scroll Wheel is moved the File Selector screen is displayed for quick reference and if no key is press for 5 seconds, the display returns to the test mode. To return to test mode immediately, use the Scan button

When in Menu mode, the Scroll Wheel moves through the Soft Keys and Icons.

### 10.3 LTS Displays

#### LTS Measurement Screen

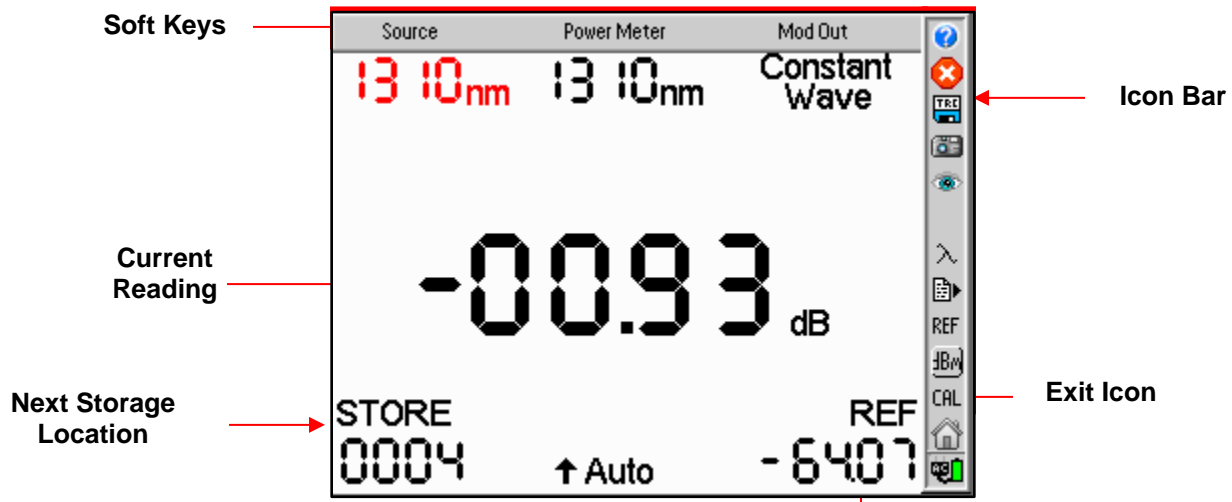


Fig 10.2

Stored Reference Of Displayed PM Wavelength

#### LTS File Storage Access Screen

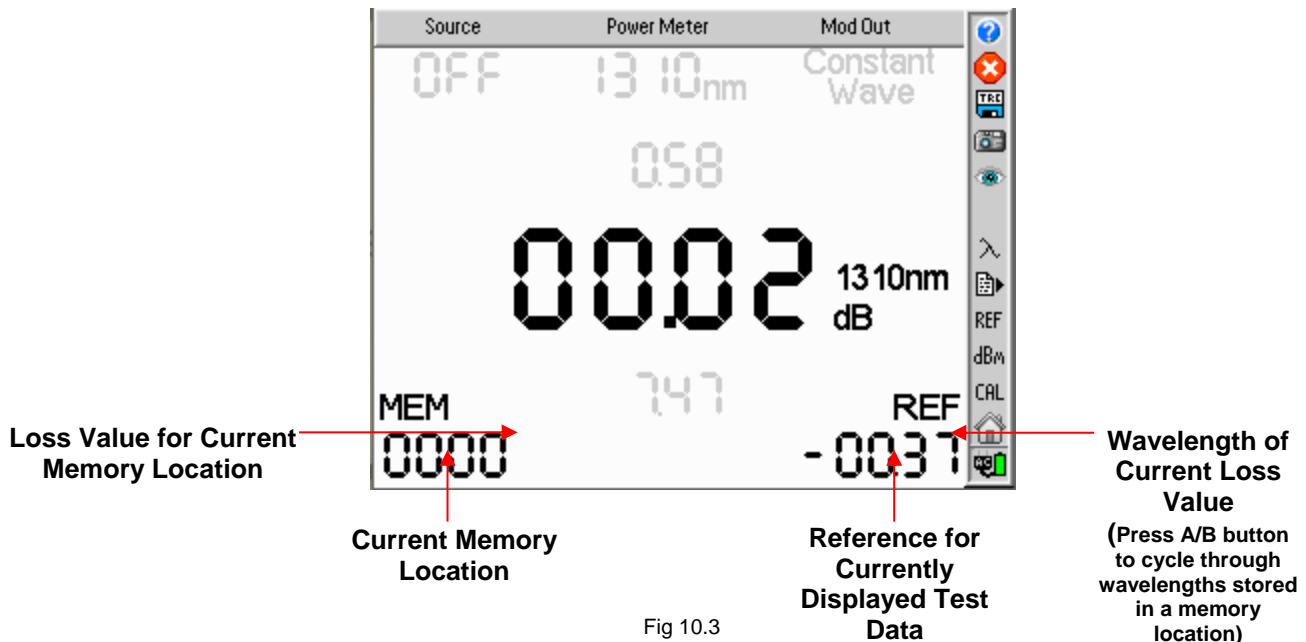


Fig 10.3

## LTS Displays (continued)

### LTS Zoom Screen

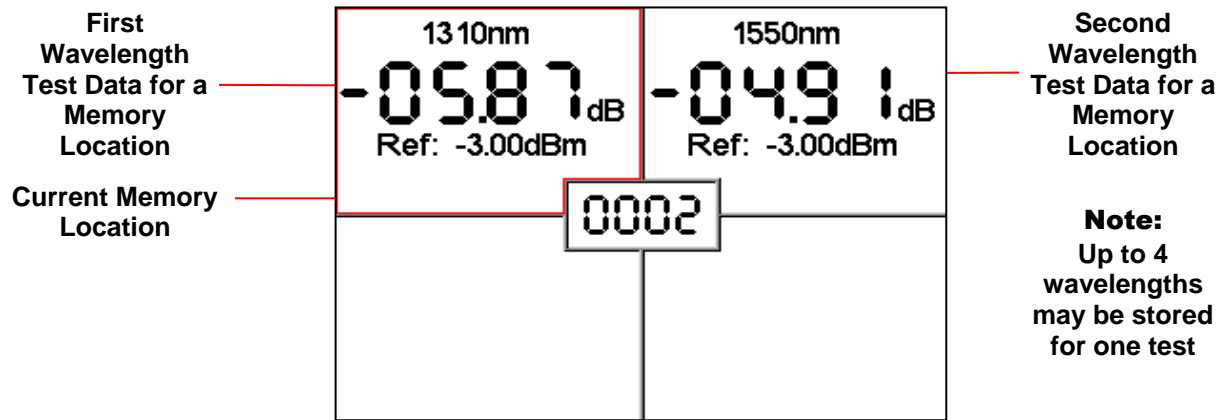


Fig 10.4

### LTS Graph Screen

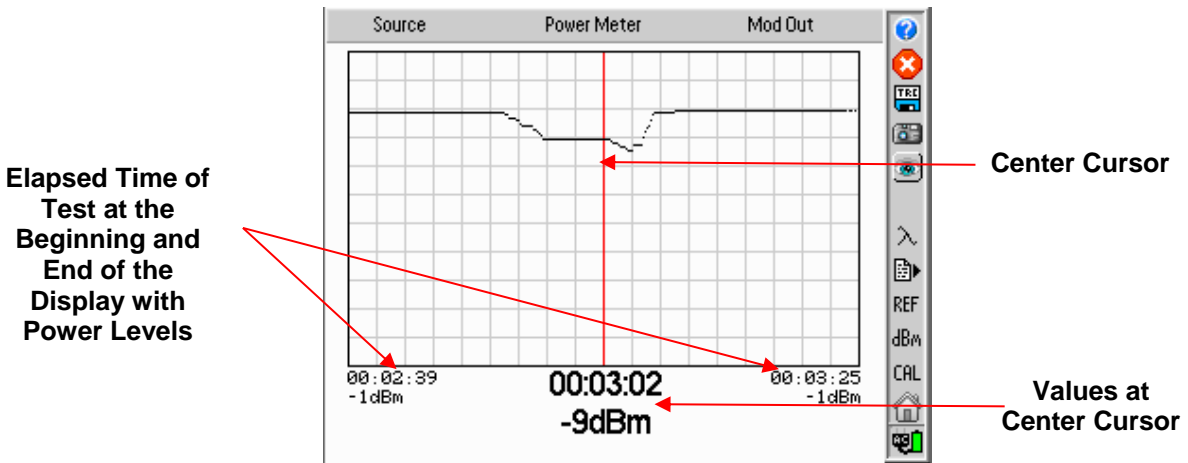


Fig 10.5

## 10.4 Soft Keys Operation

### Source



Enter the Menu mode and scroll to highlight the Source soft key. Press the Select button to cycle through the available wavelengths. (See Lambda/wavelength icon information below) The displayed source wavelength is the active source. Turn off all sources, by cycling to the “Off” position.

#### Power Meter

Enter the Menu mode and scroll to highlight the Power Meter soft key. Press the Select button to cycle through the available wavelengths. (See Lambda/wavelength icon information below)

#### Modulation

There are four source modulation settings. 270 Hz, 1000Hz, 2000Hz and CW (constant wave). To change the modulation setting, enter Menu mode and scroll Wheel to highlight the Modulation soft key. Press the Select button to cycle through the modulation rates.

## 10.5 Loss Test Set Icon List

#### Help



The Loss Test Set has an onboard help feature. To access the help feature, enter the Menu, use the scroll wheel to highlight the Question Mark Icon and press the Select button. Scroll to the desired topic and press the Select button. Press the Menu button again to exit the help feature.

#### Delete



Deleting a stored loss measurement is accomplished in the File Selector mode. (See LTS File Selector operation, Section 11.4) To delete a measurement/s from a single memory location, while in the File Selector, select the desired test to be deleted, press menu scroll to the Delete icon and press select

**Note: There is not warning or confirmation necessary to delete one memory location.**

To delete the all the memory locations at one time, follow the procedure above, however do so on an empty location. When the Delete icon is select on the empty location, a Confirm dialog with “Delete all files?” will be displayed and the option to Delete or Cancel the action. Press the Select button with the desired action highlighted.

**NOTE: A loss measurement of (----) is not empty if there is a wavelength displayed to the right. That would be a null measurement). An empty location is (----) with no wavelength displayed to the right.**

Measurements may also be deleted in the Quick File Locator. With the storage location selected, press the Menu button, scroll to the Delete icon and press Select. There is a time out on the Quick File Select. If the display reverts to the test mode, before the delete button is selected, the file will not be deleted.

#### Quick File Locator



To quickly move through the loss storage locations, enter the Menu mode, scroll to the TRC (disc) icon and press Select. The Memory location at the bottom of the display will be highlighted. Press the Select button to focus the highlighted area on just the 1000's position. Use the Scroll Wheel to make changes. Press the Select button again to move the focus to the 100's position and repeat this procedure until the desired storage location is found. Scrolling when all the digits are highlighted will move through the positions one at a time as normal. Press the Menu button to return to Menu Mode.





The FTE-7500A-CWDM OTDR is equipped with a Screen Shot tool. This feature writes files directly to the flash drive. To write a .bmp to the flash drive, highlight the Screenshot tool. Press the Select button, the display will revert to the previous screen and progress will be shown by the inverse color pattern progressing from the bottom to the top of the screen. The process is complete when the display returns to the normal color. The file name will be hhmmss.bmp, where h = hour, m = minute and s = second. If no flash drive is detected, an error message will be displayed.

**Note: Do Not Remove USB Flash Drive While Accessing.**

**Note: This method is not used with the Video Probe. The video probe has its own method of saving & copying files.**

This feature takes an image of the screen and saves it to a flash drive,

#### View Graph



Selecting the View (eye) icon will change to the Graph Mode. For More information on the graph mode, see section 11.6. To revert back to the normal power meter mode press Select again time with the View Icon highlighted.

#### Lambda (Wavelength Selection)



Highlighting and selecting the  $\lambda$  Icon will display the Wavelength Selection menu. Use the scroll wheel to highlight the wavelengths to be select for use with the light source and power meter and press the Select button to toggle them off and on. The selected wavelengths will be the only wavelengths tested auto test and the only ones available when cycling through the light source and power meter soft keys. Highlight "Save Selection" at the bottom of the menu and press the Select button to save the setting and return to the Loss Lest Set mode.

#### File Download



File Download is used to send the save Loss Test to a PC. Once the FTE-7500A-CWDM is connected to a computer with the certification software running, enter the menu mode and highlight the File Download icon. When directed to do so, press the Select button to immediately start a download to the computer via the USB cable. Press the Menu button to return to the test mode.

#### Set Reference



This icon is used to set the reference for relative loss measurements.

#### dBm/dB



This icon is used to toggle the power meter from absolute power referenced by dBm and relative power referenced by dB.

#### Calibration



This tool is for factory use only.

#### Exiting Applications



To exit the OTDR and LTS applications, Press the Menu button, scroll to the Exit icon in the menu bar and press Select. This will return user to the Home Screen.

## 11.0 Loss Test Set Operation

### 11.1 Power Meter Measurements

#### Power Measurements

With the FTE-7500A-CWDM in Loss Test Set Mode. Connect the fiber carrying the optical power to be measured to the Power Meter detector utilizing the appropriate adaptor. Select the power meter wavelength that matches the wavelength of the light being measured. The power reading will now indicate the optical power in units of dBm. The power will display an out-of-range condition indicated by a Series of four dashes on the display if the signal is greater than +5 or less than -77 dBm. CATV versions are available upon request.

To save the power measurement to the storage location indicated below the STORE label press the Select button. The memory location will auto increment to the next available memory location.

#### 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 and energize the light source. Enter the Menu mode, scroll to Ref icon and press the Select button. The reference is now stored in nonvolatile memory and displayed at the bottom right of the display. 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. A reference reading is required to change to dB measurement from dBm measurements.

Remove the connector from the power meter port and place the fiber under test inline 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. Ensure the unit is not in Menu mode and press the Select button to store the measurement.

Stored power measurements may be recalled by moving the Scroll Wheel and the File Selector Screen will be displayed. If no buttons are press for 5 seconds after entering the File Selector mode, the unit will revert to the test mode. The Scan button may also be pressed to re-enter test mode.

### 11.2 Autotest Mode

To use the Auto Test feature, connect the fiber to be tested to a compatible test set. The unit being used as the source should be set to Autotest. If Two Quad OTDRs are being used, only the wavelengths to be tested should be selected as sources by entering the Wavelength/Lambda selection menu. Only the wavelengths that are energized will be displayed on the power meter end. Once the source and power meter have cycled through the wavelengths to be tested, press the Select button on power meter to store the measurements. .

**Note:** A reference measurement is not used in the Auto Test Mode. The Source is modulated and has 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 display at one time on the display.

### 11.3 Light Source Operation

#### Energizing Light Source

The lasers are initially in the off state when the LTS is launched. Enter the Menu mode and use the Scroll Wheel to highlight the Source soft key. Pressing Select will energize the available wavelengths in sequence.

**NOTE:** If used with a compatible test set or a companion FTE Series OTDR, the light source will transmit the wavelength information automatically to the receiving unit which then changes the power meter wavelength setting to correspond to the wavelength of the light source.

## 11.3 Light Source Operation (continued)

### Modulating Light Source

Change the modulation of the light source by entering Menu mode and scrolling to highlight the Modulation soft key. Pressing the select button will toggle through available modulation rates of CW, 270Hz, 1000Hz, and 2000Hz. The rate will be displayed directly under the Modulation soft key. When measuring average power of the lasers the output will drop by exactly 3.01 dB as the source is off precisely half of the time. The modulation function is useful for fiber identification and for general purpose optical component testing. The unit that receives one of the modulated frequencies will flash the appropriate frequency annunciator.

**NOTE:** (The 3.01dB drop is also true of the laser output when in the Auto Test mode however the unit receiving this signal automatically compensates for the loss in average power and this is transparent to the user.)

## 11.4 File Selector Operation

### File Selector Screen

Enter the File Selector Screen with the scroll wheel. In the File Selector screen the soft keys will be inactive and grayed out. The Store location in the bottom left of the screen will be changed to MEM location and there will be three loss values on the display. The middle one is the measurement stored in the indicated memory location with the wavelength of the reading to the right. Pressing the A/B button will cycle through the readings stored in that location if more than one wavelength was stored. The grayed out readings above and below the main reading, are the measurements of the previous and next memory locations. If there is not activity in 5 seconds, the screen will revert back to the Test Mode. The Scan button will also return the unit to the test mode.

**NOTE:** Pressing the Select button will overwrite the displayed test with what is in the temporary memory.

### Quick File Locator

To quickly move through the loss storage locations, enter the Menu mode, scroll to the TRC (disc) icon and press Select. The Memory location at the bottom of the display will be highlighted. Press the Select button to focus the highlighted area on just the 1000's position. Use the Scroll Wheel to make changes. Press the Select button again to move the focus to the 100's position and repeat this procedure until the desired storage location is found. Scrolling when all the digits are highlighted will move through the positions one at a time as normal. Press the Menu button again to exit the Quick File Locator.

## 11.5 File Transfer

To transfer files from the Loss Test Set to the computer, start the certification software. Connect the OTDR to the computer with the supplied USB cable, on the software tools tab, select Download LTS Files, enter a file name and press Save. The Software will prompt the user to start the Loss Test Set memory download. To start the memory download, enter Menu mode on the OTDR, highlight the File Download Icon and press Select. The download progress will be indicated by the UPLOAD counter in the bottom left corner of the display.

**Note:** If there is a communication error occurs, ensure you turn off and restart the OTDR.

## 11.6 Graph Mode

To view measurements in the Graph Mode, press the Menu button, scroll to the Light Source soft key and use the Select button to cycle to the desired wavelength for the test. If a source other than one compatible for auto-wavelength recognition with the OTDR is being used, ensure proper the power meter wavelength is selected. Once the source is energized and the power meter is taking a measurement, enter the Menu mode, scroll to the Eye Icon (view), press Select and the Scan button to start the graph. Press the Scan button again to stop the graph. The elapsed time of the scan is noted at the beginning middle and end of the graph with the absolute value at each of those points displayed. The graph may also be viewed on the certification software. Please refer to the software for information on how to display the graph view on the computer. To exit the Graph Mode, press the select button again with the Eye Icon (view) highlighted.

## 12.0 Video Scope / Visible Fault Locator

### 12.1 Description

The FTE-7500A-CWDM OTDR can accommodate the VIS300 Video Probe. Located on the bottom panel is a 6pin DIN connector labeled "Vid Probe". The OTDR can view a connector end face, center the image and conduct an auto analysis of the end face with pass/fail grading. The connector may also be manually marked pass/fail using the pass/fail grading rings and contamination scale for reference.

#### Video Scope Display

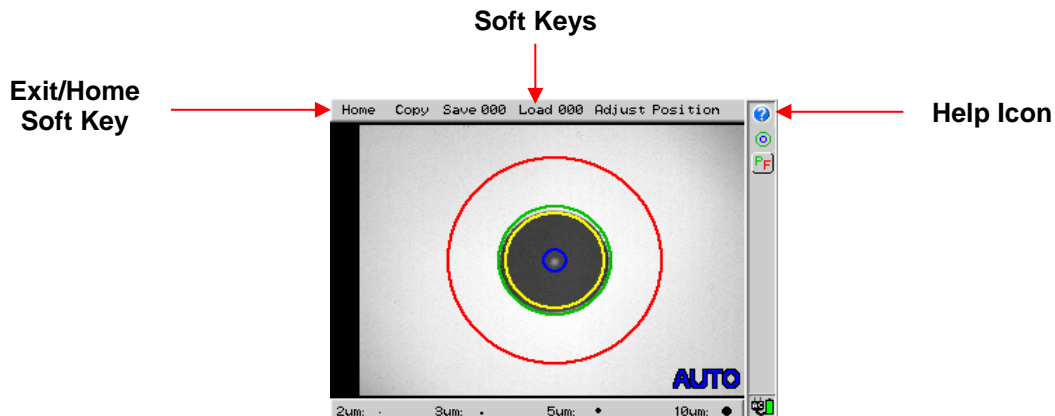


Fig 12.1

#### Home

Returns to Home Screen

#### Copy

Allows save images to be copied to the flash drive or a PC. This may also be used to delete images.

#### Save

Used to save image to the position indicated

#### Load

Used to display the image stored at the position indicated

#### Adjust Position/Contrast

Toggles between adjusting position of image on the display or adjusting contract of image.

#### Video Probe

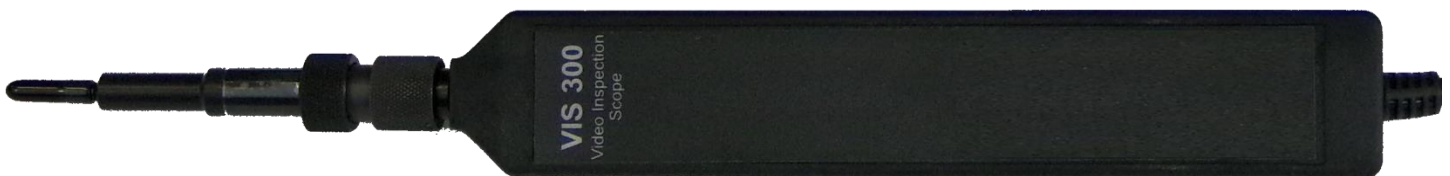


Fig 12.2

## 12.2 Video Scope Operation

The video scope feature is accessed from the Home screen. From startup, scroll to highlight the Scope icon and press Select. If the instrument is in another application, press the Menu button, scroll to the exit or home icon and press Select to return to the home screen. Connect the probe to the bottom panel. Insert a connector to the probe or insert the probe into a fiber adapters and use the focus knob to bring the connector end into focus.

## 12.3 Adjusting Display Contrast

To adjust the contrast, ensure the Adjust Contrast/Position soft key is displaying Adjust Contrast. To change between Adjust Contrast and Adjust Position, press the Menu button and highlight the soft key. Press Select to toggle between the features. Press Menu to exit the menu mode to use this features. Use the scroll wheel to adjust the contrast of the screen.

## 12.4 Adjusting Connector Image Position

### Manually Adjust Position

Ensure the Adjust Contrast/Position soft key is displaying Adjust Position. To change between Adjust Contrast and Adjust Position, press the Menu button and highlight the soft key. Press Select to toggle between the features. Press Menu to exit the menu mode to use this features.

The image may be manually centered by use of the scroll wheel when in live view mode. The Scan button toggles between live and paused modes. To center and image, use the scroll wheel as a left-right-up-down feature, press and hold those areas of the wheel to move the image in that direction.

### Auto Center Adjustment

With the Menu turned off and connector image in focus, press the Select button to auto center the image into the grading rings.

## 12.5 Connector Grading

### Manual Grading

The grading rings are used to manually grade the connector image. Turn on or off the grading rings by scrolling to the grading ring icon and pressing Select. Grading criteria is located in the help screens in the video scope section. Use the contamination references to determine if the connector passes or fails. A pass or fail indication may be placed on the image by scrolling to the Pass/Fail/Auto icon and pressing select to mark the connector image accordingly.

### Auto Grading

In the Menu mode, scroll to highlight the Pass/Fail/Auto icon and press the Select button until Auto is displayed in the bottom right of the screen. Turn off the menu mode to complete the grading. Focus, press select to center the image and then press the Scan button have the video scope grade the connector. The image will pause and after a few seconds the screen will display Pass or Fail in place of the Auto indicator.

## 12.4 Save and Recall Video Images

### Store Video Scope Images to Memory

The Video image may be stored as a Bitmap by pressing the Menu button, scrolling to the Save soft key at the top of the display and pressing the Select button. This will attempt to save the image to the location displayed next to the Save soft key. If that location is occupied by a stored image, a dialog will appear with the choice to overwrite that location, save to the next available location or cancel the process. Scroll to the desired action and press the Select button.

### Recalling Stored Video Scope Images

To view a stored image, scroll to the Load soft key and press select to view the image at the indicated location. Subsequent presses of the Select button will increment through the occupied storage locations.

## 12.5 Copy/Delete Video Scope Images

To copy or delete images, Press the Menu button and scroll to the Copy soft key. Pressing select on the soft key will display a dialog that offers the option of coping all of the images to the PC via the USB/PC port or to a flash drive. The dialog will also offer the option to delete all the stored video files or cancel the process. Scroll to the desired action and press the Select button.

**Note: Do Not Remove USB Flash Drive While Accessing.**

## 12.6 Visible Fault Locator

**WARNING:** Never clean or look directly into the fiber optic connector or the end of fiber attached to the OTDR or VFL unit while they are energized, to do so will expose the user to laser radiation and could result in personal injury or instrument damage.

### Visible Fault Locator Description

The Visible Fault Locator (VFL) is a stabilized fiber optic laser source that emits visible (red) light at 650nm. Its intended function is to allow an operator to identify fibers or find 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 other means. It is also useful for identifying a particular fiber in a cable by exciting the fiber to be located with visible radiation.

### Visible Fault Locator Operation

This feature is accessed from the Home screen. From startup, scroll to highlight the VFL icon and press select to cycle through VFL through CW (constant wave) mode or MOD (modulated) mode and Off. If the instrument is in OTDR or LTS mode, press the Menu button, scroll to the Exit icon and press Select to return to the Home screen. When in the Video Probe mode scroll to the Exit soft key and press Select to return to the home screen.

**Note: When in the OTDR application and the VFL is required, the active trace will not be lost by exiting to the home menu.**

## 13.0 Maintenance

### 13.1 Battery Replacement

Battery replacement is not recommended however if you must replace the batteries follow these procedures. Carefully remove unit from protective boot and remove the two screws from top plate and bottom plate that retain the back cover. Carefully remove back cover and remove the two screws that hold the battery covers in place. Replace only with 8 AA NiMH 2000mAh batteries. 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 maintenance, batteries require a monthly periodic recharge.

**WARNING:** To Prevent Fire or Shock Hazard: Do not install other battery types; Do not use the battery charger without the batteries installed; Do not expose the battery charger to rain or excessive moisture; Do not use the battery charger 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 battery charger than the one provided with this instrument. Any other condition will void the warranty.

**Note:** For maintenance, batteries require a monthly periodic recharge.

### 13.2 Clock Battery

In order to ensure proper Time and Date stamps on test data, it is necessary to energize OTDR for a minimum of 5 minutes per month. If this is not accomplished, it will be necessary to reset the time and date information in the Tools Menu.

### 13.3 Laser Out Port

**WARNING:** Do not under any circumstance view or inspect the laser output fibers, connectors, or the fiber under test through collimating or focusing optics. A video inspection microscope should be used to examine all fiber ends. Contact your PRECISION RATE OPTICS sales representative for video microscope information.

**WARNING:** Never clean or look directly into the fiber optic connector or the end of fiber attached to the OTDR or VFL unit while they are energized, to do so will expose the user to laser radiation and could result in personal injury or instrument damage.

**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.

In order to maintain a low loss fiber connection, care should be taken to adequately clean the ferrule of any connector to be inserted in the Laser Out Port. In the event that the port needs to be cleaned, first step is to be certain the instrument is off. We suggest the use of 99% isopropyl alcohol or other industry specific fiber optic cleaning products and foam swabs designed for cleaning connectors accepting 2.5mm ferrules.

## 13.4 Recalibration and Verification

Periodic verification of the Terahertz Technologies Inc. is recommended to ensure that your instrument remains within specification. Although not imperative, we recommend a recalibration and verification once a year to make certain the instrument is functioning properly and performing to its rated specifications. Consult the factory 315-736-3642 for service.

## 13.5 OTDR Adapter Replacement

The OTDR is supplied with three easily interchangeable adapters per port, ST/SC/FC. To change an adapter, remove the two screws that hold the adapter in place, pull the adapter straight up from ferrule. It is suggested that you clean the exposed ferrule with appropriate cleanser and lint free wipe anytime you replace the ferrule.

**NOTE:** When replacing the adapter with one that does not have a chained protective cap, use the small screw in place of the larger screw that retains the end of the chain to the adapter



## 14.0 Application Information

The Terahertz Technologies Inc. OTDR is designed to be used as an installation, troubleshooting, and maintenance tool. This is a full featured Optical Time Domain Reflectometer. Our OTDR measures distance and loss of fiber links up to 240Km by launching an optical pulse down one end of the fiber and analyzing the returned energy in time (or distance) from reflections. The FTE-7500A-CWDM OTDR uses an advanced high speed embedded controller and display processor with proprietary technology to analyze, store and average the fiber trace data in the quickest time. This highspeed processing engine allows the user to make distance and loss measurements immediately after energizing the instrument. With its advanced Event Table, Splice Loss Mode, and dB/Km Mode, it also can assist the user in interpreting major events such as bad splices, connections or broken ends. Minor perturbations along otherwise normal fiber links can also be detected using a simple moving cursor approach in Splice Loss Mode. Complex return signals with many major or minor events can be analyzed by the Precision Rate Optics OTDR then stored away for archiving and later retrieval.

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.

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 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.

## 15.0 Specifications

<b>Advanced OTDR Specifications</b>	
Wavelength	As Configured with Wavelengths 1271-1611nm +/- 3nm
Dynamic Range (typ.)	35dB CWDM Wavelengths
Pulse Width	5 - 20,000 ns
Units of Measurement	km, kf, mi
Event Dead zone	1m
Attenuation Dead Zone	4m
Resolution	.125 - 32m
Distance Range	1-260km SM
Typical Real-time Refresh Rate	Up to 2 Hz
Group Index of Refraction (GIR)	1.024 - 2.048
Linearity	± .05 dB/dB
Memory Capacity	~500 Traces
Memory Type	Internal and Flash Drive
Connector Styles	FC, SC Interchangeable
<b>Visible Light Source</b>	
Emitter Type	Laser
Wavelength	650nm ±5nm
Laser Safety Class	Class IIFDA21 CFR1040.10 &1040.11 IEC 825-1: 1993
Connector Type	2.5mm Universal
Output Power	1mW Max.
<b>Power Meter</b>	
Power Meter Detector Type	InGaAs
Calibrated Wavelength	Configured CWDM wavelengths and Standard OTDR - 850, 1300, 1310, 1490, 1550, 1625
Units of Measure	dBm, dB
Resolution	0.01 dB
Power Measurement Range	+5 dBm to -77 dBm (CATV +25 dBm to -57 dBm)
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
Autotest Measurement Rate	Four seconds per wavelength
Autotest Range	0 to -36 dB
Storage Locations	10,000
Connector	Interchangeable ST/SC/FC
<b>Light Source</b>	
Wavelengths	Depending on wavelength configuration of the OTDR. Wavelengths available on the OTDR are available as CW sources for Loss Test Set.
Output Power (CW)	0 dBm
Laser Safety Classification	Class I safety per FDA/CDRH and IEC-825-1 regulations
Modulation Modes	CW, 270 Hz, 1000 Hz, 2000 Hz
<b>General Specifications</b>	
Battery Charger	Universal
Battery	8hr
Dimensions (without rubber boot )	7.75" L x 4.5" W x 2.25" H (197mm L x 114mm W x 57mm H)
Weight	2 lbs
Communications ports	USB PC and USB Flash Drive Ports
Storage Temperature	-20 to 60 C
Operating Temperature Range	-10 to 50 C
Accessories Provided	Universal Battery Charger w/US, UK, Continental Europe, and Australian Plugs, Interchangeable FC and SC Adapters for the OTDR and FC, ST ,SC,1.25 and 2.5 Univ. for the Power Meter. Windows Compatible Reporting Software, Rubber Boot and Manual on CD

Specifications are subject to change without notice

## 16.0 Warranty / Repair / Trouble Shooting

### 16.1 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, 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.

### 16.2 Repair

If repair is required, call Terahertz Technologies Inc. @ 315-736-3642 for return instructions and a RMA number.

### 16.3 Trouble Shooting

Symptom	Possible Cause	Solution
LCD dark	Power not on	Press <b>ON/OFF</b> key
	Batteries require recharging	Recharge batteries
	Batteries are missing, in backwards or need replacement	Check polarity, replace batteries, or contact factory for servicing
LCD white	Power cycled too quickly	Turn off wait 5 seconds – turn on
Instrument locked Up	Unexpected Operational Mode	Turn off (hold ON/OFF button in for 1 second) wait 5 seconds – then depress On/Off again button to turn the unit on.
Initial Backscatter low	Defective cord or dirty connector	Replace or clean cord
	Fiber Output port requires cleaning	Clean and inspect port
	Angle polish mated with UPC polish	Examine connector ends
Extra or “ghost” reflections on backscatter	Fiber too long for short pulse	Switch to 10m pulse if >4Km
	Fiber over 16Km/53Kft	Switch to 100m pulse if >16Km
	Fiber over 64Km/200Kft	Switch to 1km Mode if >64Km
USB hookup to PC not functioning properly	USB baud rate not set properly or too quick for computer	Set port baud rate properly or decrease Baud rate in instrument and certification software
	PC drivers not set properly	Uninstall & reinstall certification software and drivers
USB Flash Driver not functioning properly	USB flash drive full	Clean or use a new flash drive
	USB flash driver cycled too quickly	Turn power off wait 5 seconds turn back on.

## 17.0 Version Control

Through a program of continuous improvement, the upgrade of the features and performance of this instrument are an ongoing process. The version is displayed on Home Screen in the lower right-hand corner of the display. The version changes and approximate release dates are as follows.

V2.6c – 9/2017 - CWDM Release