

- FX150 series
- FX300 series
- MTTplus-410 series
- RXT-41xx series
- TX3x0S series
- OTDR Viewer



## OTDR Series

Please direct all questions to your local VeEX® Sales Office, Representative, or Distributor. Or, contact VeEX technical support at [www.veexinc.com](http://www.veexinc.com).

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## About This User Manual

This user manual is suitable for novice, intermediate, and experienced users and is intended to help use the features and capabilities of VeEX products successfully. It is assumed that the user has basic computer experience and skills, and is familiar with telecommunication and other concepts related to VeEX product usage, terminology, and safety.

Every effort was made to ensure that the information contained in this user manual is accurate. Information is subject to change without notice and we accept no responsibility for any errors or omissions. In case of discrepancy, the web version takes precedence over any printed literature. The content in this manual may vary from the software version installed in the unit. For condition of use and permission to use these materials for publication in other than the English language, contact VeEX, Inc.

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### 1.1 Customer Support

For more technical resources, visit [www.veexinc.com](http://www.veexinc.com).

For assistance or questions related to the use of this product, call or e-mail our customer care department for customer support. Before contacting our customer care department, have the product model, serial number, and software version ready. Please locate the serial number on the back of the chassis. Please provide this number when contacting VeEX, Inc. customer care.

Support hours may vary depending on the product.

#### Product Technical Support

Support is generally available 8:00 AM to 8:00 PM, Eastern Standard Time, Monday to Friday.

**Phone:** +1 510 651 0500

**E-mail:** [customercare@veexinc.com](mailto:customercare@veexinc.com)

## MPA Product Technical Support

Support is generally available 8:30 AM to 5:30 PM, Eastern Standard Time, Monday to Friday.

**Phone:** +1 877 929 4357

**International:** +1 727 475 1206

**E-mail:** [serviceandsupport@veexinc.com](mailto:serviceandsupport@veexinc.com)

## 1.2 Warranty

For warranty information on VeEX products, go to <https://www.veexinc.com/Support/Warranty>.






To activate the warranty, please register your product at <https://www.veexinc.com/Support/ProductRegistration>.

## 1.3 Patent Information

VeEX product hardware and software may be protected by one or more patents on file with the United States Patent Office.

## 1.4 Documentation Conventions

Icons used in this manual:

	Marks a helpful tip (action or method), which can save time and improve usability of the product.
	Provides important information needed to use this product and avoid missteps.
	Cautions against an action or inactivity, which can hinder productivity.
	Strongly warns against a condition, an action, or inactivity which can lead to a health hazard, injury, equipment damage, data loss, and/or financial losses.
	Stop and read before continuing.

## 2.0 Product Introduction

The FX150, FX300, MTTplus, RXT, and TX3x0S feature an OTDR optimized for the installation and troubleshooting of FTTx, PON, CATV, Mobile Backhaul, and Metro fiber networks.

### 2.1 Platform Highlights (FX150/FX300/MTTplus/RXT/TX3x0S)

Features are subject to change. See the product's data sheet for current features and specifications. For further instructions on platform specific operations, refer to the product's user manual at [www.veexinc.com](http://www.veexinc.com).

- Robust, compact hand-held design for demanding field test environments
- High resolution, TFT color touch-screen viewable in any lighting condition. See the platform's datasheet for screen size.
- Fast boot-up time essential for fiber restoration
- Internal data storage varies with model. See the platform's datasheet for more information at [www.veexinc.com](http://www.veexinc.com).
- USB-A Host Interface supporting (FX300/MTTplus/RXT/TX3x0S):
  - USB flash drives
  - Fiber inspection probe connection
  - Bluetooth option available
  - 3G UMTS data card support (not available on all models). See the platform's datasheet for more information at [www.veexinc.com](http://www.veexinc.com).
- Micro USB interface OTG to support (FX150/MTTplus):
  - USB flash drives
  - Fiber inspection probes (requires OTG cable)
  - OTG Ethernet option available
  - OTG Micro USB-Micro USB male cable available
- Ethernet (10/100T) LAN Interface supporting (FX300/MTTplus/RXT/TX3x0S):
  - Remote control
  - Transfer OTDR test data
  - Perform software upgrades
  - Basic IP testing (Ping, Trace route, Web browser)
- Wireless and Bluetooth options (FX150 standard; FX300/MTTplus/TX3x0S/RXT optional; see platform's datasheet for details/availability at [www.veexinc.com](http://www.veexinc.com)):
  - Software upgrades and uploading test data via wireless connection
  - Pairing applications with Mobile Smartphones, Tablets, Windows PCs, and OPX-BOXe units.

- Rechargeable Li-Ion or Lithium Polymer battery with capacity indicator, low voltage alarm and Auto-off function. See the platform's datasheet for availability at [www.veexinc.com](http://www.veexinc.com).
  - FX150 platform – 10,000 mAH battery
  - FX300/TX3x0S platform – 5200 mAH battery
  - MTTplus platform – 5400 mAH battery
  - RXT platform - 8400 mAH battery
- Continuous operation of > 8 hours per Bellcore TRNWT-001138 (platform dependent).
- Remote control access using ReVeal PC software for Windows, built-in Web browser, VNC, and EZ-Remote. ReVeal software and Web browser can be used to transfer fiber test data, upgrade software and perform remote control (check with factory on availability).
- Fiberizer Cloud to PUSH and PULL fiber test files.
- VeExpress to check/upgrade software and installed options status (not available on FX300 or FX150).
- R-Server option (not available in FX300).

## 2.2 Key Features



*Features are subject to change. For current product features and specifications, see the product data sheet at [www.veexinc.com](http://www.veexinc.com).*

- FTTx optimized parameters for best dead zones
- Filtered 1625 or 1650 nm OTDR port for in-service measurements
- Live fiber detection with embedded power meter
- Dynamic range up to 50 dB (model dependent)
- Event dead zone < 1m, attenuation dead zone < 4m
- Singlemode wavelength options - 1310, 1490, 1550, 1625 and 1650 nm (CWDM and DWDM C-band also available). See the OTDR datasheet for availability at [www.veexinc.com](http://www.veexinc.com).
- Multimode wavelength options - 850 and 1300 nm
- Telcordia SR-4731.sor file formats
- Generate and save OTDR results in sor, html, pdf (with embedded sor and link map) or csv format (model dependent)
- Auto mode with automated trace diagnostics, simplified setup and events detection
- Optional V-Scout Profile test mode – Intelligent Link Mapping using intuitive icons derived user defined Profiles that allow multiple test acquisitions



- Markers for distance, attenuation, reflectance and splice loss measurements
- Optional universal interface with interchangeable optical adaptors (SC, ST, FC, LC) for OTDR port
- Power meter, light source, fiber inspection probe, VFL options, and MPO-12 SM optical switch (available for FX150, soon to be available in other models; consult factory).
- Remote measurement via USB or WiFi connection using Fiberizer Desktop software
- API commands for third party remote control software.

## **2.3 Package Contents**

- OTDR (OPX-BOXe, FX300, FX150, TX3x0S OTDR blade, RXT-4100 module or MTTplus-410 module)
- AC/DC adaptor
  - Input: 100-240 VAC (50/60 Hz), 1.5A max (RXT1200/TX3x0S); 5.3A max (MTTplus); 1.5A max (FX150)
  - Output: 16VDC (RXT1200/TX3x0S); 15VDC (MTTplus); 12VDC (FX150)
- Li-Ion or Li-Polymer battery (capacity depends on platform)
- Nylon Soft Carry case (optional)

### 3.0 Safety Information



Safety precautions should be observed during all phases of operation of this instrument. The instrument has been designed to ensure safe operation however please observe all safety markings and instructions. Do not operate the instrument in the presence of flammable gases or fumes or any other combustible environment. VeEX Inc. assumes no liability for the customer's failure to comply with safety precautions and requirements.



#### Optical Connectors

The test platform displays a laser warning icon when the laser source is active to alert the user about a potentially dangerous situation. Make sure that optical sources are inactive before connecting fiber to the test set to avoid skin or eye damage, or damage to the unit. It is recommended to:

- Deactivate the laser before connecting or disconnecting optical cables or patchcords.
- Never look directly into an optical patchcord or an optical interface (e.g. CFP, CFP2, CFP4, QSFP+, SFP+, SFP, OTDR, LS, VFL) while the laser is enabled. Even though optical transceivers are typically fitted with Class 1 lasers, which are considered eye safe, optical radiation for an extended period can cause irreparable damage to the eyes.
- Never use a fiber microscope to check the optical connectors when the laser source is active.

#### Electrical Connectors

Telephone lines may carry dangerous voltages. Always connect the electrical test ports to known test interfaces which carry low level signals.

## 4.0 Theory of Operation

### 4.1 OTDR

The principle of OTDR operation is based on measuring the Rayleigh back scattering signal when a single powerful optical pulse passes through an optical fiber. The weak back scattering signal is registered by an optical receiver, converted into digital form and averaged many times.

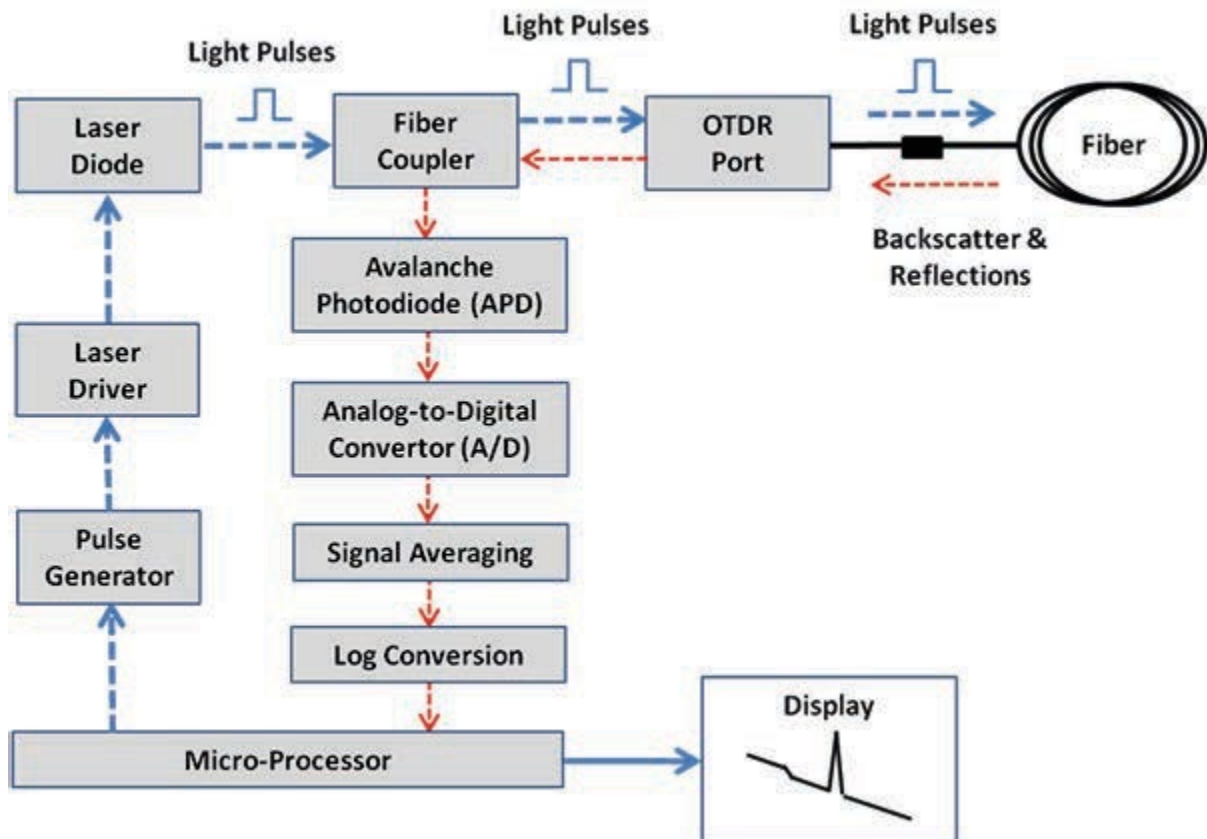
The OTDR calculate distance with next formula:

$$\text{Distance} = c * t / (2 * n)$$

where  $c$  - light speed in vacuum,  $n$  - optical fiber index of refraction,  $t$  - time delay between pulse emit and it registration by receiver

Each sample converted by ADC into digital form is registered in the RAM. To measure the back-scattering signal precisely, repeated triggering optical pulses is performed. The processor averages samples, corresponding to the same points of the optical fiber that leads to the increasing signal-noise ratio. After several cycles, the obtained signal values are transferred from RAM and displayed. Then, the process of measuring, averaging, and cleaning RAM registers is repeated again.

#### OTDR – Principle of Operation



## 4.2 Light Source

An optional light source is available and designed for generating continuous optical radiation. The light source output is the same as the OTDR port and uses the same laser diodes and optical splitter. The radiation power is stabilized with the help of external photodiode and power stabilization circuit.

The light source has two operation modes: Continuous and Modulated/tone (270, 1000 and 2000Hz). One or all wavelengths (Loop) can be used in OLTS measurement.

The average power at modulation mode is 2 times lower (3dB) than in continuous mode of operation.

## 4.3 Optical Power Meter

The OPM is equipped with an InGaAs photodiode (1mm diameter) to measure optical power. The OPM will support both MM and SM fiber with the APC or UPC connector type. WaveID can be enabled to detect source wavelength automatically when used with VeEX light sources that also support WaveID. For more information on specifications, see the datasheet.

For extended measurement PM2 range (+25dBm), an integrating sphere with a photodiode is used. Input power is attenuated by the integrating sphere by approximately 100 times.

The current of the photodiode is amplified and converted into digital form with the help of analog-digital converter. The received digital signal is processed by microprocessor and the value of the measured optical power is displayed.

## 4.4 Visual Fault Locator

The unit is equipped with an optional Visual Light Locator (VFL) to visually identify breaks in the fiber typically hidden in the OTDR dead zone.

- Output power: 0 dBm (Typical)
- Operation modes: Continuous wave (CW) or 2Hz modulation

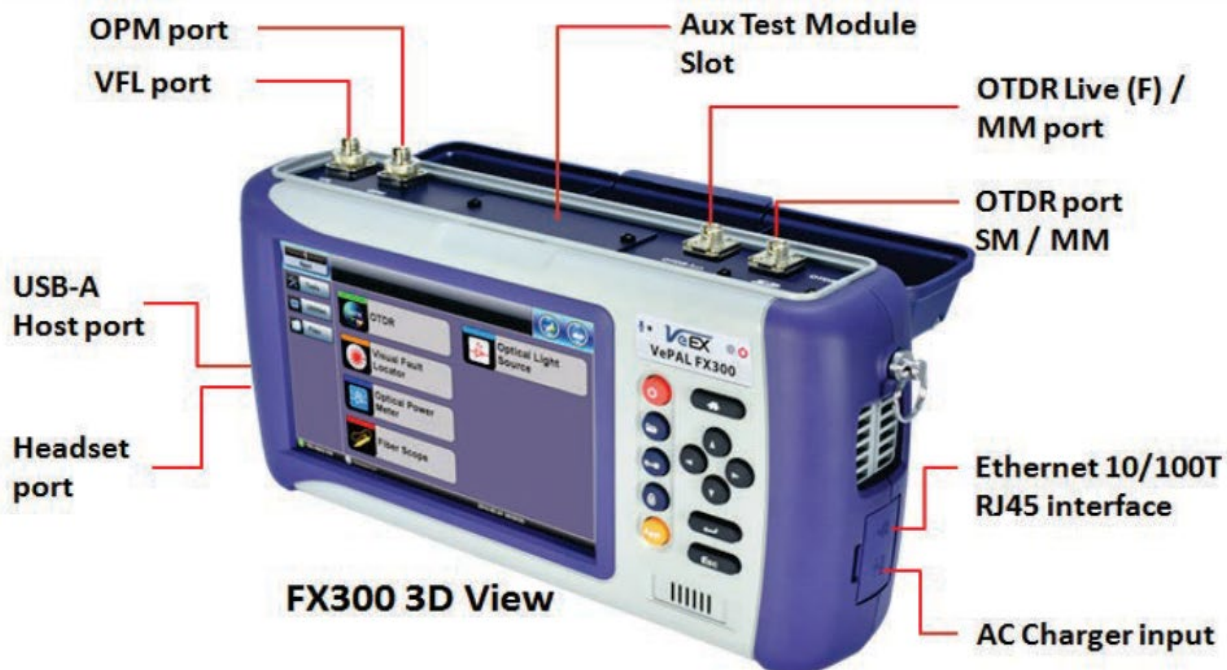
## 5.0 Basic Operation

### 5.1 Test Ports and Interfaces

**OTDR testing:** The optical fiber under test is connected to either the OTDR or OTDR-AUX (Filtered SM or MM) port on the top panel. The type of the optical fiber connector must correspond to the OTDR connector or adaptor type, including the connector polish.

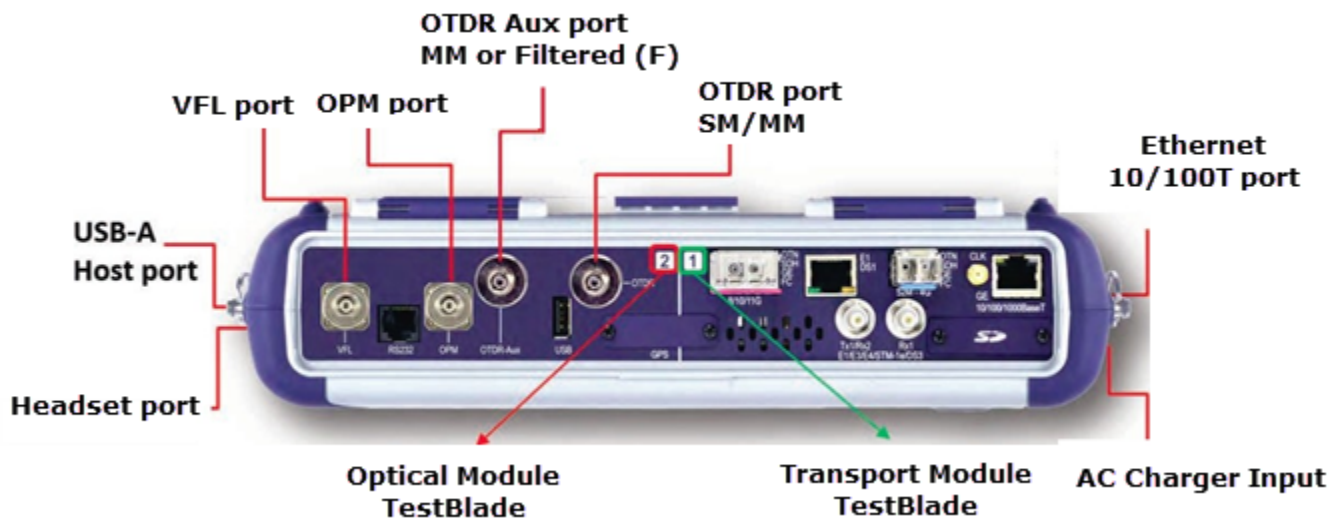
**Optical Power Meter (OPM) testing:** The optical fiber is connected to the OPM port on the top panel. Depending on fiber connector type, use interchangeable adaptors. FC, SC, ST or LC type are supplied standard.

**Visual Fault Locator (VFL) testing:** The optical fiber is connected to the VFL port on the top panel. The VFL interface is fitted with universal 2.5mm sleeve accepting all 2.5 mm connector ferrules. A 2.5mm to 1.25mm converter is available.

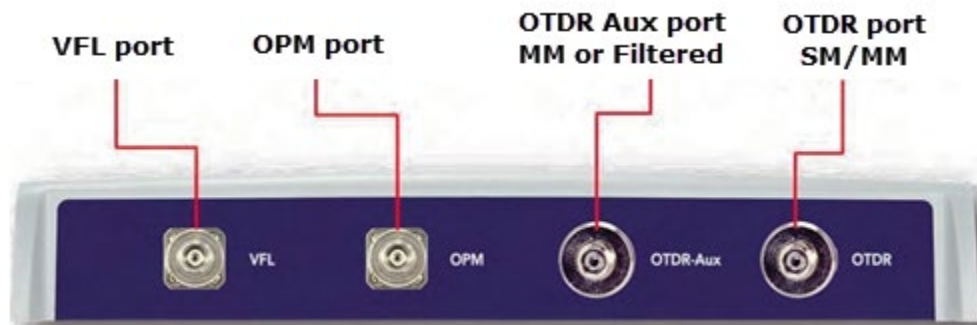


#### **Optical Connections**

*The optical fiber connector must be cleaned prior to connecting to the fiber under test. Dust and dirt severely impact optical performance. For more information on fiber handling procedures and tip cleaning, see [Section 6.0 Test Fiber and Initial Preparation Introduction](#).*



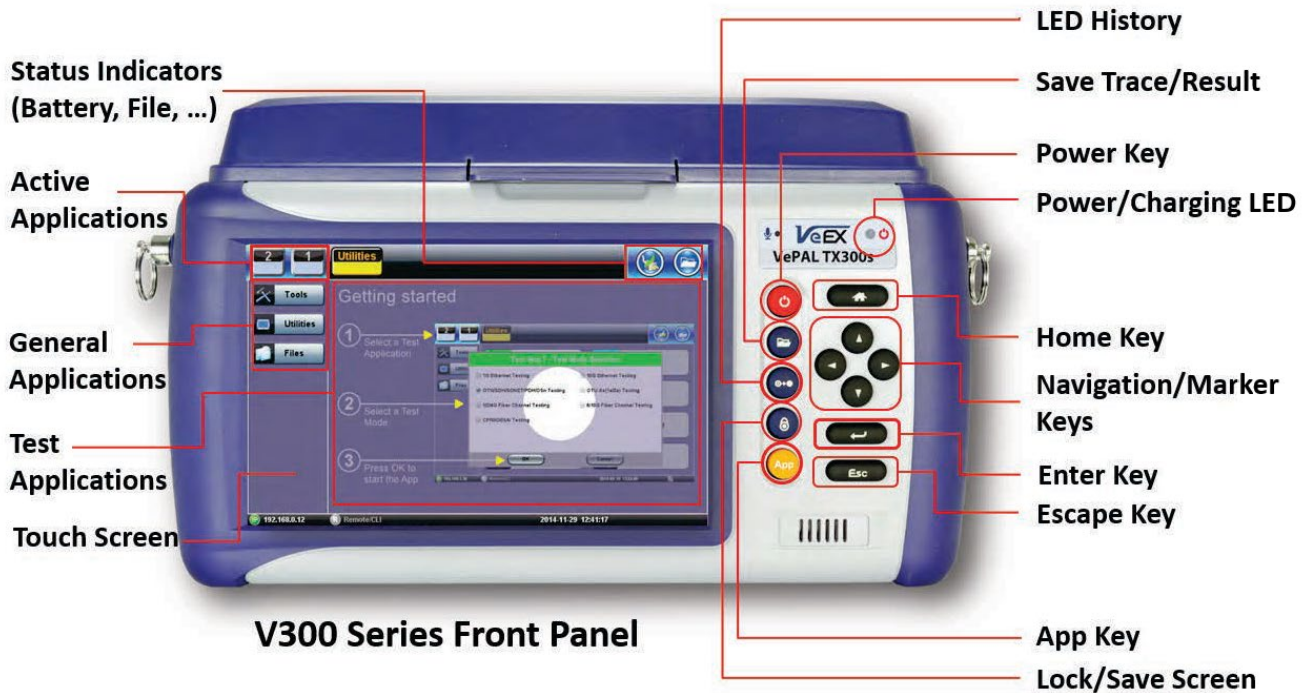
*TX3x0S Top View*



*RXT-4100 OTDR Module*

## 5.2 Front Panel Layout

The picture below depicts the TX3x0S. Layout will vary depending on FX150, FX300, MTTplus, or RXT platforms.



### 5.2.1 LED Indicators

**Power/Charge LED** - indicates battery charging is in progress. LED turns off when battery is fully charged.



*The device is powered from the built-in Li-Ion battery and can be operated with the AC/ DC adaptor plugged in.*

### 5.2.2 Rubber Keypad

- **Home Key:** Resets user interface to Main menu
- **Navigation/Marker Keys:** Used to move markers or navigate menus (in the event touch screen is disabled for any reason)
- **Enter Key:** Enters the desired value or selects active menu, check box or radio button
- **Escape Key:** Exits the menu
- **App Key:** Toggles between active test applications (OTDR, OLS, OPM, VFL)
- **Lock/Save Screen Key:** Locks the touch panel or saves the screen (bmp) depending on setting defined in Utility menu
- **LED History Key:** Resets LED condition (depends on test application)
- **Save Trace/Result Key:** Saves test result file (OTDR, OPM, Ethernet, Fiberscope - depends on active application and unit configuration)

### 5.2.3 Menu Navigation

Navigate between test applications, setup menus, tabs, or active functions using the supplied stylus or by using up/down arrows followed by “Enter”.



*TX3x0S test unit: Getting started*

“Getting started” information is displayed after power up.

### Select a Test Application

- **FX150:** The Fiber Menu is loaded automatically. Select the desired application from the Fiber Menu. Tap **HOME** to hide the Test **APP** and toggle to another. Tap **X** to close the **APP**. The Fiberscope icon can be found on the **Fiber Menu** or **Advanced Tools** screen and on the right side menu when the scope is detected.
- **TX3x0S:** Select **Application 2**, which corresponds to the optical test function blade #2, located on the top connector panel. Select OTDR, VFL, OPM, or OLS by clicking the icon on the main menu
- **FX300/MTTplus/RXT:** Select **Application 1**, which corresponds to the module, inserted into the module slot. Select the desired Fiber test mode and tap **OK**. The OTDR, VFL, OPM, and OLS test functions will be displayed on the main menu.

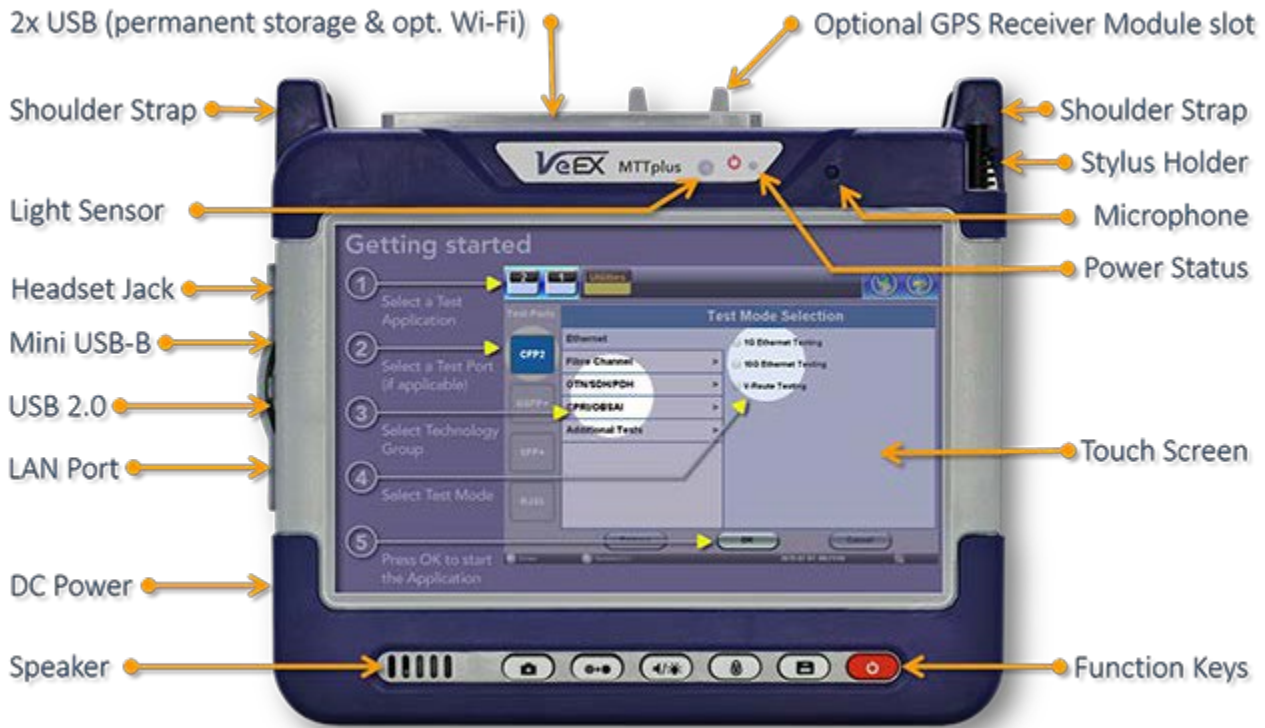


### **Touch Screen Navigation**

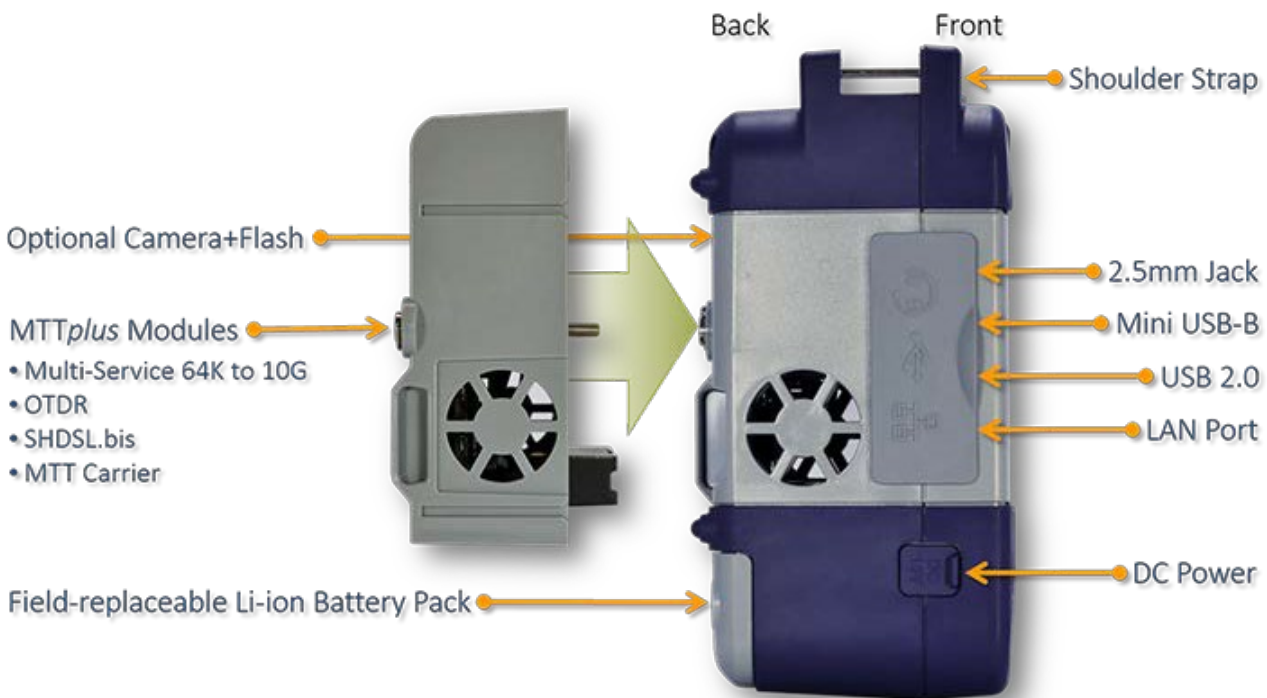
*The unit is equipped with a state of art, full color, LCD TFT touch screen. When used properly, the screen is designed to give years of reliable and precise operation. Always use the stylus supplied with the unit to operate the touch screen. Never use any sharp object such as a ballpoint pen, screwdriver, or similar item as this will damage the screen and void the warranty. The touchscreen can be recalibrated when needed. For more information, see the platform user manual at [www.veexinc.com](http://www.veexinc.com).*



### 5.3 MTTplus Overview



#### 5.3.1 MTTplus Side View





### 5.3.2 MTTplus Control Panel



- **Power:** Press for 2 seconds to turn the test set ON or OFF (prevents accidental ON/OFF) If a test is running when the power off is started, test is terminated and results may not be automatically saved.
- **Save Test Results:** Saves the current Test Results with customized or auto naming.
- **Lock/Unlock Touch Screen or Screen Capture:** Can also be programmed to Capture Screen images. Go to **>Utilities >Settings >Global >Save Settings** to set save and image compression options.
- **Volume and Brightness Control:** (it also acts as the MTT F1 key, when the is active) Brings up the Sound and screen Brightness controls; Use cursor buttons to adjust the levels.
- **Clear History:** Resets blinking LED reminders of past Errors or Alarms Test results are not affected. (not used with OTDR)
- **Camera App:** Launches the optional Camera App to help document the job site, damage, connections, etc. Requires the camera (factory-installed option).



#### **Upgrading Platform Software**

To upgrade the platform software, simultaneously press and HOLD the **Camera**  and **Power**  keys until the unit beeps.

### 5.3.3 MTTplus OTDR Module Top View



## 5.4 RXT Overview



## 5.4.1 RXT Front Panel

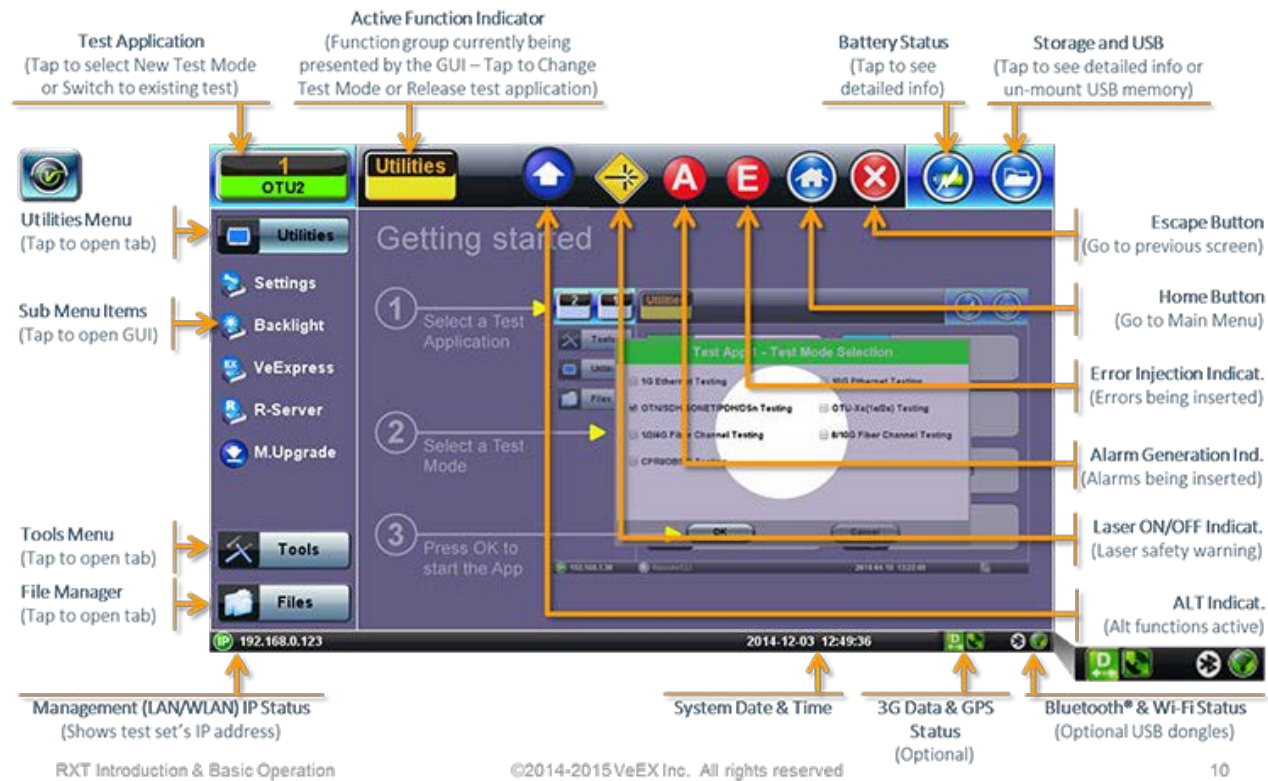


- **Power:** Press for 2 seconds to turn the test set ON or OFF (prevents accidental ON/OFF)
- **Cursor Keys:** Application dependent; May offer alternative GUI Navigation to touch screen (e.g. while wearing gloves in cold weather)
- **Enter:** Application dependent
- **Escape:** Application dependent
- **Alt Alternate function:** Links the buttons to the GUI soft Function Keys (MTT Emulation Mode only)
- **Clear History:** Resets blinking LED reminders of past Errors or Alarms. Test results are not affected. (not used in OTDR)
- **Volume and Brightness Control:** (it also acts as the MTT F1 key, when the Alt key is active) Brings up the Sound and screen Brightness controls; Use cursor buttons to adjust the levels
- **Test Application Selector** (it also acts as the MTT F2 key, when the Alt key is active): Quickly switches back and forth between the active Test Application and RXT platform. Utilities functions; Active test is not affected.
- **Lock/Unlock Touch Screen:** Can also be programmed to capture screen shots (>Utilities >Settings>Global>Save Settings)
- **Home:** Returns to the Main Menu
- **Save Test Results:** In OTDR test mode, selects the **Results** tab.

## 5.4.2 Getting Started

A Quick Guide is always present in the Home screen after booting up (actual image may vary with models and software version)

*This screen can be displayed at any time from any screen.*



The test port group is assigned to the Fiber application when the MTTplus 410 or RXT-41xx OTDR module is installed. All options associated with the OTDR module will be installed.

## 5.5 FX150 Overview



### 5.5.1 FX150 Test Ports



### 5.5.2 FX150 Keypad



- **Save:** Saves the test results.
- **Power:** Press for 2 seconds to turn the test set ON or OFF (prevents accidental ON/OFF).
- **Home:** Resets user interface to Main menu.
- **Right side + Save:** Saves the screen (bmp).
- **Right side + Home:** Hibernates device.

### 5.5.3 FX150 Screen Navigation



*OTDR Screen (with MPO switch connected)*

Use the top tabs of the FX150 screen to access test measurement controls and view results.

On the bottom bar, you can see:

- IP address, when connected
- Remote control connection status
- Date and time
- Bluetooth and WiFi connection indicators



For all available chassis operations, see the [V150 Common Functions User Manual](#) on [www.veexinc.com](http://www.veexinc.com).

### 5.5.3.1 View/Hide side menu panels

The left and right menus of the display provide icons to access more functions of the FX150. Use the shift keys located on the left and right sides of the unit to toggle on/off the left and right menu panels.

Press the **LEFT SHIFT KEY** to access:



**File Storage** – Tap to see the size and current capacity of the internal SSD storage.

**Power Source Indicator**– Indicates when unit is powered by external AC power and battery charging level. Tap to see battery charge status.

**V key / Fiber** – Tap to access all Fiber Test Modes or access the Utilities screen.

**Fiber Scope** – Tap to access the Fiber Scope options.

Press the **RIGHT SHIFT KEY** to access test control buttons and the following:



**Home** – Tap to return to the Main Fiber Menu.

**Escape/Exit** – Tap to close APP and access the System Settings and Tools screen.

**Arrow** – Tap to expand/contract the side menu panels.

**Start** – Begin trace.

**Green arrow** – Switch  $\lambda$  active trace

**Real Time OTDR** – See trace in real time.

**Fiber Scope** – Shortcut key to access Fiber Scope. This icon appears on the right menu automatically when a Fiber Scope is detected.



## 5.5.4 Setting up WiFi (optional feature)

The Bluetooth/WiFi option is available as an optional built-in feature in the FX150, allowing the transfer of OTDR traces and software upgrades on the unit. For other models, WiFi or Bluetooth options are available using WiFi and/or Bluetooth dongles.

### 5.5.4.1 Access WiFi option

1. Tap **Utilities** or the green **HOME** key, and then tap **Bluetooth/WiFi**.

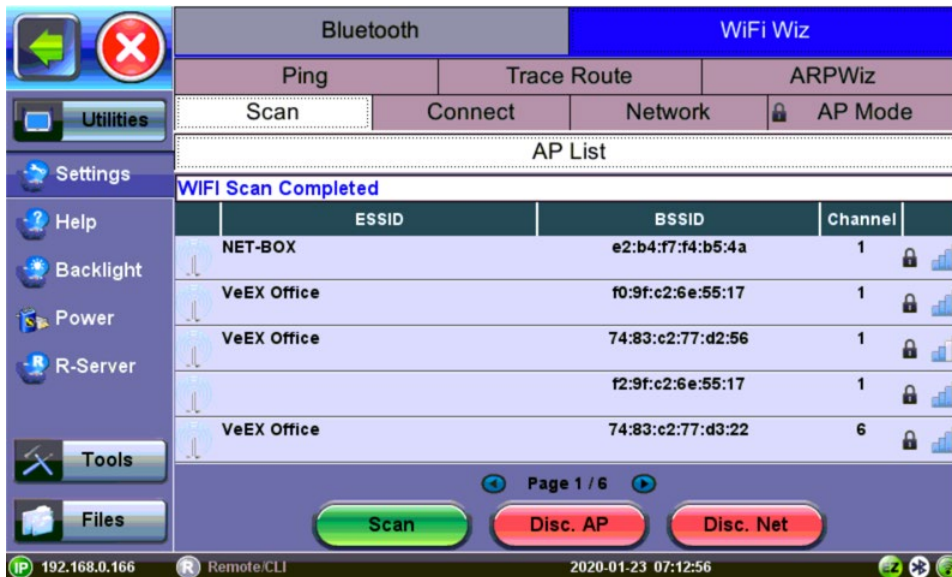


2. Select the **WiFi Wiz** tab.



## 5.5.4.2 Connect to a WiFi network

1. Tap **Scan** to see all networks



2. Select one of the available networks and the **Edit Settings** key will appear to the right. Once selected, an **Edit Settings** function key appears to the right.
3. Tap on **Edit Settings** to change the Encryption Type and enter the WiFi Key or **Connect AP**. The label will change to **Disc. AP** upon successful connection and the **Connect Net** key will appear.

**Encryption Type:** Supported encryption types include WEP, WPA, and WPA2.

**Password:** Security phrase or password necessary to access SSID and network. Tap the Password field to enter the network password on the pop-up keypad (ASCII formatting supported).

4. Tap **Apply** after selecting the Encryption Type and entering the Key.
5. If the encryption menu was accessed via **Connect AP**, the test set will connect to the AP automatically after hitting Apply.
6. If the encryption menu was accessed via Edit Settings, tap **Connect AP** to connect to the AP.
7. After a successful connection to the Access Point, tap **Connect Net** to obtain an IP address and access the additional IP tests like Ping, Trace Route etc.



*Passwords are case sensitive. If the wrong network key is entered, the test set will still connect to the Access Point but will not be able to connect to the web or perform the Ping test.*



*Built-in web browser remote control is available when WiFi is enabled.*

## 5.6 Customizing Your Tester (see *platform user manual for details*)

You can customize the settings on your OTDR device in the **Utilities>Settings** menu. For additional information about setting up the unit, see the unit's platform user manual.



*Settings screen*

- **About:** Displays information about the software version, serial number, MAC address of the management port of the unit, as well as a list of software licenses (optional test features) currently loaded in the test set.
- **Screen Calibration:** Screen Calibration can be access from the Screen icon or by pressing the Save and Home buttons on the keypad. See below.



### Activating Touchscreen Calibration Mode

You can activate the Touchscreen Calibration Mode using the keypad by pressing **SAVE + HOME** keys simultaneously for 3 seconds, then releasing. Press **SAVE + HOME** again to start a new calibration.



**Press SAVE and HOME  
simultaneously, then release.**

- **Bluetooth/WiFi:** Setup and scan Bluetooth and/or WiFi. See the *V150 Common Functions Manual* on [www.veexinc.com](http://www.veexinc.com) for more details.

- **LAN (USB adapt):** Configure network parameters for Trace Route tests. For LAN connection, an external USB OTG adapter for 10/100BaseT connectivity is required.
- **Backlight:** User defined settings when unit is used on Battery or AC power including Brightness settings. To help improve the battery autonomy and preserved LCD life, configure the timer to turn off the backlight if the unit is not in use and adjust the duration of the idle time. Once the timer is active and the backlight is turned off, any action on the test set (touch screen, keypad) will turn on the backlight again.
- **Global:** Various settings including:

### General Settings

- **Language:** English, German, French, Chinese, Japanese, Korean and others (depends on software version). You must reboot the device to fully activate the new language.
- **Units:** Measurement system (English - feet or Metric - meter).
- **Audible Alarm:** When enabled, the test set will sound (beep) when alarms and errors are detected or when battery runs low.
- **Show Password:** Shows/Hides username and password associated with FTP and related IP functions.
- **User Interface:** The USA user interface version presents SONET/DSn application-oriented menus, while the International setting is open to all settings.
- **WiFi Auto Connect:** After successfully connecting to a WiFi access port, the unit will attempt to connect automatically to the same AP after the unit is turned off and then turned back on.
- **RTU-410 (OTDR) Emulation Mode:** Enables remote control of the FX150 OTDR using API commands.



*Turn OFF RTU-410 (OTDR) Emulation Mode when not being used. It can conflict with the OTDR Server button in the OTDR app.*

- **OTG Port Mode:** Configures the micro USB port for any USB device connected via an OTG cable. Later models will detect and configure automatically the OTG port to host or device mode.
  - **Host:** Enables the micro USB port to connect with USB devices such as a USB stick or Fiberscope. USB devices will not be recognized if the OTG port is not set to Host mode.
  - **Device:** Enables the micro USB port to connect directly with a Windows® PC for the Share Results function.
- **Telnet/SSH:** Allows telnet connection to the unit.
- **Share Results Access via USB:** Turn ON to enable direct transfer of saved results from a V150 unit to a Windows PC. To directly transfer files, connect the unit to a PC via an OTG cable, set the OTG port to **Device** mode and turn ON **Share Results**. When turned OFF results are saved to the internal partition of the unit and can be transferred to a USB using the **To USB** function in the **File Manager**. For more information about saving OTDR results, see [Section 8.5 Results](#).
- **NTP Time Service:** (optional) Turn ON to allow the test unit periodically to obtain the current time from a public time server. Whenever the test set is connected to the Internet, the time will be updated.



If R-Server is used, the time service option can be made unavailable by the R-Server administrator. This ensures that all test sets have the same time, which is set by the R-Server.

### Storage Settings (not currently supported for OTDR/OPM/FiberScope results)

- **File Name Prefix:** Not used for OTDR file naming. Use AutoSave Setup Menu
- **Profile Deleting:** Auto Delete or Prompt before deleting profile.
- **Profile Saving:** Auto Overwrite or Prompt before saving profile.
- **Result Saving:** Manual or Prompt before saving results.
- **Advance Saving:** Turn On to add extra information to the results file to be uploaded to a centralized R-server. Requires Advanced Management Option.

### Save Settings

- **Maximum Number of Screenshots:** Sets the maximum number of screenshots that can be saved on the unit.
- **Date & Time:** Sets the date and time. Daylight savings are enabled automatically.
- **More:** Additional options including:
  - **Remote Access:** Settings for accessing and/or controlling the test set and the information it contains using the VeEX ReVeal software or VNC Server/Viewer. For more information on Remote Access, see the *V150 Common Functions Manual* on [www.veexinc.com](http://www.veexinc.com).

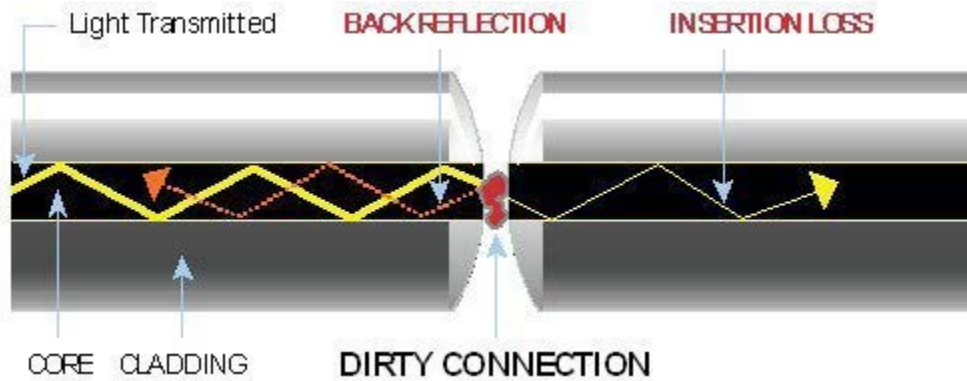
For more information on using the ReVeal software, refer to the *ReVeal User Manual* on the individual platform's page at [www.veexinc.com](http://www.veexinc.com).

- **Power:** Provides information about the unit's current power source and information about the battery. It also provides settings for putting the unit in Standby mode.
- **EZ Remote:** Allows remote access function that can be used across the Internet or Network Segments without requiring public IP addresses, port forwarding, or holes in the firewall. No special setup is required, only the test set serial number is needed. For additional details see the *V150 Common Functions Manual* on [www.veexinc.com](http://www.veexinc.com).

## 6.0 Test Fiber and Initial Preparation Introduction

Dirt, dust, and other contaminants severely impact high-speed data transmission in optical fibers and dirty connector end-faces are often the #1 cause of link failures. High insertion loss and/or high back reflection can result in transmission loss or high bit errors and poor BER.

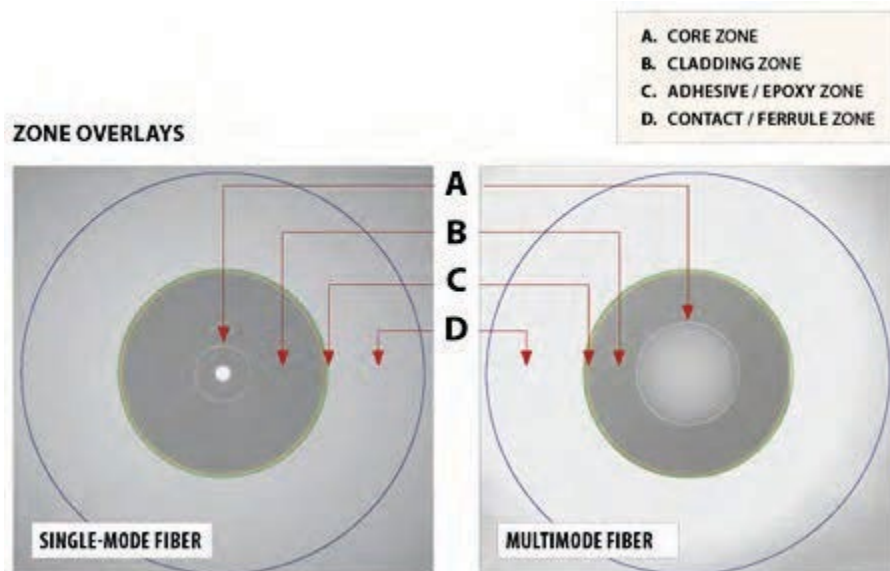
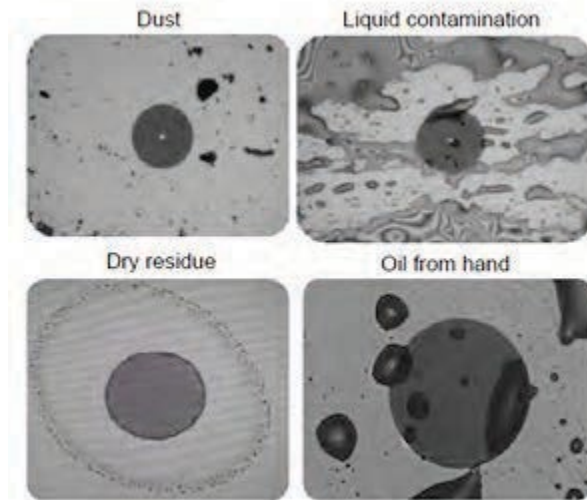
Furthermore, most measurement variations and test repeatability conditions in fiber-optic systems can be traced back to the cleanliness of optical connections. Contamination of fiber end faces not only affects optical power levels but also impacts back reflectance performance and levels which is harmful to sensitive optical components.



*Contamination of fiber end faces affecting optical power levels*

## 6.1 Contamination

Optical connectors are susceptible to contamination from air borne particles and human body oils when exposed. Left over liquid residue from improper cleaning can also leave the fiber end face contaminated. The smaller the fiber core, the more severe the problem is likely to be, especially when you consider that fiber core diameters can range from 62.5 microns all the way down to 8 microns in size. Below are some examples viewed by a 400x Fiber microscope:



## 6.2 Inspection

Whenever possible, inspect the fiber-optic connection (connectors, bulkheads, and test interfaces) with a fiber microscope. It is recommended to wear laser safety glasses when you work with fiber-optic connections, and always check that you disconnect the laser or transmitter before you begin cleaning the connector end faces.

## 6.3 Cleaning Procedure

To ensure proper and effective cleaning of optical fiber connectors and interfaces, please equip yourself with the following cleaning materials:

- Isopropyl alcohol
- Lint free soft tissues
- Ferrule cleaners (1.25mm and 2.5mm versions)
- Connector reel cleaners (CleTop or similar)



### Procedure

1. Dab the contaminated connector end-face with a wipe that has been dampened with Isopropyl alcohol - the solvent will dissolve and remove contaminants that have dried and attached to the connector or fiber end-face.
2. Rub the fiber end-face perpendicularly against a dry lint free wipe several times.
3. Alternatively, use compressed air to dry the surface quickly. Do not blow or allow the connector end face to air dry as this may leave a residue behind which is often more difficult to clean, and which can attract even more dirt.
4. Re-inspect the fiber end-face with an optical microscope to check that all the contaminants have been removed properly - if not, please repeat the process.



### **Using Compressed Air**

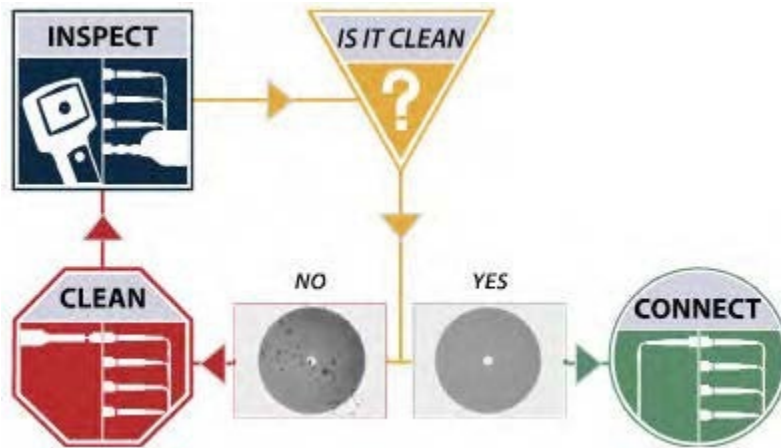
*In some clean air situations, you can use filtered air, which is free of oil and moisture to remove debris and clean a fiber optic connection. However, unless you follow very strict cleaning procedures, air-driven contaminants can cause more problems.*

*If you need to use compressed air, hold the can upright. If the can is held at a slant, propellant could escape and dirty your optical device. First spray into the air, as the initial stream of compressed air could contain some condensation or propellant. Such condensation leaves behind a filmy deposit.*



## 6.4 Best Practices

- Never touch the end face of an optical fiber connector with your hands or fingers.
- Always install dust caps on unplugged fiber connectors.
- Store unused dust caps in a re-sealable plastic bag to prevent dust accumulating.
- Never re-use optic cleaning swabs or lint free wipes. Always discard materials that have been used.
- Ensure all alcohol or solvent residues are removed after using wet cleaning techniques
- It is recommended to re-inspect the bulkhead receptacles and connector end face using a fiber microscope following the cleaning and prior to use.
- The flow diagram below describes a best practice prior to connecting your optical fiber.



## 6.5 Connectors

### 6.5.1 Connector Types

In fiber optic networks, you will come into contact with many different connector types, the most common being described below:

#### ST Connector

ST stands for Straight Tip—a quick release bayonet style connector developed by AT&T. STs were predominant in the late 80s and early 90s and are still one of the most commonly used fiber optic connectors in networking applications. They are cylindrical with twist lock coupling, 2.5mm keyed ferrule.



ST connectors are used both short distance applications and long line systems. The ST connector has a bayonet mount and a long cylindrical ferrule to hold the fiber.

#### FC Connector

FC stands for Fixed Connection - it is fixed by way of a threaded barrel housing. FC connectors are typical in test and measurement environments and for single-mode applications.



FC is the fiber optic connector standard for Nippon Telephone & Telegraph (NTT) installations, developed with Nippon Electric Co. (NEC).



*The FC screws on firmly, but make sure the key is aligned in the slot properly before tightening.*

## LC Connector

LC stands for Lucent Connector. It is a small form-factor fiber optic connector that uses a 1.25 mm ferrule, which is half the size of the ST / SC connectors.



It uses a standard ceramic ferrule connector. The LC has good performance and is highly favored for both multimode and single mode applications, especially in high-density connector facilities. The LC connector is available in simplex or duplex cables.

## SC Connector

SC officially stands for Subscriber Connector; however, some people believe that “Square Connector”, is the correct name. It is a general purpose push/pull style connector. It was developed by NTT, which has an advantage in LAN/enterprise networks where duplex cabling to support TX/RX channels are commonly used.



SC Connectors are frequently used network applications. The connector is square and keyed with push-pull mating, 2.5mm ferrule, and molded housing for protection. The SC is a snap-in connector that is widely used in singlemode systems due in part for its performance. The snap-in connector latches with a simple push-pull motion.

## E2000 Connector

Developed by Diamond, this connector has proven its performance worldwide in CATV and telecommunication networks. The connector features a spring-loaded shutter used to protect the ferrule from dust and scratches, and to provide increased safety protection. It uses a high precision Zirconia full ceramic ferrule with an insertion loss of 0.1dB. The APC version has a return loss of better than 85dB. The connector is especially suited for installation in global high performance networks.



The E2000 patchcords is available in simplex and duplex versions and comply with IEC 61754-15 and TIA/EIA 604-16 standards.

### 6.5.2 Connector Performance and Polishing

Polishing of fiber optic connectors is the process of polishing the end-face of the ceramic ferrule within the fiber optic connector. The purpose is to improve the light transfer between the mating of connectors, in order to minimize optical losses and reducing reflections. This is an important aspect of fiber optic communications as losses affect the quality of the light signals.

There are two main types of losses that are affected by the style and quality of polishing, which dictate the optical performance level of terminated fiber optic connectors:

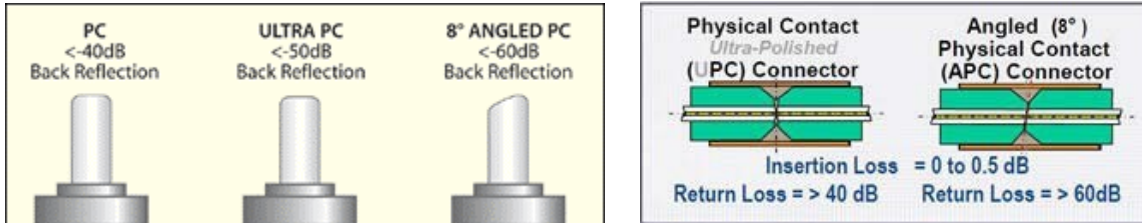
- **Insertion Loss (IL)** - The most important performance indicator of a fiber optic connection. This is the loss of light signal, measured in decibels (dB), during the insertion of a fiber optic connector.
- **Return Loss (RL)** - Also known as back reflection, is the portion of the light signal that is reflected back to the original light source. This occurs as the light is reflected off the connector and travels back along the fiber to the light source. This indicator is measured in negative decibels (dB). When reading return loss figures, the higher the absolute value of the decibel unit means the better the performance of the interconnection.

The amount of insertion loss is affected by fiber alignment, and/or the quality of the finishing on the end of ferrule, while reflectance is affected by the style of polishing on the ceramic ferrule in a connector. There are three different styles of polishing, reflected by their shape of the finish:

- **Physical Contact (PC)** - In the PC style finish, the fiber is polished to a smooth curve. As the name implies (i.e. physical contact), the ferrules of adjoining fibers come into physical contact and this reduces the air gap between the contacting ferrules, resulting in lower insertion losses. The smooth curve in the PC style is designed to reduce the return loss by reflecting the light out of the fiber. However, the PC polishing style incurs more return loss than other styles.

- **Ultra-Physical Contact (UPC)** - The UPC style ferrule has the shape of the PC style, except they are polished with several grades of polishing film that allows for an ultra-smooth surface. The main difference between UPC and PC is that the former has lower return loss.
- **Angled Physical Contact (APC)** - The APC style produces the lowest return loss when compared to other styles. The ferrule is polished to an angle of 8 degrees. The angle is calculated so that it is less than the critical angle, which ensures light is not propagated back along the fiber.

### Connector Polish and Performance



Typical Return loss values are:

- Polished Connector ~ -45dB
- Ultra-Polished Connector ~ -55dB
- Angled Polished Connector up to ~ -65dB

## **6.6 Fiber Cables and Fiber Patchcords**

### **6.6.1 Fiber Cable**

Styles of Fiber Optic Cable vary in outer appearance, materials, application, features, and benefits. In OTDR applications, you will regularly come across the following types:

#### **Bare Fiber**

- Usually Spooled in 25km spools
- 250 to 400um acolyte buffer / polyimide
- PM Light Sensitive Bare
- Fiber Adaptor is a useful accessory and provides quick connection to check fiber length/continuity

#### **PVC or Plenum Jacketed**

- Many colors that mean very little
- Used mostly in internal applications

#### **900um**

- Patchcords
- Simplex (single fiber) or Duplex (two fibers) construction
- Singlemode or Multimode
- Pig tails
- Outer Diameter is usually 1.6mm, 2.0mm, and 3.0mm
- Duplex versions - Zip cord with outer diameters of 1.6mm, 2.0mm, 3.0mm

#### **Break Out**

- Both Multimode and Singlemode
- Indoor / Outdoor applications
- 1.6mm, 2.0mm, and 3.0mm subunits
- 2, 4, 6, 8, 12, 24, 48, 72 or greater fiber counts Outer Jacket can be of a variety of materials
- Terminated with all styles of connectors
- Often field terminated

#### **Distribution**

- Both Multimode and Singlemode
- Indoor / Outdoor applications
- 900um subunits

## **2, 4, 6, 8, 12, 24, 48, 72, 144 or greater fiber counts**

- Outer Jacket can be of a variety of materials
- Usually longer runs and can be terminated with almost any style of connector

### **Ribbon**

- Commonly used in LAN and PON applications with MTP/MPO connectors

### **6.6.2 Fiber Patchcord**

A fiber patch cord is a piece of fiber cable that is used to connect the OTDR to the fiber under test. In a typical installation, fibers comprising the incoming cable will be “broken out” and terminated in a patch panel or wiring closet. One end of the patch cord is usually connected to the OTDR while the other end is progressively moved along the patch panel as measurements are made on each fiber.

The patchcord plays a critical role in fiber measurements. Ensure that a high quality patchcord is always used, because this can and will have profound performance on test results and traces.

Factors affecting the choice of patchcord include:

- Fiber type – singlemode, multimode or ribbon
- Connector type (ST, SC, FC, LC, E2000, MTP/MPO, etc.)
- Dead-zone requirements (Refer to Section 4.2) Back reflection performance
- Insertion Loss
- Durability and Longevity
- Bend Limitation

## Color Coding

The buffer or jacket on patchcords is often color-coded to indicate the type of fiber used.

### Connector boot

The strain relief “boot” that protects the fiber from bending at a connector is color-coded to indicate the type of connection.

Connectors with a plastic shell (such as SC or E2000) typically use a color-coded shell. Standard color coding for jackets and boots (or connector shells) are shown below:

Color Code of Jacket	Definition or Meaning
Yellow	Singlemode fiber
Orange	Multimode fiber
Aqua	10G laser-optimized 50/125um multimode optical fiber
Grey	Obsolete color code for multimode fiber
Blue	Sometimes used to designate polarization maintaining fiber

Color Code of Connector Boot	Definition or Meaning
Blue	Physical Contact (PC), 0° Mostly used for singlemode fibers; some manufacturers use this for polarization-maintaining optical fiber.
Green	Angle Polished (APC), 8° Singlemode only, not available for multimode fibers
Black	Physical Contact (PC), 0°
White	Physical Contact (PC), 0°
Red	High optical power. Sometimes used to connect external pump lasers or Raman pumps





## 6.7 Inserting the Fiber

Carefully align the optical fiber connector to the port to avoid rubbing the fiber against the external part of the port or any other surface. If the interface of the connector has an alignment key, make sure to insert it correctly into the corresponding groove.

Push the connector in and make sure the optical cables are inserted to guarantee sufficient contact. If the connector has screw bushing, screw down the connector to fix in the optical fiber. Do not over-screw the connector or it will damage the optical fiber and the port.

### 6.7.1 Preventing Inaccurate Readings

To achieve maximum power and prevent false readings, clean the optical fiber connector interfaces before inserting them into the test port.

Please ensure the correct fiber connector type is used before inserting it into the test port or connector. Mismatched connector types will damage the optical end faces and the test set.



***If the optical fiber is not aligned properly and/or completely connected, it will cause serious loss and reflection.***

## 6.8 Fiber Scope Utility (FX150, FX300, MTTplus, RXT-1200, TX3x0S)

### 6.8.1 Fiber Scope Overview

#### DI-1000 / DI-1000 MPO Digital Fiber Scope

The DI-1000 and DI-1000 MPO can use auto focus to capture the image and qualify the connector endface for cleanliness and damage per IEC 61300-3-35. For more information about available connector tips, see the *DI-1000 Digital Fiber Inspection Microscope Adapter Tips Guide* on [www.veexinc.com](http://www.veexinc.com).

#### VS-500 Video Fiber Scope

The VS-500 features a single-finger focusing knob, built-in spot light, brightness control, and a digital sensor with detectable resolution to 0.5  $\mu\text{m}$ .

### 6.8.2 Connecting the Fiber Scope

**Note:** Fiber Scope image view requires the Fiber Scope Expert option to be enabled on the chassis/platform except for the VS500 which can already include this option. This can be confirmed by viewing the device ID is either -1500 or -2500.

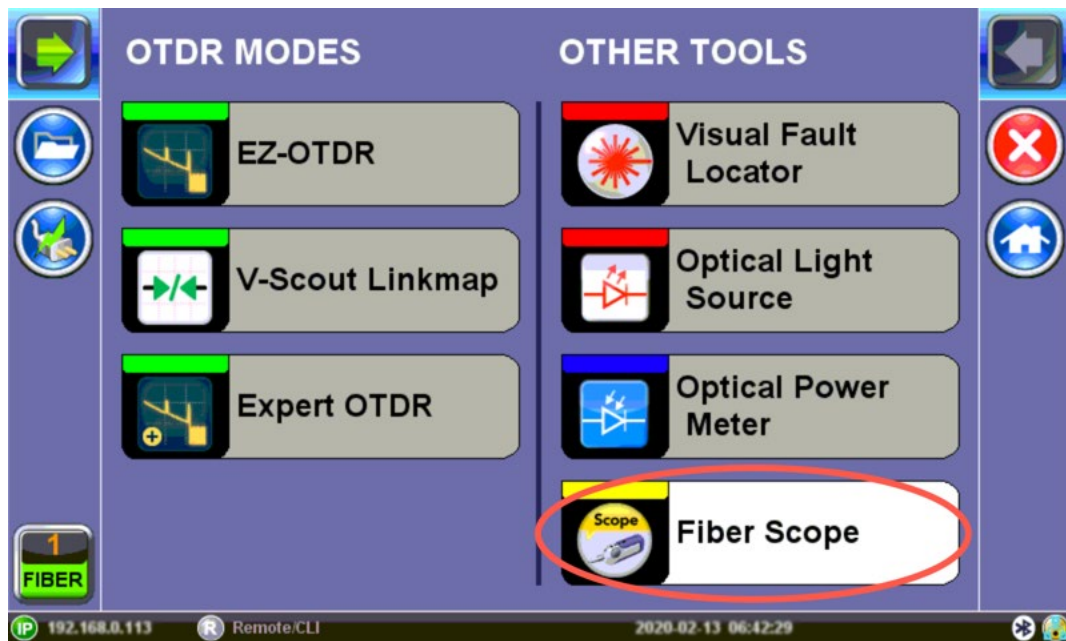


1. Connect the Fiber Scope to the test set, using any available USB port (older analog fiber scopes require a USB adapter). To connect to the FX150, use a standard OTG USB cable or optional Micro USB male cable.
2. On the Fiber Main Menu, tap the **Fiber Scope** option. Alternatively, on the left panel select the **Utilities<Advanced Tools**, and then select **Fiber Scope**.
3. Select the **Fiber Scope** options.



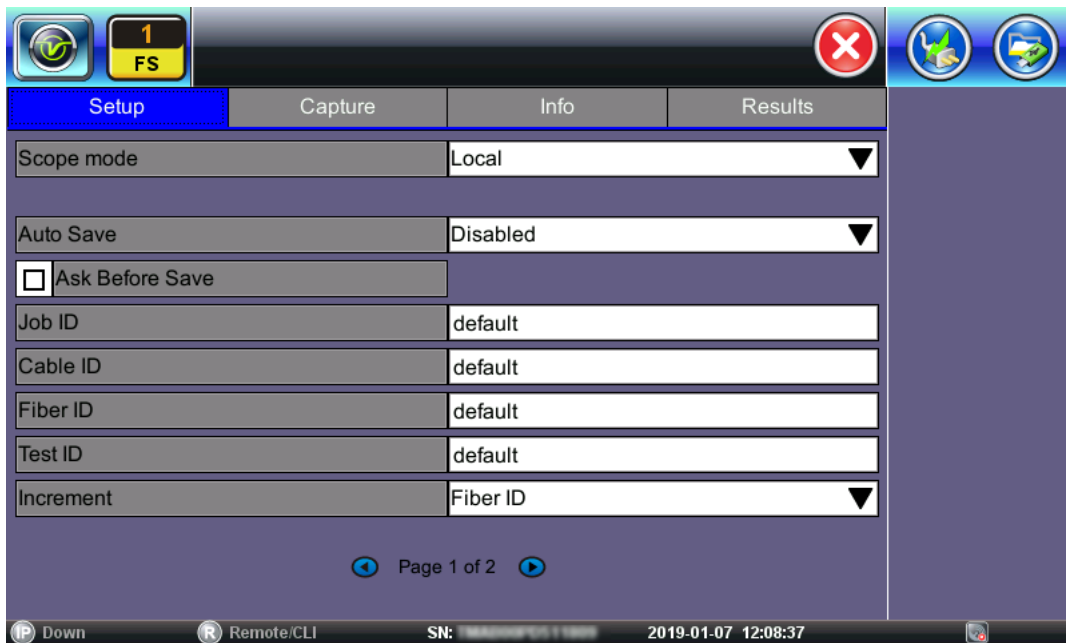
The OTDR Viewer app is for the portable USB/Bluetooth OPX BOX micro OTDR option. The Optical Power Meter app is for the UPM-100 USB dongle option or FX4x OPM tethered to device using USB cable.

The FX150 will detect when a Fiber Scope is connected automatically. A shortcut icon will be displayed on the right-side menu.



*Fiber Scope menu option (FX150)*

### 6.8.3 Fiber Scope Setup

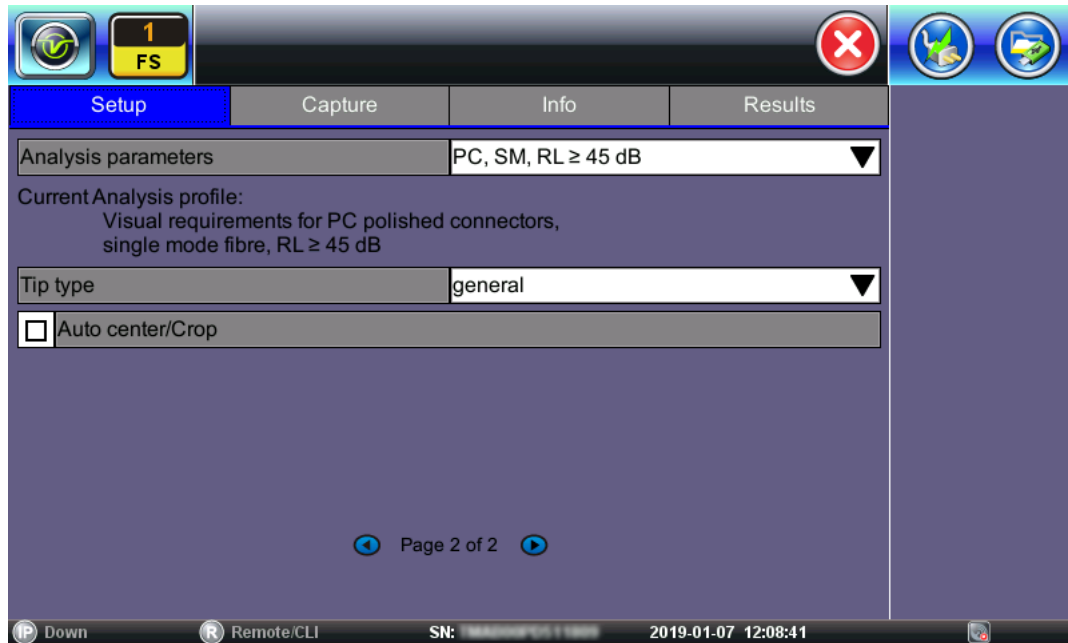


*Fiber Scope Setup page 1*

- **Scope mode:** Select Local (USB connect) or Remote (WiFi connect not available) operation.
- **Auto Save:** Select Disabled, Enabled, Enabled+Report (pdf) or Enabled+V-Scout Report (I
- **Ask Before Save:** Check this to be prompted to save after test is complete.

The details entered in the following fields can be used to pre-set the filename automatically, and increment fiber or test number automatically.

- **Job ID, Cable ID, Fiber ID, Test ID (content in this field automatically added to filename)**
- **Increment:** Choose to increment by Fiber ID or Test ID (can be used to increment fiber count).

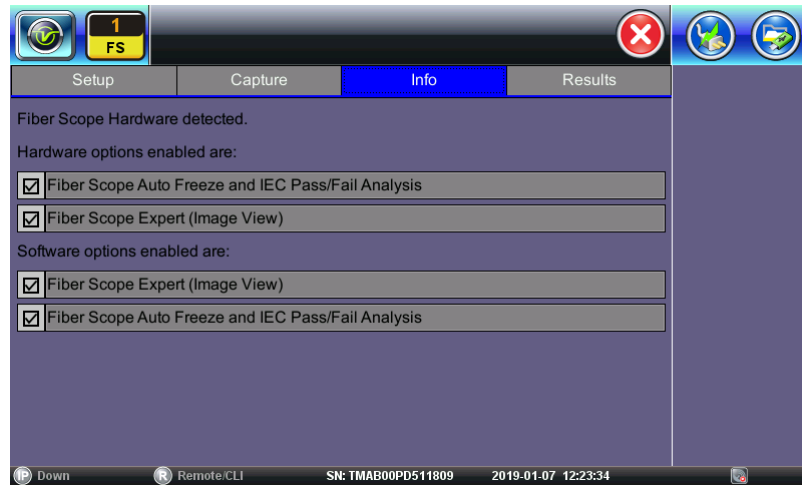


*Fiber Scope Setup page 2*

- **Analysis parameters:** Enter any name to identify the cable, site, technician, job, etc.
- **Tip type:** Select the type of tip used on the Fiber Scope. General is the default type. LC/APC and E2000/APC should not use general tip type.
- **Auto center/Crop:** Check this to center and crop the image automatically. This is ideal for APC images.

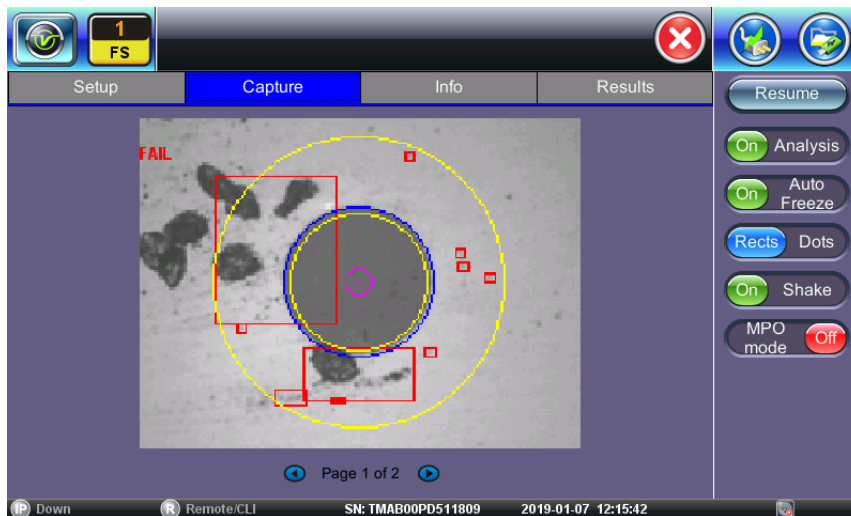
## 6.8.4 Hardware and Software Settings

Check the settings for the Fiber Scope detected on the **Info** screen.



*Fiber Scope Info Screen*

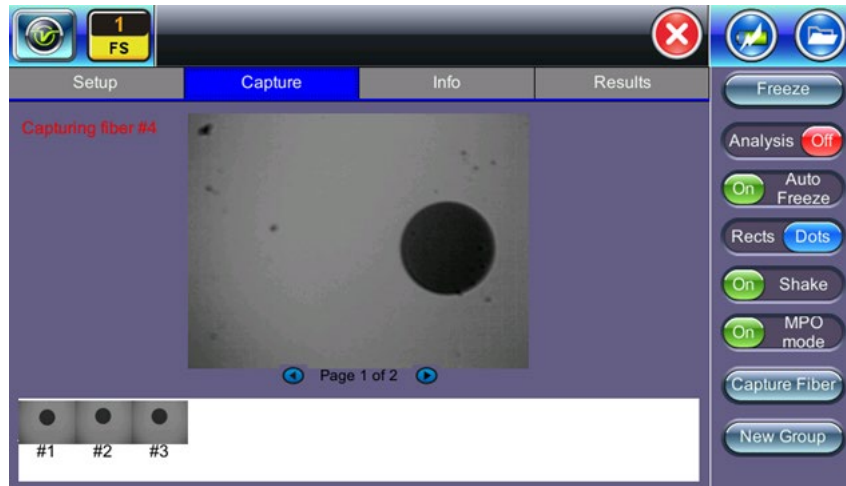
## 6.8.5 Capture Screen



*Fiber Scope Capture Screen*

- **Freeze / Resume:** Stops the real time video so the static picture can be viewed.
- **Analysis On / OFF:** Turn the Auto Analysis ON and OFF (software option).
- **Auto Freeze:** Turn ON and OFF the ability to freeze the image automatically, when in Focus. The default is set to OFF. To see the image after it freezes, tap **Resume**.
- **Rectangles / Dots:** Dots draw a red contour around scratches and defects. Rectangles highlight scratches and defects without obstructing the view.

- **Shake:** Turn ON or OFF the ability to Auto Freeze and Analyze when probe image is unsteady. Shake should be OFF when testing bulkhead couplers.
- **MPO mode:** Turn ON when inspecting ribbon fibers (MPO/MPT connectors). Create New Group for each MPO ribbon and Capture to save an image for each strand.



*Fiber Scope MOP mode*

To save the fiber picture on the screen, tap the screen.



### **DI-1000 Fiber Scope**

*When the DI-1000 Fiber Scope is plugged into USB, a blue LED will emit. The round FOCUS knob is on top. Turn right or left to focus.*

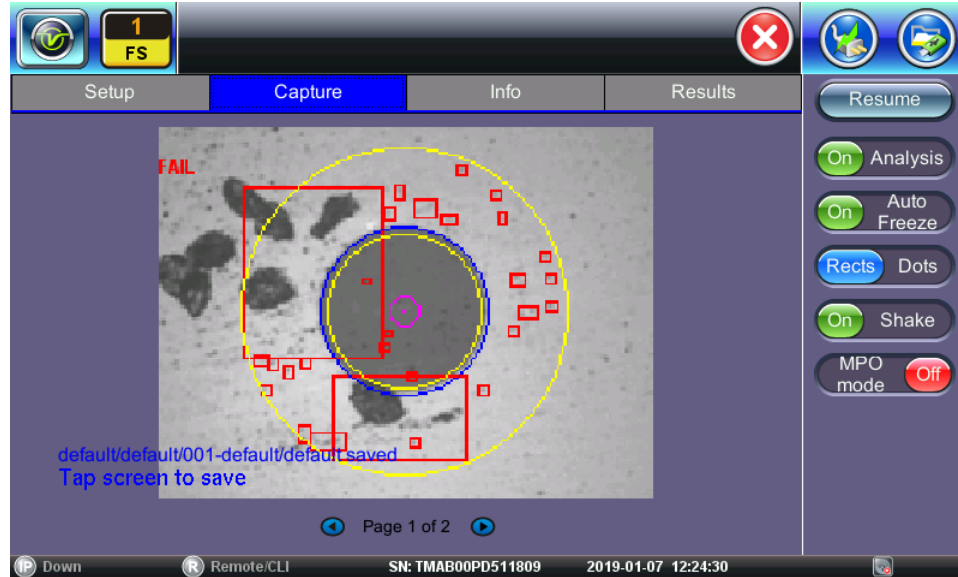
### **DI-1000 MPO Fiber Scope**

*When the DI-1000 MPO Fiber Scope is plugged into USB, a blue LED will emit. To focus, rotate the vertical control dial (top half) clockwise to trigger the camera positioning to travel downward, and for counterclockwise, to travel upward. The focusing dial (bottom half) zooms in and out respectively by rotating clockwise and counterclockwise. The horizontal (side) knob provides left and right direction positioning respectively by rotating it forward and backward.*

### **VS-500 Fiber Scope**

*When the VS-500 Fiber Scope is plugged into USB, the white LED spotlight will turn ON automatically. A blue LED will emit from the camera. The FOCUS adjustment is located on the left side. The spotlight ON/OFF, image contrast Up/Down buttons, and Freeze/Save buttons are on top. For more instructions on using the Fiber Scope, see the Fiber Scope User Manual on [www.veexinc.com](http://www.veexinc.com).*

## 6.8.6 Connector Face Analysis



*Connector Face Image*

## 6.8.7 Connector Face Analysis Results Table

	Scratches			Defects		
	Criteria(μm)	Thresholds	Count	Criteria(μm)	Thresholds	Count
A:Core 0-25 μm	[0;∞)	0	0	[0;∞)	0	0
B:Cladding 25-120 μm	[3;∞)	0	0	[2;5) [5;∞)	5 0	0 4
C:Adhesive 120-130 μm	-	-	-	-	-	-
D:Contact 130-250 μm	-	-	-	[10;∞)	0	24

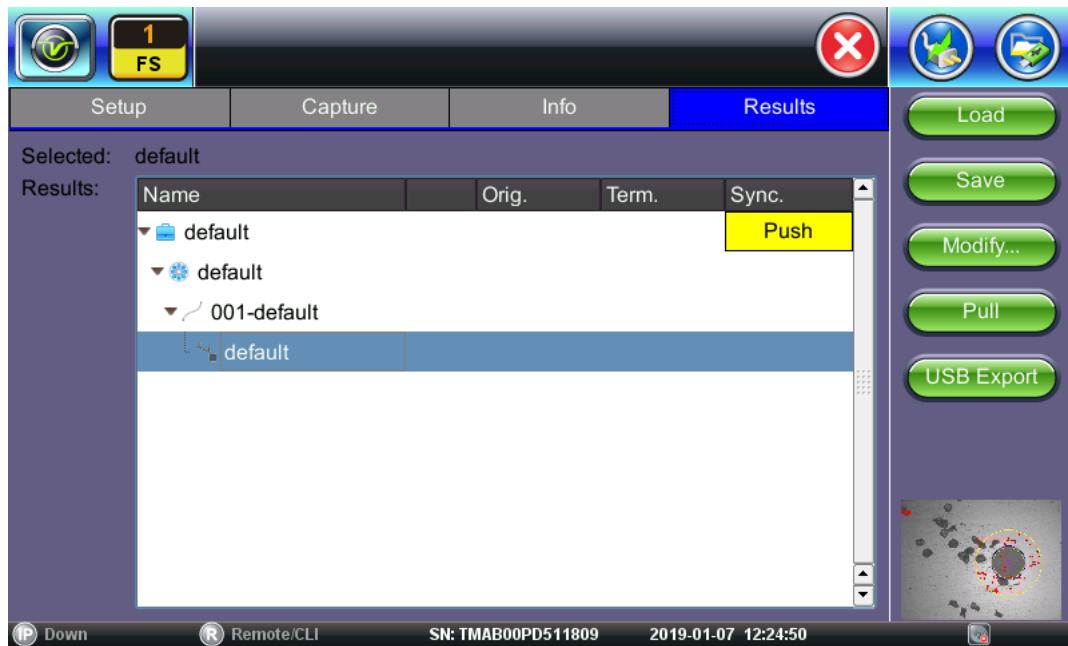
*Analysis Results Table*

Select **Page 2 of 2** view in the **Capture** tab. The test set displays a table with all numeric results from the analysis. **Catalogs**, **Defect** and **Scratch** events found for all four zones. Scratch requirements refer to width.



*This table will also be included in the reports.*

## 6.8.8 Result Files



*Fiber Scope Analysis Result Files*

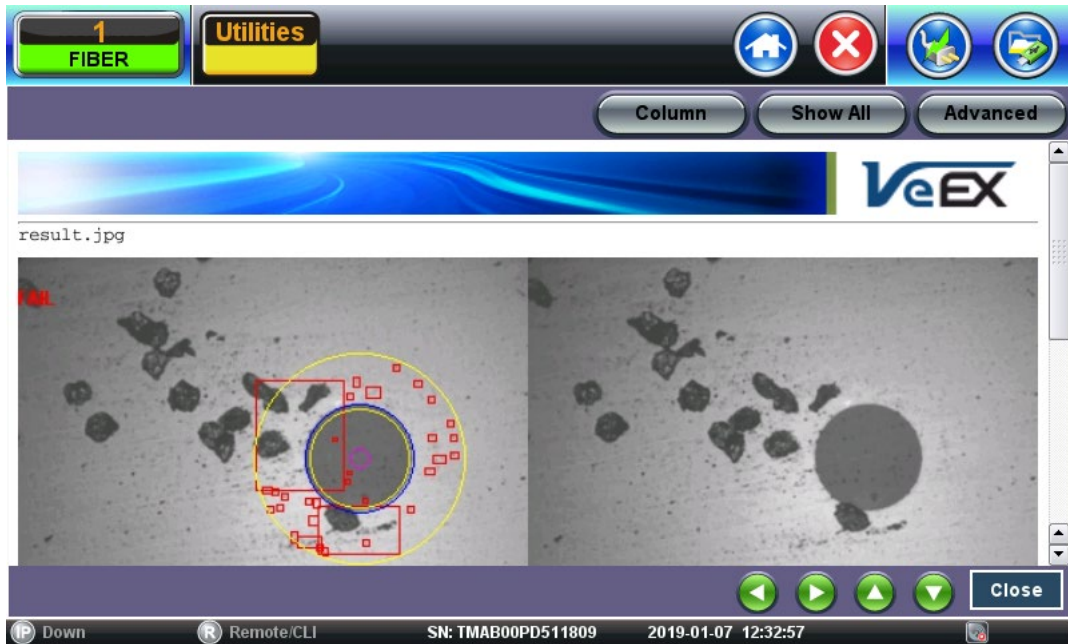
Select the file(s) by tapping them.

- **Load:** Displays file for viewing.
- **Save:** Saves file when autosave is disabled. Once saved, the files can be accessed in the File Manager or R-Server. For more information on **File Manager**, see [Section 9.0 File Management](#).
- **Modify**
  - **Rename:** Renames files.
  - **Remove:** Removes (deletes) files.
  - **Settings:** Enter Fiberizer Cloud information.
- **Pull:** When connected, pulls file from Fiberizer Cloud onto test set.
- **USB Export:** Exports files to USB stick. Choose **Export Group** to retain the tree format (sub-directory) or **Export Flat** to create a single filename using sub-directories to build a name.



### 6.8.8.1 Test Analysis Report

To view the report files, tap **Utilities>Files>Save**. The Fiber Scope test report can be viewed in JPG format or exported to PDF. In addition, all fiber optic test results can be viewed using Fiberizer Cloud or the Fiberizer Desktop Plus PC software. For more information on viewing reports, [Section 6.8.9 Managing Fiberscope Results with File Manager](#).



*Analysis Report (.jpg format)*

[MyTestReport01]-[FS Analysis]-[Common].pdf - Adobe Reader

File Edit View Window Help

Open [Icons] 1 / 1 100% Tools Fill & Sign Comment

**Analysis Report:**

Setup

Parameter	Test Data
Fiber From	Fremont/NO
Fiber To	ADNS Telecom Inc, Hub
Comments	Outbound 100GE

Analysis Result

Sones	Scratches			Defects		
	Criteria(um)	Thresholds	Count	Criteria(um)	Thresholds	Count
A:Core 0-65 um	{5;inf}	0	0	{0;5} {5;inf}	4 0	0 0
B:Cladding 65-120 um	{5;inf}	0	0	{2;5} {3;inf}	5 0	0 0
C:Adhesive 120-130 um	-	-	-	-	-	-
D>Contact 130-250 um	-	-	-	{10;inf}	0	0

Result

PASS

8.26 x 11.69 in

*Analysis Report (.pdf format)*

## 6.8.9 Managing Fiberscope Results with File Manager

1. Go to **Utilities >Files >Saved**. All results stored in the test set are displayed.
2. Use the  to select the desired files.
3. Tap on any column header to sort by that specific parameter (FS Analysis or Fiber Scope). Tap again to change the sorting order.



- **U/L:** Unlock or locks files to prevent accidental deletion.
- **PDF:** Converts all selected files: Requires FAT32 USB Memory stick.



To backup and restore files, use a USB Memory stick.

- **To USB:** Copies all selected files to the stick.
- **From USB:** Restores all files from the stick.
- **BT:** (Bluetooth®) File Transfer the requires compatible USB dongle.

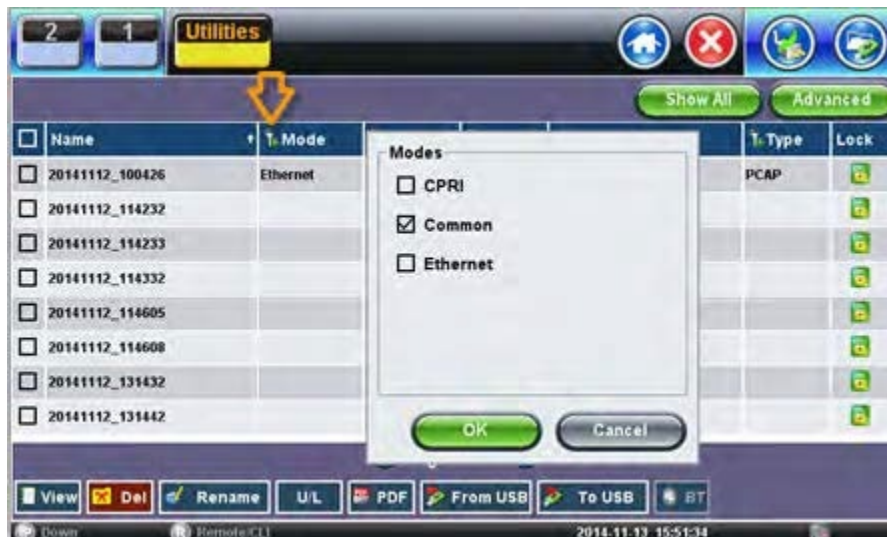
### 6.8.9.1 File Manager Filters

File Filters make it easier to isolate desired types of results from all other test results stored in the test set. It also reduces the number of pages displayed.

To activate filters, use the stylus to tap the + icon.



Fiber inspection test results belong to **Common Mode** and **Fiber Scope Tests**. Filter parameters can be combined.



To reset filters, tap the **Show All** button.

To make locating test results and reports easier, sort the results by tapping a header to sort by that field's type, in ascending or descending order.

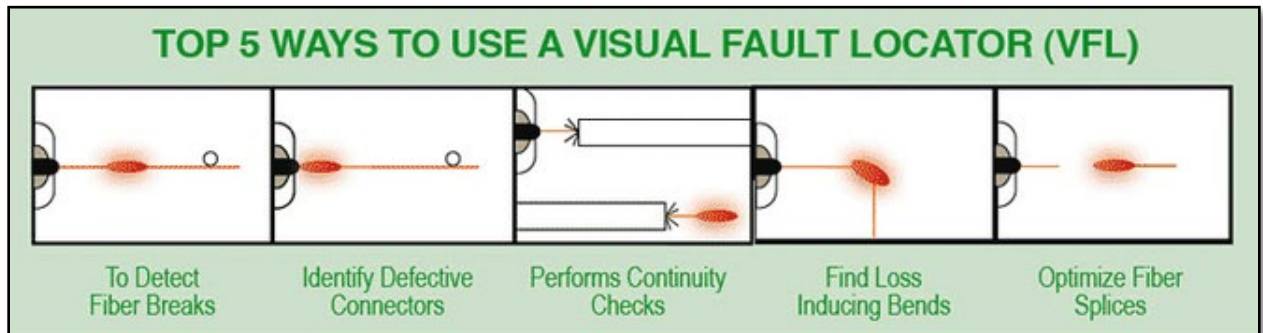
### 6.8.10 Fiber Scope Image Management Software

For information on using Fiber Scope Management Software, see the *Fiber Scope User Manual* on [www.veexinc.com](http://www.veexinc.com).

## 6.9 Visual Fault Locator (VFL)

The unit is equipped with an optionally built-in Visual Fault Locator (VFL) to trace and visually identify breaks in ODFs, bare fibers (900  $\mu\text{m}$ ), and patch cords that are typically hidden in the OTDR dead zone.

The VFL works by injecting a 650nm visual red light into the fiber (up to 5 kilometers/3 miles) to bend a single fiber strand and force light to exit the center of the fiber. It traces it to identify faults through light leakage. It identifies fiber strands, connectors, breaks, bends and other potential problems or anomalies on events.





To see the most recent VFL specifications, go [www.veexinc.com](http://www.veexinc.com).



### PROTECT YOUR EYES!

***Never look directly into the VFL's light. It is a Class II laser and emits laser radiation that can potentially harm your eyes with extended exposure. It is good practice to never look directly into any fiber connector for any reason.***

Use the  **Home** icon (FX150/RXT) to toggle between active tests (OTDR, OLS, OPM, VFL).

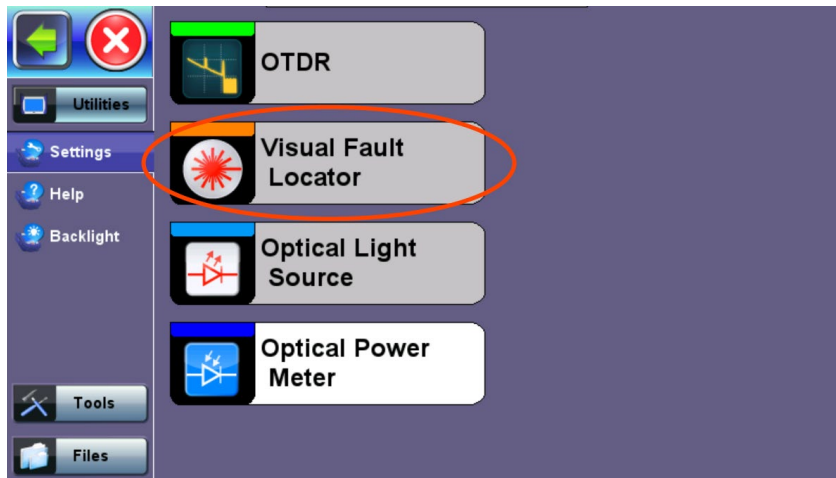
Use the  **App** key (FX300) to toggle between active tests (OTDR, OLS, OPM, VFL).

VFL can be used with OTDR simultaneously.

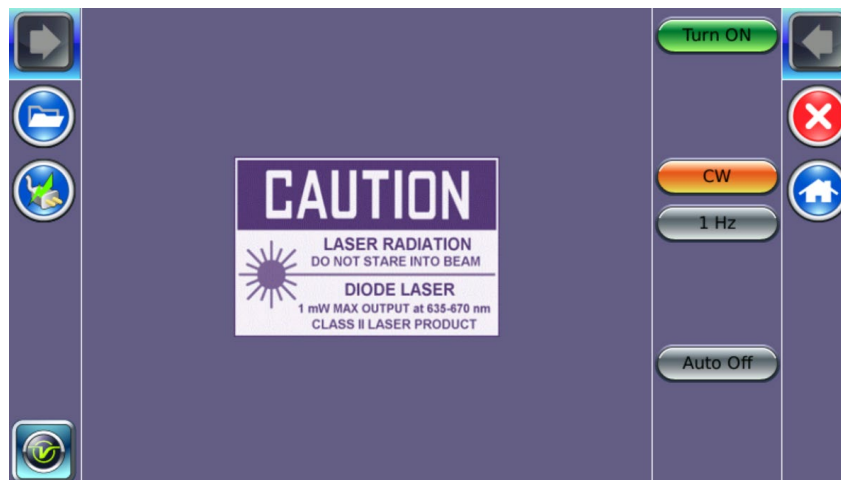
## 6.9.1 Using the VFL

### To operate the VFL:

1. Make sure laser is turned off. Remove connector covers from the cable.
2. Connect the fiber to the VFL port located at the top of the unit. The VFL interface is fitted with universal 2.5mm sleeve accepting all 2.5 mm connector ferrules. Use a 2.5 to 1.25mm converter to check MU or LC connectors.
3. Power ON the unit, and then tap the **X** icon to close OTDR mode and display the **Fiber Main Menu**.
4. Tap **Visual Fault Locator** on the main menu. The **Caution** screen appears.



*Visual Fault Locator menu option*



*VFL: Caution screen*

5. Select the operation mode.

**CW:** (*Continuous Wave*) Select this option to turn on the VFL continually to check for faults.

**1 Hz:** (*Pulse*) Select this option to send intermittent light pulses. In some cases, this makes it easier to identify faults (than continuous light). It can also be used with audible detectors (toners) that can identify faint light or in well-lit (bright) environments.

6. Tap **Auto Off**. When VFL application is exited, the VFL powers down automatically.

7. Tap **Turn ON** to power the laser. The **Caution** box turns yellow.

8. You will observe that a red light emits from the end of the fiber to confirm continuity. This red light will also appear at splices, joints, connectors, ODLs, etc. if any light is leaking.

9. Tap **Turn OFF**.

10. Disconnect the cable and replace covers.



*When not in use, disconnect the cord from the port, replace dust covers, and keep the port cap securely closed.*

*VFL will not work on G.655 bend insensitive patchcords or cables with dark jacketing material or armored cables.*

## 6.10 Optical Light Source (OLS)

The unit can be equipped with an optional Optical Light Source (OLS) to use in conjunction with the OPM and test the entire fiber infrastructure. It identifies microbends, bad splices/connectors, and fiber breaks through visible laser light leakage. Use the automated feature to control both units at each end and test the fiber (multimode or singlemode) at different wavelengths. The OLS radiates continuously or in pulses.

To see the most recent OLS specifications, go [www.veexinc.com](http://www.veexinc.com).



### PROTECT YOUR EYES!

**Never look directly into the OLS test port. The laser radiation emitted can be harmful to your eyes.**

### 6.10.1 Configure the Optical Light Source

To access and set up the OLS option:

1. Make sure that the Optical Light Source option is installed on the test unit.
2. Power on the unit. The Fiber Main Menu is loaded by default.



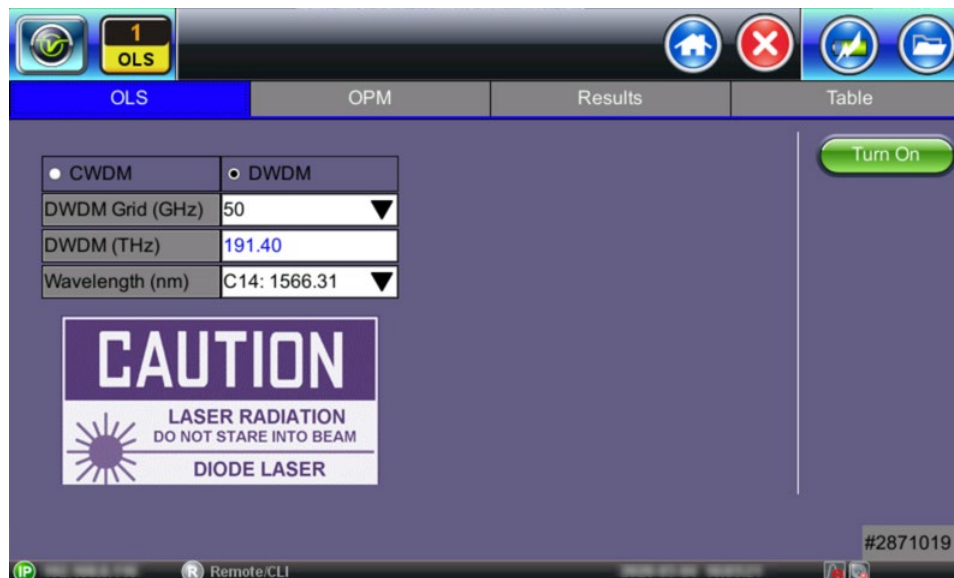
On the RXT, if the Fiber Main Menu does not appear tap **Fiber** at the top.

3. Tap **Optical Light Source** on the main menu. The **OLS** screen appears with the **Caution** warning.



*Optical Light Source menu option*





*OLS Setup (RXT-4113)*



*OLS Setup (FX150)*

4. In the **Lasers** drop-down list box, select the desired laser wavelength to transmit. For Multimode or Filtered OTDR lasers, use the OTDR-Aux port.
5. Select the operation mode (**CW**, **270 Hz**, **1000 Hz**, or **2000 Hz**) for the test.
  - **CW (Continuous Wave)**: Select to continually measure level, loss, and reflectance in optical components.
  - **270 Hz, 1000 Hz, 2000 Hz (Pulse)**. Select this option to send intermittent light pulses. In some cases, this makes it easier to identify faults (than continuous light). It can also be used with audible detectors (toners) that can identify faint light or in well-lit (bright) environments.

- **Loop:** Loop ON will enable lasers to cycle through all available lasers automatically.



- *RXT4111/4113 OLS operates in CW mode only without WaveID feature supported.*
- *RXT4113 Loop not supported.*

## 6.10.2 Using the Optical Light Source

### To use the OLS:

1. Connect a patchcord between the OLS and OPM test ports.
2. Select **Optical Light Source** from the main menu. The **OLS** screen appears.
3. Tap **Turn ON** to power on the OLS.
4. If **WaveID** is available, tap **Loop** mode, to auto cycle through all available wavelengths on the test port. The laser will change every three seconds.



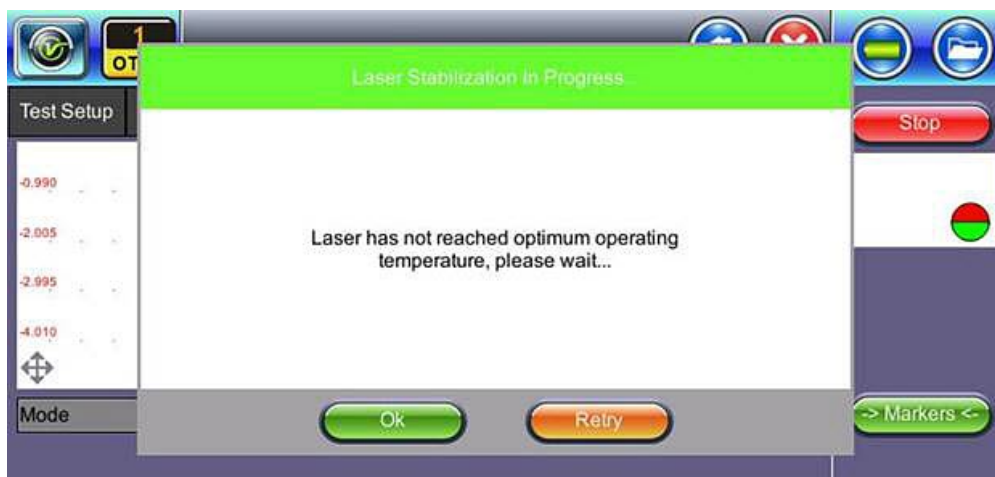
*WaveID feature will not work with modulated light signals.*

5. When testing is complete, tap **Turn OFF** to power off the OLS, and then disconnect the cable and replace the port covers.



### **RXT-4111 DWDM OTDR Laser Stabilization**

*The RXT-4111 DWDM OTDR test module offers advanced TEC laser stabilization for hot and color weather operating conditions. If the optimal temperature for usage has not been reached, a **Laser Stabilization** message appears.*




*Laser Stabilization message*

## 6.11 Optical Power Meter (OPM)

The unit can be equipped with an optionally built-in Optical Power Meter (OPM). It can also access an external Optical Power Meter using the Micro-USB port. It works by testing average output power from a light source and can be used to measure the span loss in dB of an optical fiber systems. On the test set display, view measurement loss in real-time.

To see the most recent OPM specifications, go [www.veexinc.com](http://www.veexinc.com).

Use the  **Home** icon to get to the Fiber Main Menu (OTDR, VFL, OLS, OPM test modes).



- *Only optical power meters (e.g. Built-in, UPM-100 or FX4x/8x OPM series meters) approved by VeEX are supported. WaveID will work with OLS in CW mode only.*
- *Accessing the Optical Power Meter module shuts down GPS and the atomic service.*

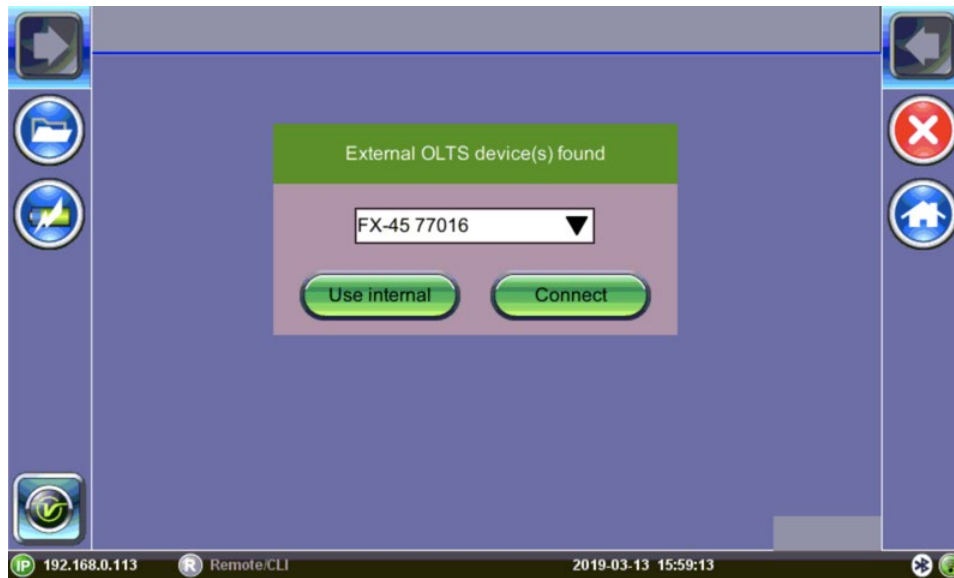
### 6.11.1 Access the OPM

#### To access the internal (built-in) OPM:

1. Connect the test fiber to the OPM test port located at the top of the test unit.
2. Tap the **X** icon to close OTDR mode. The **Fiber main menu** appears.
3. Tap **Optical Power Meter** on the main menu. The **OPM** screen appears with the **Caution** warning. See [Section 6.11.3 Using the OPM](#) for information on using the built-in OPM.

#### To access the externally connected OPM:

1. Make sure the external Optical Power Meter is connected to the Micro-USB port via an OTG cable.
2. Power on the external meter, and then tap the **X** icon to close OTDR mode. The **Fiber main menu** appears.
3. Tap **Optical Power Meter** on the main menu. The **External OLTS device(s) found** screen appears.



*External OPM connection screen*

4. Select the connected external meter and tap **Connect**. The **OPM setup** screen appears. If the test unit, also has a built-in meter that is preferable, tap **Use Internal**.

### 6.11.2 Configure the OPM

When configuring the OPM, the meter must be referenced (calibrated) to the Laser Source output.

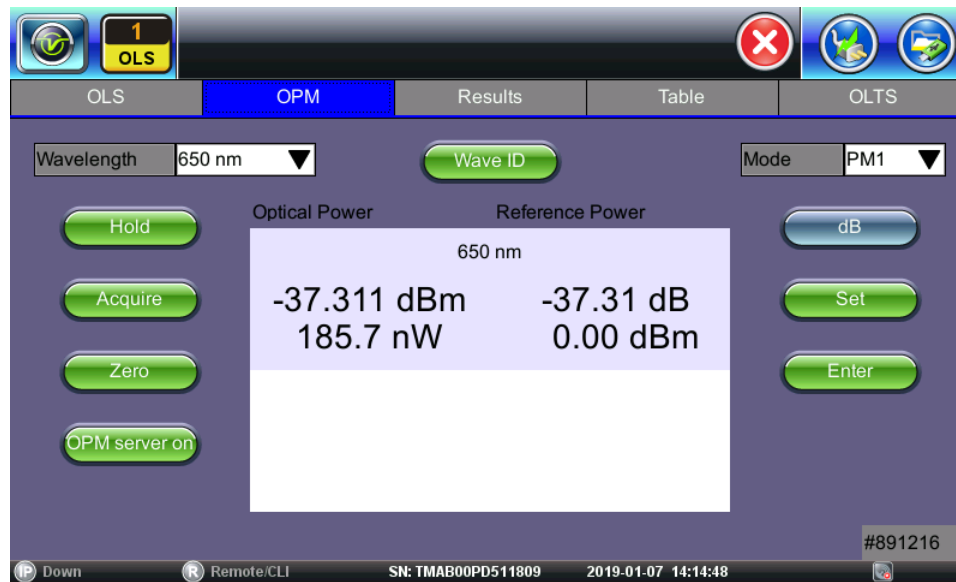
#### 6.11.2.1 Calibrating to Laser Source

For more information on patchcords, see [Section 6.6.2 Fiber Patchcord](#).

#### To measure reference cable loss:

1. Connect the LS to the OPM using a patch cord (Loopback Referencing).
2. Tap the green **dB** button.
3. Go to OLS and select the laser wavelength and turn ON. The wavelength should match the light source wavelength, unless Wave ID is available.
4. Tap **Set** to record the 0.00 dB point. A reference point is established and the calibrated LS can be connected to the far-end of the fiber to measure the loss. Tapping **Set** will overwrite previously saved reference value(s).

## 6.11.2.2 OPM options



*OPM (Optical Power Meter) options screen*

- **Wavelength:** List of calibrated wavelengths to match the signal being measured.
- **Wave ID:** Detects the incoming wavelength automatically. Use when operating the OLS in CW mode with or without Loop enabled.
- **Mode:** Designates the measurement specification built-in: PM1 or PM2. For specific information on the PM1 or PM2 specifications, see the platform's datasheet at [www.veexinc.com](http://www.veexinc.com).
- **Hold:** Freezes the last power or loss reading on the screen. Hold appears on the white screen when tapped. Tap **Hold** again to unfreeze it.
- **Acquire:** Records instantaneous power or loss readings in the **Results** tab. The **Table** tab must be used to record these individual readings (e.g. same cable at different wavelengths). Use the **Folder** button to save the complete set of results. This is useful when measuring multiple fibers or testing one fiber with multiple wavelengths.



*If your device is equipped with a built-in clock, the saved measurement result will have a time stamp.*

*Saving the power or loss readings is useful when measuring multiple fibers or testing one fiber with multiple wavelengths.*

- **Zero:** Recalibrates the OPM to zero value for when measurement conditions change significantly. When in doubt, perform this procedure prior to making any measurements. For example, when you are testing in cold outdoor temperatures and then move testing inside to a heated building.



*Put the cover over the OPM test port BEFORE recalibrating.*

- **OPM server on:** Turns ON/OFF the OPM.
- **dB/dBm:** Switches between dB and dBm measurement units.
- **Set** (appears after tapping dB button): Sets the reference value for the current wavelength.
- **Enter** (appears after tapping dB button): Edits reference values.

### 6.11.3 Using the OPM

#### To use the OPM:

1. Power ON unit. Tap the **X** icon to close OTDR mode. Connect OLS to OPM using a reference patchcord.
2. Tap **Optical Power Meter** on the Fiber main menu. For each OLS laser you will use in testing, tap **Set** to establish the Reference value for this patchcord. The display should be **0.0dB** for each laser after you pair the OPM wavelength and tap **Set**.
3. In the **OLS** screen, tap **Loop**. This auto cycles through all available wavelengths on the test port. The laser will change every three seconds. The OLS and OPM wavelength must be the same.
4. If the light source has a WaveID option tap **Wave ID** in the OPM mode to detect the wavelength of the incoming signal automatically.



*The WaveID option is available for CW laser test mode only. If the OLS Loop mode is ON, each wavelength will be shown and the scroll bar can be used to see measurements for each laser. For more information on OLS Loop mode, see [Section 6.10.2 Using the Optical Light Source](#).*

5. Remove the reference cable and connect fiber to the OPM port on the unit.
6. To record instantaneous power or loss readings, tap **Acquire**. Repeat for additional fibers, as needed. Results appear on the **Table** screen and can be saved to a file on the **Results** screen. For more information, see [Section 6.12 Table](#) and [Section 6.13 Results](#).
7. When testing is complete, tap **OPM server on** to power down the OLS, and then disconnect the cable and replace the port covers.

## 6.12 Table

To record individual readings, tap **Acquire** in the **OPM** tab. The readings appear in the **Table** tab.

	Date/Time	Power	Wavelength
<input type="checkbox"/>	2019-01-08T05:01:56.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm
<input type="checkbox"/>	2019-01-08T05:01:55.000Z	-44.00 dB	650 nm

*Table screen – Individual readings*

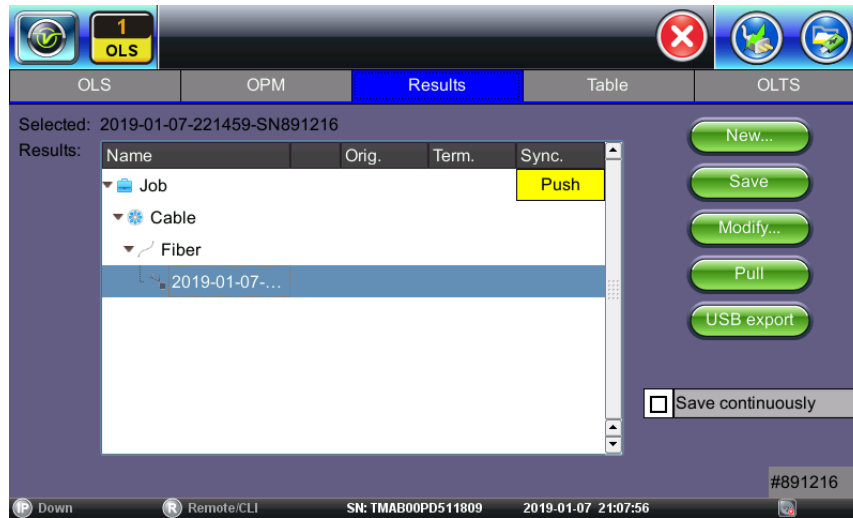
### To save the individual results:

1. Select the check box next to the reading(s) to save, then tap **Save**. The Result saving screen appears.
2. Tap **OK**. The readings are saved to a file and the table resets.

To remove results before saving, select the check box next to the reading(s), then tap **Remove**.

After saving power or loss readings to a file, access the file in the **Results** tab.

## 6.13 Results



*Results screen*

Use the following options when using the **Results** screen:

- **Push:** Saves locally saved results to Fiberizer Cloud. See instructions for viewing and saving results below.
- **New:** To create a new folder.
- **Save:** Saves results. Once saved, the files can be accessed in the File Manager or R-Server (not available on all OTDR models). For more information on **File Manager**, see [Section 9.0 File Management](#).
- **Modify**
  - **Rename:** Renames files.
  - **Remove:** Removes (deletes) files.
  - **Settings:** Enter Fiberizer Cloud information.
- **Pull:** When connected, pulls file from Fiberizer Cloud onto the test set.
- **USB Export:** Exports files to a USB stick.
- **Save continuously:** To autosave results at a specified interval (1 to 60 seconds). Use this option to check power drift.

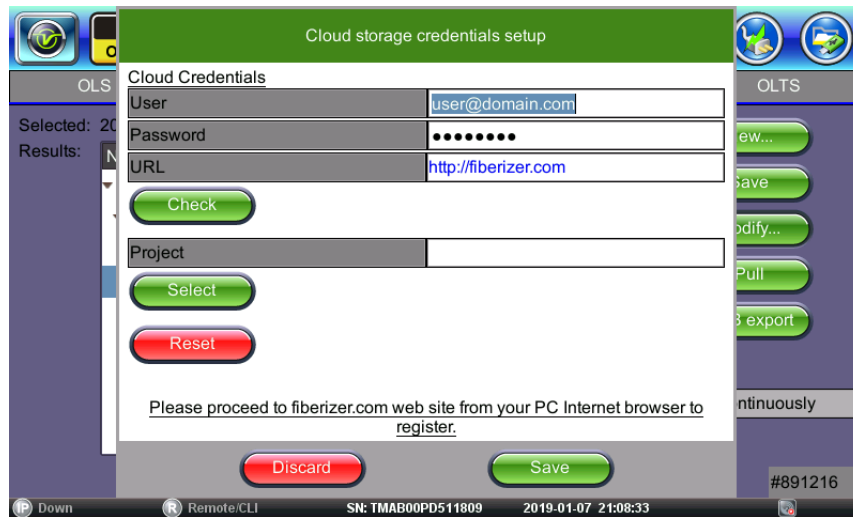


## To view and save results using the FX150 test unit:

1. On your device, select the results you wish to save, and then tap **Back**.
2. To save locally, tap **Save**.

--OR--

To push the results to Fiberizer Cloud, ensure connection to the network via Ethernet or WiFi, and then tap **Modify>Settings** to sync with Fiberizer Cloud. Then, tap **Push** to sync saved files to the cloud.



*Fiberizer Cloud set up screen*

## 7.0 OTDR Setup



*Screens provided in this section are based on the V300 series OTDR. Slight differences may occur between FX150, FX300, MTTplus, or RXT platform screens when describing OTDR and OPM operation.*

The **Fiber Main Menu** is available for the FX150 series OTDR only, at this time. There are three **possible** OTDR test modes:

- **EZ-OTDR**: Select this option for Automatic setups only.
- **V-Scout (optional)**: Default Auto profile. Select this option to use factory or user defined auto test profiles with summary results displayed on a LinkMap.
- **Expert OTDR**: Select this option to customize setups and/or manually override the default options. Realtime, Manual, Auto, and V-Scout are all available from this option.

### 7.1 Wavelengths

Select desired wavelength for fiber properties.

- **OTDR** - If the OTDR contains both single and multi-mode optical fiber test ports, selecting a single-mode OTDR wavelength (SM1310, SM1550, SM1625) will automatically prevent the selection of multimode OTDR wavelengths (MM 850, MM1300) and vice versa.
- **OTDR Aux** - The Aux port is reserved for:
  - In-service filtered testing at 1625nm or 1650nm.
  - Multimode testing when OTDR is equipped with both singlemode and multimode capability

#### **RXT-4111/RXT-4113 only**

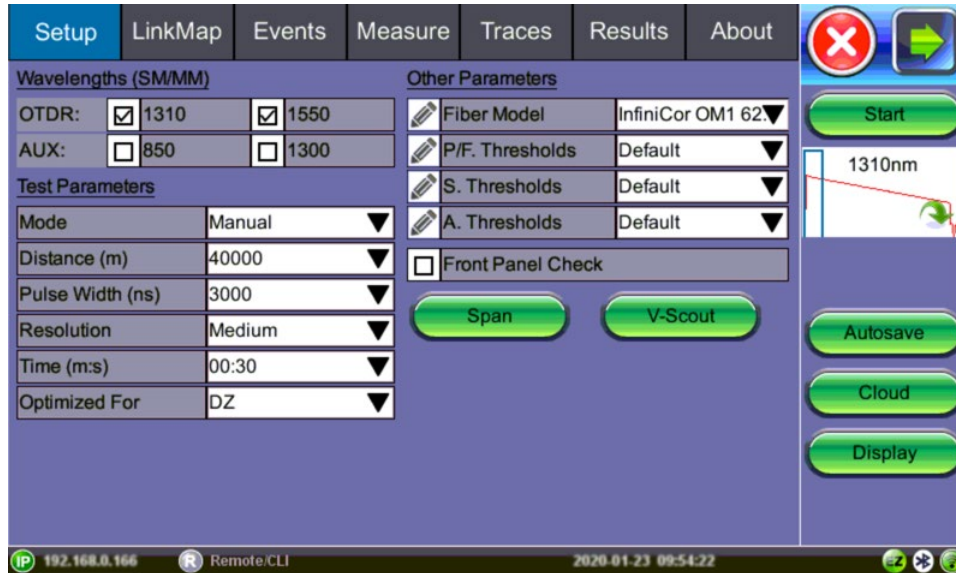
- **Frequency** – The displayed frequency automatically matches the chosen test wavelength/channel.
- **DWDM Grid (RXT-4111)** – Select the test wavelength.
- **XWDM Grid (RXT-4113)** - Select CWDM or DWDM (50, 100, or 200GHz)
  - **CWDM Unit (RXT-4113)** – Select the test wavelength.
  - **DWDM Channel (RXT-4113)** – Select the test channel.

## 7.2 Test Parameters

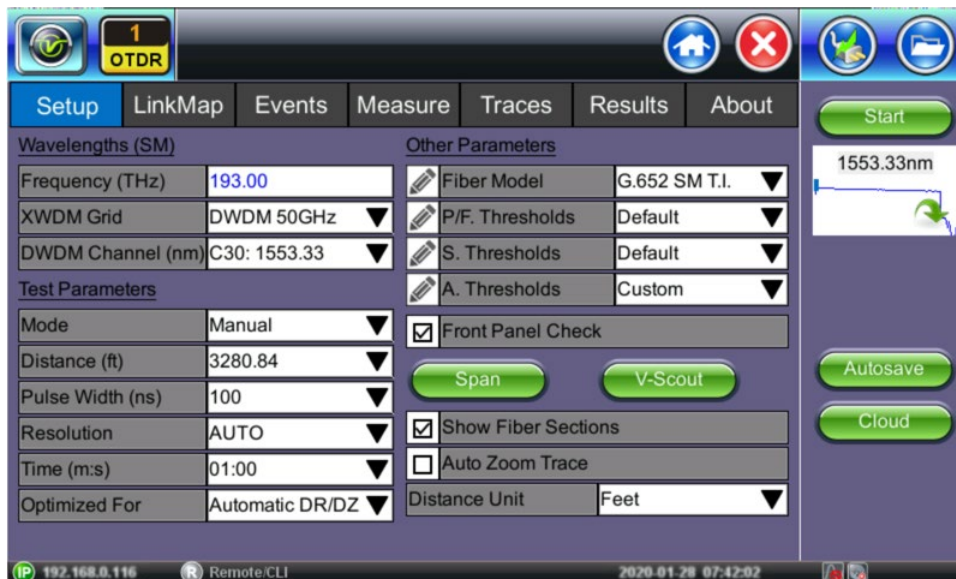
Select the type of test to perform from the Mode drop-down menu: **Manual**, **Auto**, **Manual Real Time**, **Auto Real Time**, **V-Scout Profiles** or **MPO Auto** (with OX-MPO-12 optical switch connected).

### 7.2.1 Manual Mode

To set OTDR test parameters manually, under **Test Parameters** select **Manual** from the **Mode** drop-down menu.



*OTDR Test Setup: Manual Mode*



*OTDR Test Setup: RXT-4113 Manual Mode*

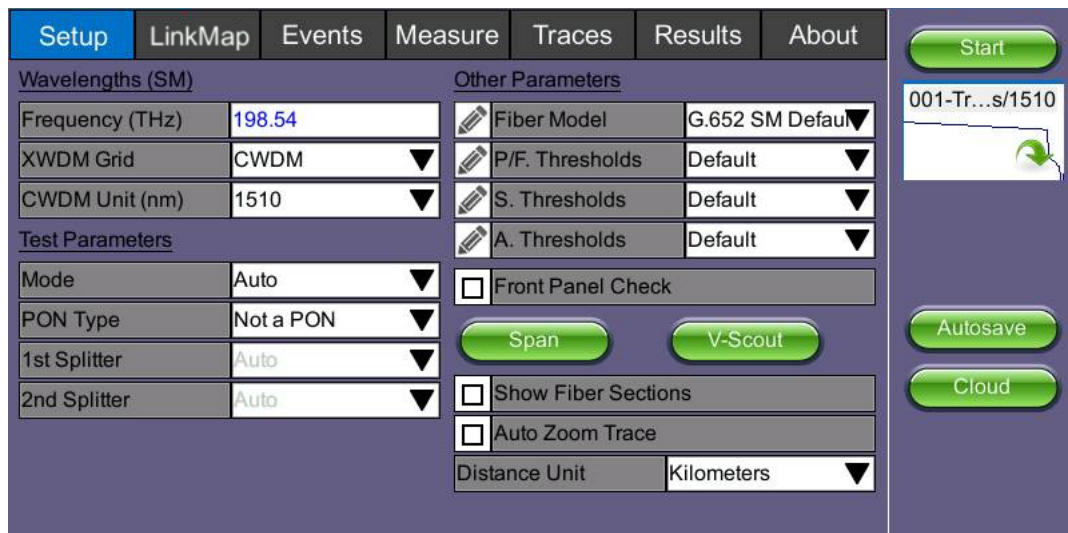
- **Distance range (km, m, miles, kilofeet, ft):** maximum value of measured distances; the value of distance range should exceed the expected length of the fiber under test (20% more). The distance unit type can be set by clicking the **Display** button (FX150) or selecting the unit in the **Distance Unit** drop-down (RXT-4111/RXT-4113).
- **Pulse Width, ns:** the value of the optical pulse duration; the range of available optical pulse values depend on the selected distance range and is set by the OTDR software automatically (10 ns pulse ~ 1 meter). Short pulse widths provide better resolution and produce the best event and attenuation dead zones. Short pulse widths, however, inject less optical energy into the Fiber-Under-Test (FUT), resulting in a noisier trace and lower dynamic range. Longer pulse widths provide the highest dynamic range and are used to test long fibers.
- **Resolution, m:** distance between two data points (sampling interval) of the trace; values depend on the selected distance range. Select smallest value to measure events spaced close together and use largest value to for longer ranges. Auto mode will determine best value for Fiber Under Test.
- **Time, min:sec:** determines the duration of measurement process with averaging. Use Live mode to perform monitoring of the fiber in Real Time. Longer averaging time improves the SNR and produces a “smoother” trace.
- **Optimized For:** test modes - Automatic DR/DZ, maximize dynamic range (DR mode) or best deadzone, sacrifice range (DZ mode)

## 7.2.2 Auto Mode

To set OTDR test parameters automatically, under **Test Parameters** select **Auto** from the **Mode** drop-down box. In this mode, the OTDR performs a measurement and analysis of the fiber and determines optimal test settings automatically.



*OTDR Setup: FX150 Auto mode*




*OTDR Setup: RXT-4113 Auto mode*

Auto mode is intended for inexperienced operators and uses single pulse per wavelength. The type of network to be tested must be specified.

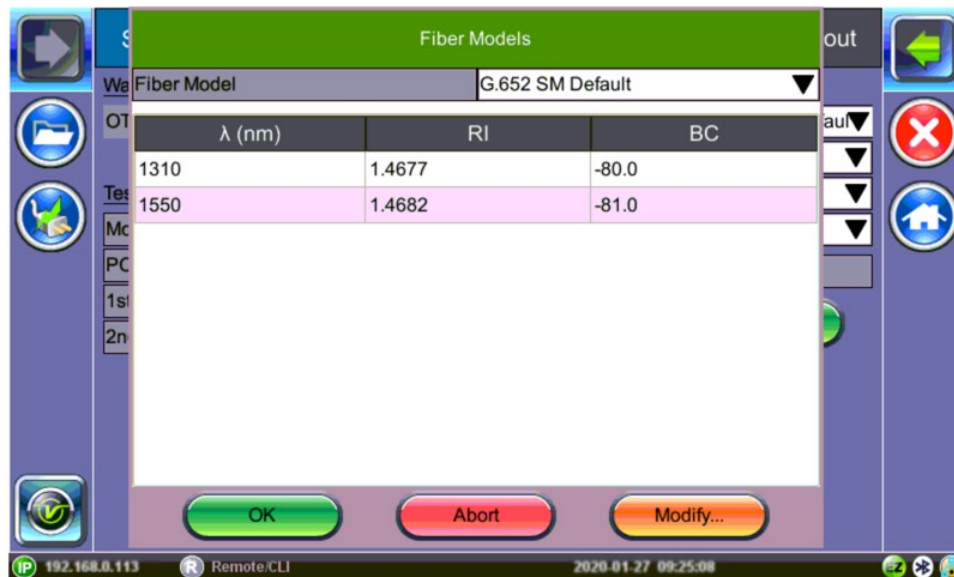
- **PON Type** – Select from the following.
  - **Not a PON** - Point-to-Point
  - **Manual PON** – Point-to-MultiPoint (includes RFoG). Specify splitter type. (Connect at Customer site.) Enables 1<sup>st</sup> Splitter and 2<sup>nd</sup> Splitter fields so splitter settings can be selected manually, if needed. For information on defining splitter loss values, see [Section 7.3.1.2 Splitter Thresholds](#).
  - **Auto PON** - Point-to-MultiPoint where software will assign splitter types based on event loss. (Connect at Customer site.)
  - **Auto PON to ONT**: Ideal for fiber monitoring when connected at OLT site. Recommend 50dB dynamic range.

## 7.3 Other Parameters

- **Fiber Model:** Select the type of fiber to be tested to auto populate Index of Refraction (IoR) and Backscatter co-efficient (BS) values. To modify values, click the pencil icon  to the left of the Fiber Model field to access the Fiber Models screen. Then, tap **Modify** to **Add**, **Rename**, or **Remove** values.



*An incorrect Index of Refraction can affect measured length results. Incorrect IoR and Backscatter values can affect Reflectance and ORL results.*



*OTDR Setup: Fiber Models*



***These settings apply to the next measurement only.***

*To edit RI and BC for an already measured trace, use the **Information** button on the **Traces** tab. For more information see, the steps in [Section 8.4.1 Trace Properties](#).*

**RI (Refractive index, N):** Setting for each available wavelength (also known as group index) is used to convert time to distance. Setting proper value (1.2000-1.8000) determines accurate distance measurement.

Refractive index can be changed for any stored trace. Enter a custom value or select fiber type to populate corresponding values by selecting file(s) using the **Traces** tab.

**BC (Backscattering coefficient, BC):** Represents level of backscattering in a particular fiber. It is used for Reflectance and ORL measurement and can be obtained from the fiber manufacturer. Backscattering coefficient can be changed for any stored trace.



*Use the Refractive Index (IoR) and Backscatter coefficient as provided by the cable or fiber manufacturer.*

- **Thresholds** - For information on setting thresholds, see [Section 7.3.1 Thresholds](#).
- **Front Panel Check:** Tests OTDR connection and displays warning indicating when the OTDR launch level is 1.5 dB lower than expected or if initial reflectance is too high (-45dB is default fail threshold). If needed, stop and clean connectors, or proceed with the bad connection.

For OTDR with built-in internal launch fiber, (G.657), the OTDR connector insertion loss will depend on the fiber type connected to the test set. Mismatched fibers can result in higher OTDR connection loss than expected connector loss. Use the **SPAN** button to enter fiber mismatch compensation or de-select **Include Event Loss**. Mismatch fibers should not impact Reflectance if the correct Fiber type is selected.

Reports Insertion Loss and Reflectance, and also advises if acceptable or not. When testing PON or xWDM MUX, use a launch fiber between the OTDR and Splitter or MUX or disable this feature.

When the OTDR is connected to a fiber with traffic (live), a warning is displayed. As long as the signal exceeds the threshold, the OTDR test will continue. IF the signal is removed, press OK to resume testing. Pressing Abort will permanently disable the OTDR test, requiring the need to close the OTDR application and reboot the test set.

- **Show Fiber Sections:** Check to show fiber section in the Event table. For other models, click the **Display** button to access this option.
- **Auto Zoom Trace:** Use this mode to auto scale the viewing window at the end of the test. For other models, click the **Display** button to access this option.



*Disable this feature when using **Realtime** test mode.*

- **Distance Unit:** Select the distance unit type for fiber length. For other models, click the **Display** button to access this option.

### 7.3.1 Thresholds



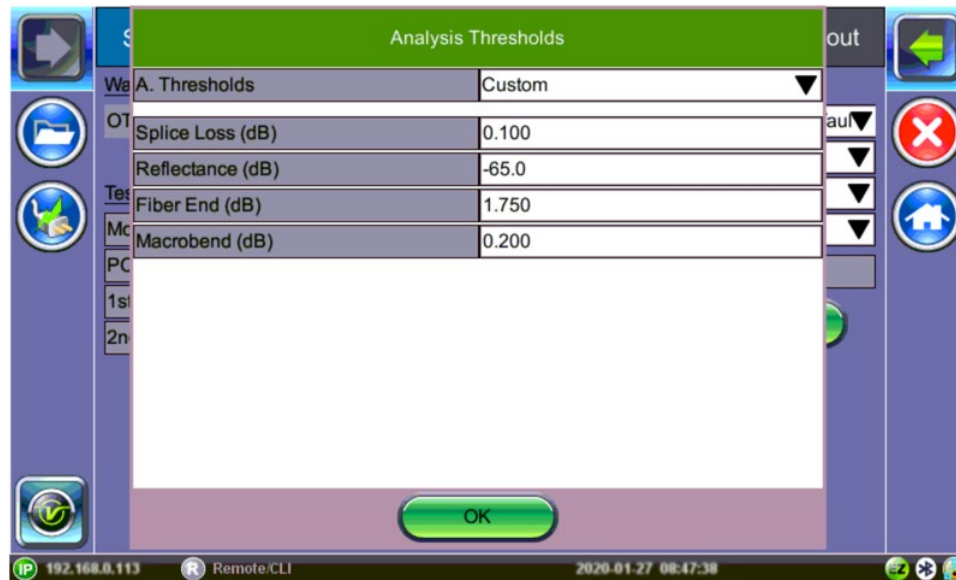
*Microbends require two different wavelengths. When setting the thresholds, enter the loss difference between the two wavelengths. The trace will report when the loss exceeds the macrobend threshold and be displayed in the LinkMap.*

Select the drop-down arrow next to the **A. Thresholds**, **S. Thresholds**, and **P/F. Thresholds** fields to select factory default settings (**Default**) or to enter custom settings (**Custom**). Events will be placed into the table only if the Analysis threshold is met/exceeded. Events that fail to meet the Pass/Threshold will be flagged and highlighted as red in the event table.

### 7.3.1.1 Analysis Thresholds

Tap the pencil icon  to the left of the **A. Thresholds** field to access the **Analysis Thresholds** screen and enter custom threshold settings.

The Fiber End default value is 5dB.



*OTDR Setup: Analysis Thresholds*

Events that exceed the Analysis Threshold settings are reported in the Event table. These parameters include:

- **Splice Loss (dB)** - The setting range for this parameter is 0.01 dB to 9.99 dB in 0.01 dB increments. The default value is 0.020dB.
- **Reflectance (dB)** - Defines the lowest Reflectance value that will be reported by the analysis. The setting range for this parameter is -70.0 dB to -20.0 dB in 0.1 dB increments. The default value is -65.0dB.
- **Fiber End (dB)** - Defines the value which will be reported in the Events analysis. The setting range for this parameter is 1 dB to 99 dB in 1 dB increments. The default value is set to 20dB but for non-PON spans, a 3dB value is recommended.
- **Macrobend (dB)** - Defines the detection value with a default value 0.200dB.




*A non-reflective event will be reported as a macrobend if its loss at a longer wavelength exceeds its loss at a shorter wavelength. Macrobend detection requires at least two singlemode wavelengths being tested - 1310 nm and another either at 1550 nm or 1625 nm. The range for this parameter is 0.3 dB to 2 dB in 0.1 dB increments. The default value is 0.2dB.*

- **Show Fiber Sections** – Shows fiber section in event table.
- **Distance Unit** – Sets unit to be used for all length measurements (km, kft, feet, meter, miles).



### 7.3.1.2 Splitter Thresholds

Splitter Thresholds define the splitter loss values to be applied when building the LinkMap.

Click the pencil icon  to the left of the **S. Thresholds** field to access the **Splitter Thresholds** screen and enter custom threshold settings.



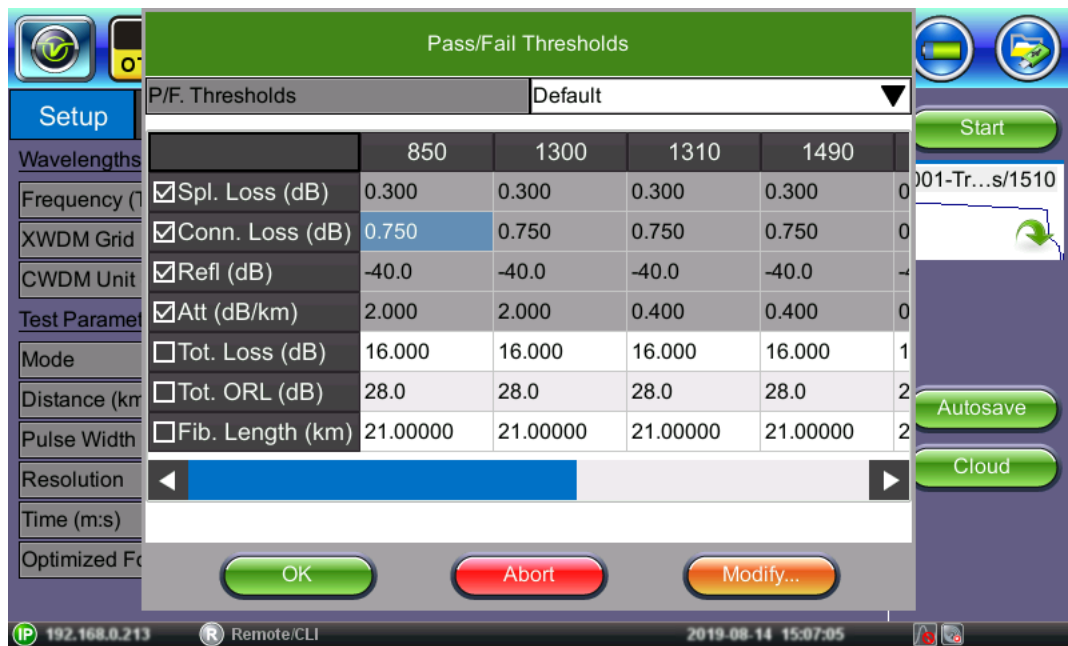
Splitter Thresholds					
Profile			Default		
	Min (dB)	Max (dB)		Min (dB)	Max (dB)
1x2	3.000	4.500	2x2	3.000	4.800
1x4	6.000	8.100	2x4	6.000	8.400
1x8	9.000	11.700	2x8	9.000	12.000
1x16	12.000	15.300	2x16	12.000	15.600
1x32	15.300	18.300	2x32	15.600	18.600
1x64	18.300	19.500	2x64	18.600	19.800
1x128	21.300	24.500	2x128	21.600	24.800

*OTDR Setup: Splitter Thresholds*

### 7.3.1.3 Pass/Fail Thresholds

Events exceeding the Pass/Fail Thresholds are highlighted in Red in the Event table. Different Pass/Fail Thresholds values can be set for each test wavelength.

Event Loss (splice, connectors, mux) and Reflectance threshold settings determine if a detected anomaly should be reported and included in the event table including its event type (reflective or non-reflective).



*OTDR Setup: Pass/Fail Thresholds*

Each column heading displays the wavelength to which the Pass/Fail Thresholds apply.

- **Splice loss (dB)** - Non-Reflective Event Loss. The range for this parameter is 0.001 dB to 9.99 dB in 0.001dB increments. For mated APC connectors, if there is no reflection, the loss reports as Splice.
- **Connector Loss (dB)** - Reflective Event Loss (connectors and mechanical splices). The range for this parameter is 0.001 dB to 9.99 dB in 0.001 dB increments.
- **Reflectance (dB)** - Events in the Event table exceeding the set Reflectance value. The range for this parameter is -50.0 dB to -10.0 dB in 0.1 dB increments.
- **Attenuation (dB/km)** - Average Fiber Section Loss in dB/km that exceeds the set value.
- **Total Loss (dB)** - Total fiber loss in dB for Fiber-Under-Test (FUT) that exceeds the set value.
- **Total ORL (dB)** - Total Optical Return Loss in dB for Fiber-Under-Test (FUT) that exceeds the set value.
- **Fiber Length (km, miles)** - Total fiber length that exceeds set value.

To modify values, select the P/F threshold from the drop-down list. Then, tap **Modify** to **Fill**, **Add**, **Rename**, or **Remove** values.

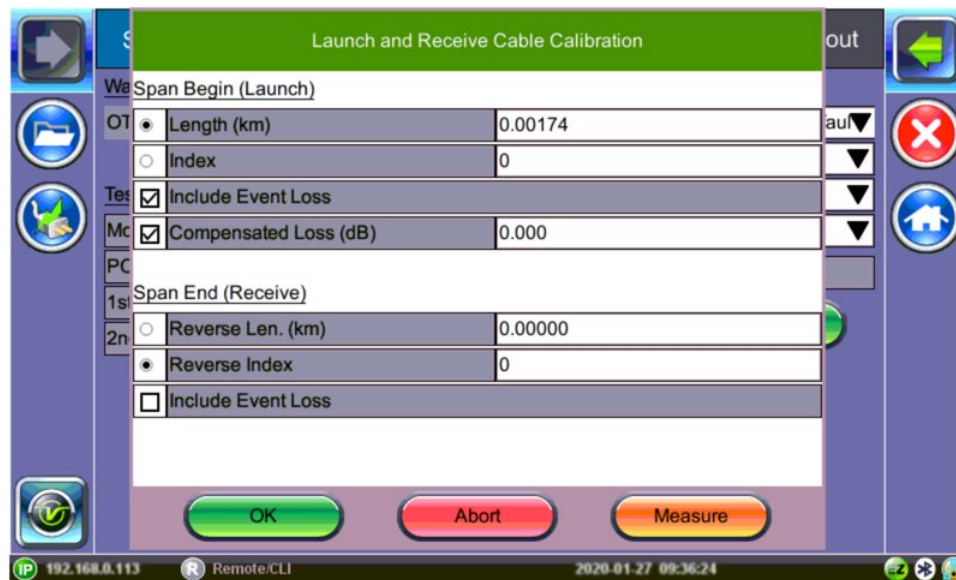
### 7.3.2 Span Settings

Tap the **Span** button to configure Span settings. After configuring the Span settings, click **OK**.

Use the **Span Settings** to offset the length of an external launch fiber or patchcord, which is connected to the fiber under test; otherwise, it becomes part of the fiber span and analysis.

The launch fiber can be offset or compensated in any of the following ways:

- Entering the known distance manually.
- Entering the index # based on the event table.
- On the Event table, position the left marker at the event and tapping **Span start** in the right side menu.



*OTDR Setup: Span settings*

- **Span Begin (Launch):** Enter Length or Index. Used to identify where a launch cable ends and test fiber begins. Defines the start of the Fiber Under Test. This appears as a green bracket with arrows pointing right on screen.  
If **Event #1** is the end of the launch fiber, set the **Span Begin Index** to “1”.
- **Span End (Receive):** Enter Reverse Length or Reverse Index. Defines the end of the Fiber Under Test. This will appear as a large green arrow pointing left on screen.  
If a launch fiber is used at the far end of the test fiber, set the **Span End Index** to the **Event #** associated to the location where the far end launch fiber starts.

- **Include Event Loss:** Check to not include connector loss in Total Loss Summary.



*If Event Loss is not checked, the LinkMap will state that the event loss is not included.*

- **Compensated Loss (dB):** For OTDR with built-in internal launch fiber, (G.657), the OTDR connector insertion loss will depend on the fiber type connected to the test set. Mismatched fibers can result in higher panel loss than expected connector loss. Use the **Span** button to enter fiber mismatch compensation. Mismatch fibers should not impact Reflectance.

The same procedure for offsetting Launch Fibers applies to offsetting Receiver fibers which are often used in Fiber to The Antenna (FTTA) applications.



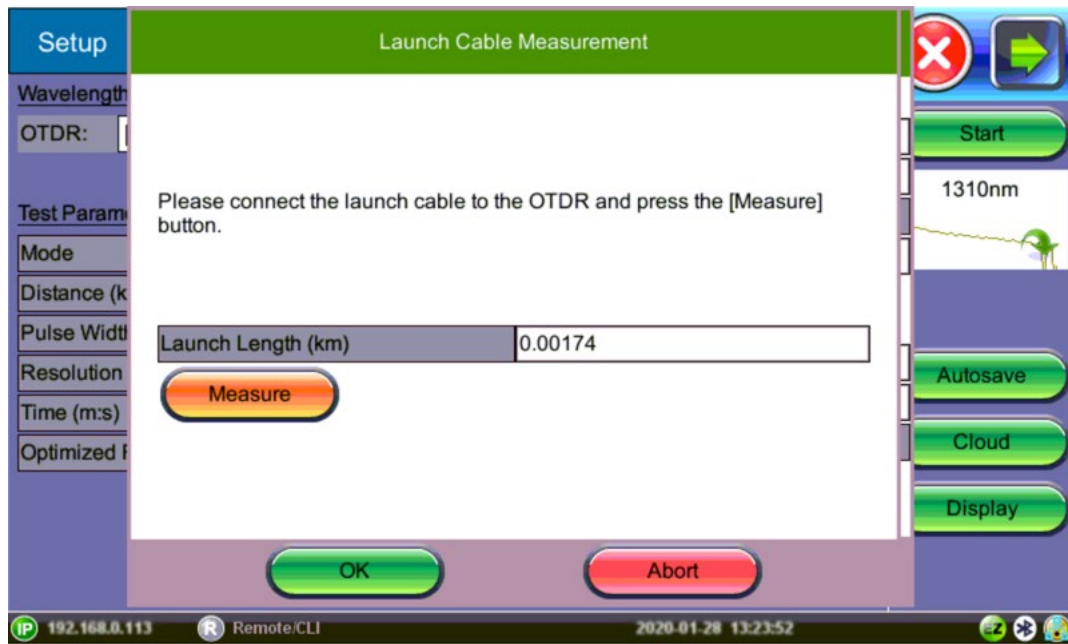
*The FX300 and RXT OTDRs have a built-in launch fiber which is approximately 40 meters in length. This fiber section will appear in grey color preceding the OTDR connection. This internal launch fiber allows the first connector of the fiber under test to be characterized and its performance (insertion loss and reflectance) be evaluated. The MTTplus OTDR has an optional built-in launch fiber.*

### 7.3.2.1 Measure Cables

Use the **Measure** button to measure the Launch/Receive cables and populate the result into the Length field automatically.

#### To measure cable length:

1. Click the **Measure** button. The **Launch and Receive Fiber Measurement** screen is displayed.
2. Select which cable (**Launch only**, **Receive only**, or **Launch and Receive**) to measure. To measure both cables (Launch and Receive), connect the cables together, but this requires a connection to have -55dB reflectance. Then, click **OK**. The **Launch and Receive Cable Measurement** screen is displayed.



*OTDR Setup: Auto Measure Cables*

3. Tap **Measure** to begin. After the measurement is completed, the measured lengths will populate the fields automatically. To reject the values, click **Abort**. To accept the values, click **OK**. The new measured length(s) populate the **Launch and Receive Cable Calibration** (Span settings) screen.



*If the Launch and Receive option is selected and the cables are not connected, you will receive a “Can’t find the  $R \geq -55\text{dB}$  coupling event, try measuring each cable individually”.*

## 7.4 V-Scout (Custom Profiles)(optional)

V-Scout gives the ability to optimize automated testing further by creating **custom** V-Scout test plans. A **unique profile** can be created for specific test environments. The V-Scout Profiles use factory or user defined auto test profiles to evaluate separate test acquisitions comprising of multiple wavelengths to detect anomalies. Traces are analyzed, compared, and merged into a single symbolic link map. Multiple OTDR trace files (.sor) are saved in a single file folder for simplified archiving and easy future analysis. Each individual acquisition can be customized and user defined as a test profile depending on network type or application (e.g. PON, Access Fiber, FTTA test plans). This optional feature eliminates event interpretation. Custom profiles can be distributed by email or server to OTDR users.

Selecting the **V-Scout** profile will apply the test plan using that profile for every fiber test automatically.

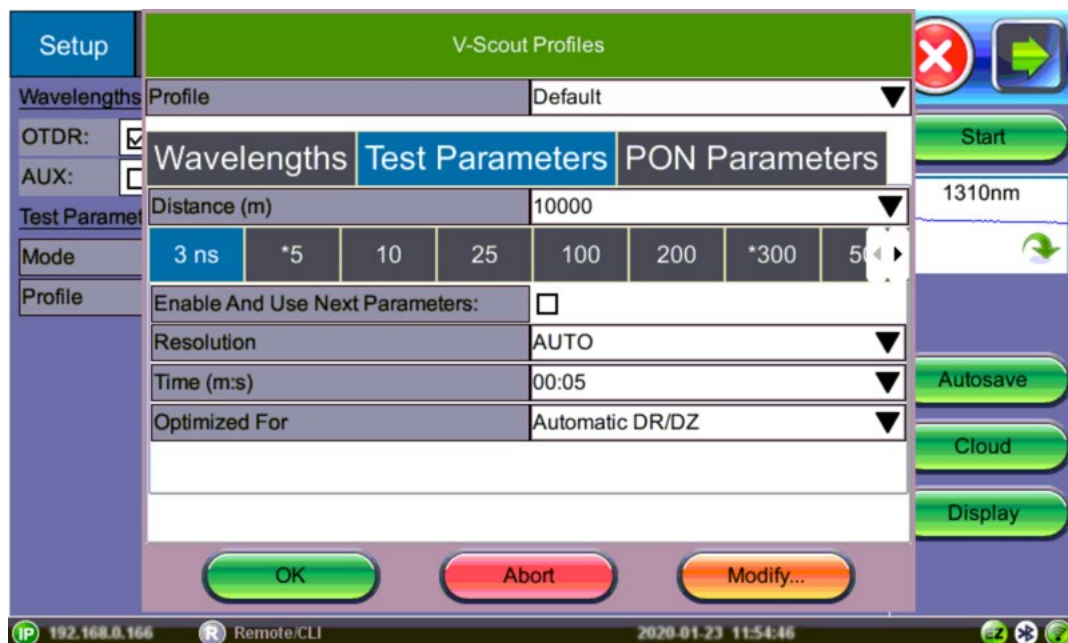


*When the V-Scout Mode is selected as a Test Parameter, Wavelength options are greyed out. Specify Wavelengths on the V-Scout Profile screen. The Wavelengths you assign to the profile are selected for the Test Parameters for the V-Scout Profile automatically; however, Pulse Widths (PW) must be selected AND enabled on the profile screen.*

### 7.4.1.1 Using V-Scout Mode

To setup or modify V-Scout custom profiles:

1. On the **Setup** screen, select **V-Scout** for **Mode**, then tap the **V-Scout** button. The **V-Scout Profiles** screen appears.



*V-Scout Profiles Screen*

2. Configure the V-Scout profile using the information below, then tap **OK** to accept the changes selected or **Abort** to not accept the selections.

- **Profile:** Auto, Default, Short, Medium, Long (Point-to-Point)



*Selecting the Auto profile will use single pulse/wavelength only.*

- **Wavelengths:** OTDR - 1310 or 1550; AUX: - 850 OR 1300

- **Test Parameters**

- **Distance:** Select the length and pulse. Select a test range value 25-30% longer than actual length of test fiber. Select 1-10 pulsewidths that you wish to use to build V-Scout Link Map. An asterisk will mark any Pulse Width that you have already selected for use in your new test plan.
- **Pulse Width:** Select pulse width for test.
- **Enable And Use Next Parameters:** Check this to enable this profile and use test parameters set on this screen.



*Pulse Widths (PWs) must be selected and enabled for both custom and default profiles. A profile allows up to 10 PW per wavelength.*

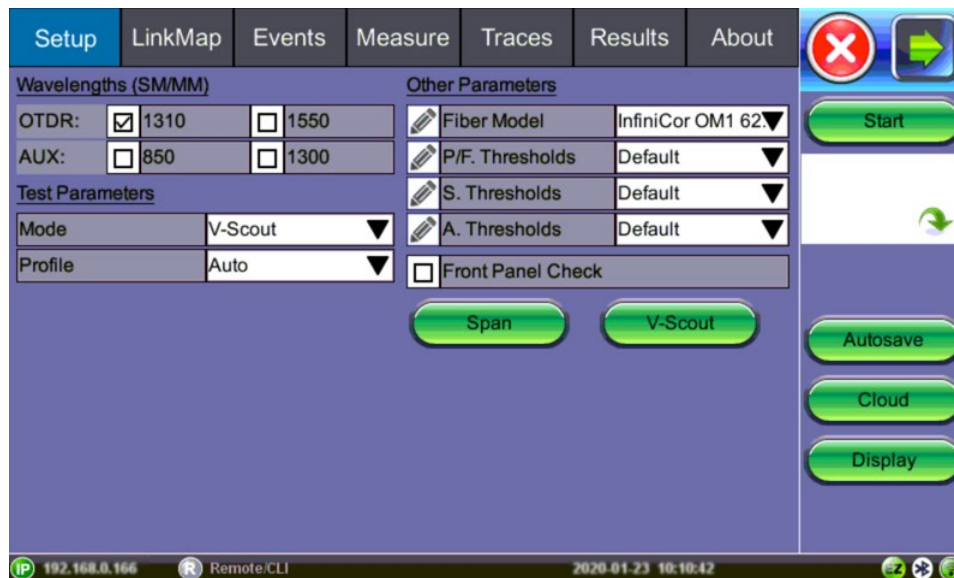
- **Resolution:** Auto, High, or Low, depending on distance range
  - **Time (m:s):** Select the time to use in each test. (The more pulsewidths, the longer the total test time will be). For record keeping, using short test times is not recommended test times. Bellcore recommends up to 3 minutes per test.
  - **Optimized For:** DR, DZ, or Automatic DR/DZ
- **PON Parameters**
    - **PON Type:** Not a PON (Point-to-Point), Manual PON, Auto PON, or Auto PON to ONT
    - **1st Splitter and 2<sup>nd</sup> Splitter** (if Manual PON selected) – Not Present, (1x2, 1x4, 1x8, 1x16, 1x32, 1x64, 1x128, 2x2, 2x4, 2x8, 2x16, 2x32, 2x64, or 2x128)

For information on defining splitter loss values, see [Section 7.3.1.2 Splitter Thresholds](#).

3. Use the **Modify** button to add, rename, or remove the profile.

- To save the settings for a profile, tap **Modify** and then tap **Add** to name the new profile.
- To rename the profile, tap **Modify** and then tap **Rename** to change the profile name.
- To remove a profile, tap **Modify** and then tap **Remove**.

4. In the **Profile** drop-down list box, select the V-Scout Profile configured previously.



*OTDR Viewer Setup Screen: V-Scout Profiles mode*

5. On the OTDR screen, tap **Start** to begin the test. The screen switches to the **Measure** tab screen automatically. When the V-Scout test plan is complete and OTDR traces performed, view the V-Scout link map on the **LinkMap** tab.

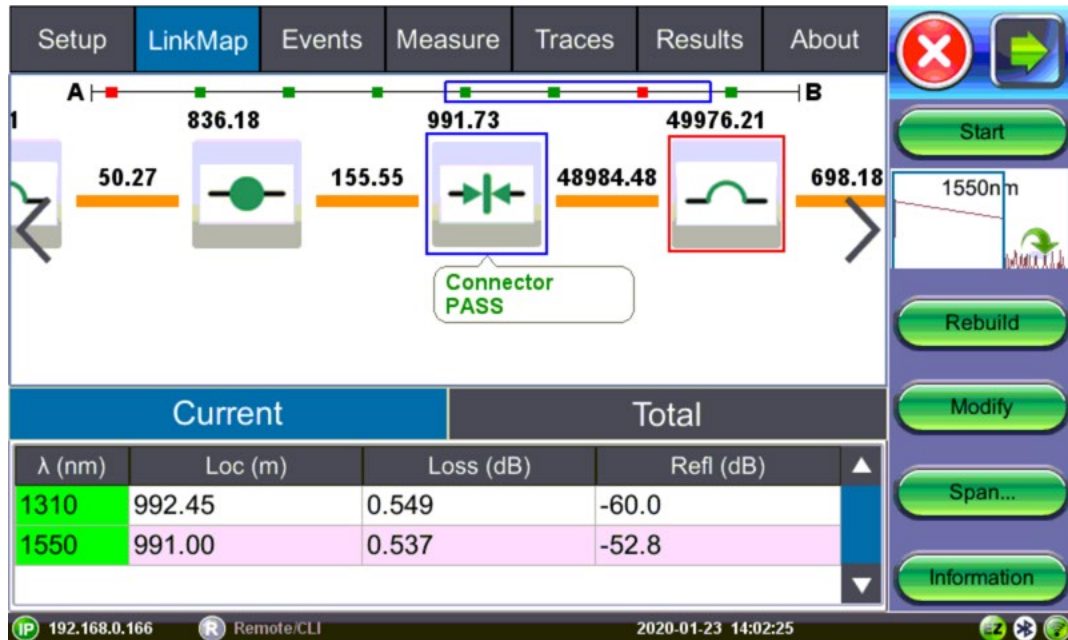
**To set up and use the automated V-Scout mode:**

1. Select the **Autosave** parameters in the **Setup** tab. See the [Section 7.5 Autosave Parameters](#) for more details.
2. Tap the green **Start** button. Elapsed time and acquisition wavelength are indicated below the red **Stop** button.
3. When the test is complete, the **Stop** button will revert back to a green **Start** button. If needed, tap **Stop** to terminate the measurement manually.
4. If **Autosave** is enabled with **Ask Before Save** checked, an **AutoSave** window appears asking if the results should/how be saved. If **Ask Before Save** was not checked, results will be saved automatically using the parameters previously set for AutoSave.
5. When the V-Scout test plan is complete and OTDR traces performed, view the V-Scout link map on the **LinkMap** tab.



### 7.4.1.2 V-Scout LinkMap

Any event that exceeds user-defined Pass/Fail thresholds will be displayed in **RED** font. The icon box will be outlined in red. For information on symbols, see [Section 7.4.1.3 V-Scout symbols](#).



*V-Scout Link Map*

- **Start:** Begins the measurement.
- **Rebuild:** Reanalyzes the trace or visible traces only. Use this option when you change the trace event table(s) or icons want to rebuild the LinkMap to apply the changes.
- **Modify:** Modifies the LinkMap.
- **Span:** To redefine the Span Start/End, select the Event, then click Span and choose the applicable option, Span Begin, Span End, or Edit (to change Span setup details).
- **Information:** Displays measurement information.



*To view contents of a merged event, double-tap the LinkMap or Event table.*

Modify Node	
Type	Link Start ▼
Splitter Ratio	Not Present ▼
Comments	
<input type="button" value="OK"/> <input type="button" value="Abort"/>	

*Modify: modifies LinkMap*

**Type:** Link Start, Link End, Subscriber Splitter, Connector, APC Connector, Splice, Macrobend, Office Splitter, Unknown

**Splitter Ratio:** Not present, 1x2, 1x4, 1x8, 1x16, 1x32, 1x64, 1x128, 2x2, 2x4, 2x8, 2x16, 2x32, 2x64, or 2x128

**Comments:** Enter information regarding the modification.

Group Information	
PON Type	Auto PON ▼
1st Splitter	Auto ▼
2nd Splitter	Auto ▼
<input type="button" value="OK"/> <input type="button" value="Abort"/>	

*Information – modifies measurement information*

**PON Type:** Not a PON, Manual PON, Auto PON (default with Auto Save), Auto PON to ONT


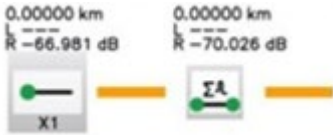








**1<sup>st</sup> Splitter** (when Manual PON type is selected) Not present, 1x2, 1x4, 1x8, 1x16, 1x32, 1x64, 1x128, 2x2, 2x4, 2x8, 2x16, 2x32, 2x64, or 2x128

**2<sup>nd</sup> Splitter** (when Manual PON type is selected): Not present, 1x2, 1x4, 1x8, 1x16, 1x32, 1x64, 1x128, 2x2, 2x4, 2x8, 2x16, 2x32, 2x64, or 2x128

### 7.4.1.3 V-Scout symbols

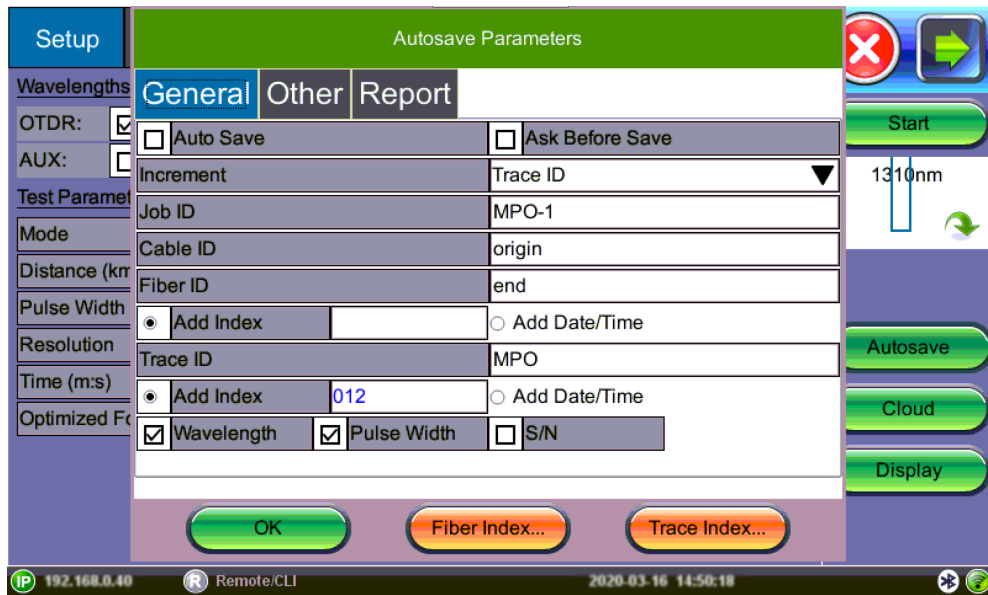
The V-Scout Icons facilitate quick fiber diagnosis so that technicians can fix issues quickly and efficiently which ensures fast turnaround time and reduced truck rolls.

The table below summarizes the symbols used to represent various events on the fiber link.

Icon	Description
	Span start (indicates start of analysis section) – as defined in Test Setup
	X1(2)(3) means ONE (or 2 or 3) merged events followed by “short patchcord” icon XXXX km      Distance to the node L ----      Loss cannot be measured R -40.5 dB    Reflectance
	Span end (indicates start of analysis section) – as defined in Test Setup (distance or event index)
	Splice Loss >0.01 dB, Reflectance <-50 dB
	Connector Loss >0.05 dB, Reflectance > -50 dB
	Angled Connector Loss >0.05 dB, Reflectance >-60 dB
	Macrobend (difference between two non-reflective events exceeding defined dB) Threshold measured at different wavelengths
	Several aggregated or grouped events
	1xN Splitter from the OLT side Loss > 4dB, Reflectance not applicable
	1xN Splitter from the ONT (end-user) side Loss > 4dB, Reflectance not applicable

## 7.5 Autosave Parameters

Use Autosave to save results automatically with default information in the filename.



*OTDR Setup: Autosave Parameters-General*

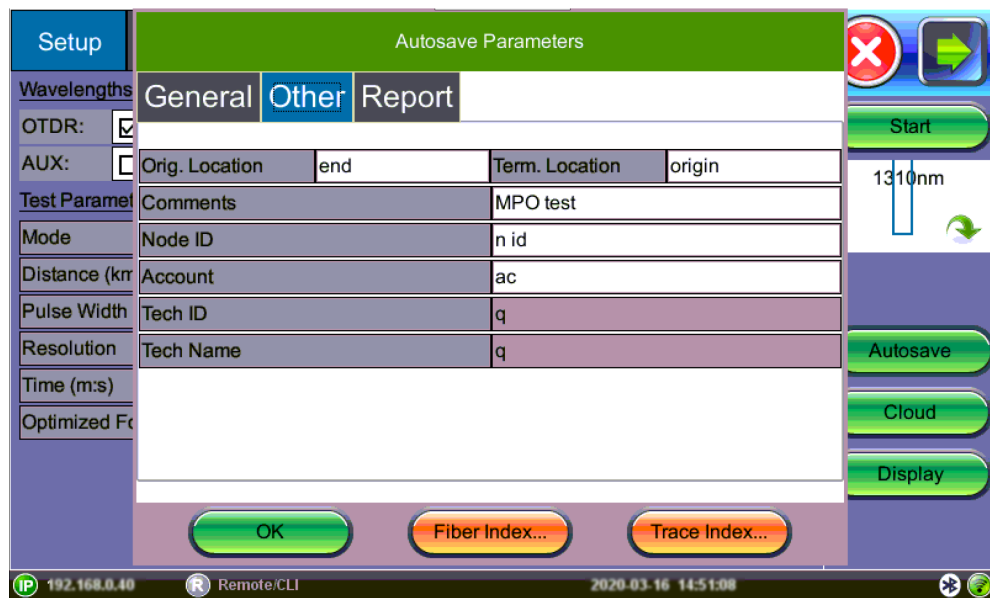
**Auto Save:** To enable/disable autosave. Disabled, Enabled, Enabled+Report or Enabled+V-Scout Report. (Choose the Report options to be able to export results to PDF.)

**Ask Before Save:** Check this to be prompted to save after measurement is completed.

The following information can be pre-set to create a name and increment fiber or trace number automatically. The filename will begin with the Index value, Trace ID, Wavelength, Pulse Width, and S/N, if checked.

- **Increment:** Choose to increment Fiber ID or Trace ID.
- **Job ID:** Select the field to enter a default value that will be included in the filename.
- **Cable ID:** Select the field to enter a default value that will be included in the filename.
- **Fiber ID** - Select **Add Index** to auto-increment or select **Add Date/Time**. The filename will include details entered in this field automatically. The fiber count can be incremented in Trace ID or Fiber ID.
- **Add Index (Fiber):** Test counter. When saving test results, count auto increments and is added to filename. To change the value, click **Fiber Index** and select **Force** to enter a specific value or **Reset** to reset the counter.
- **Trace ID** - Select **Add Index** to auto-increment or select **Add Date/Time**. The filename will include details entered in this field automatically. The fiber count can be incremented in Trace ID or Fiber ID.

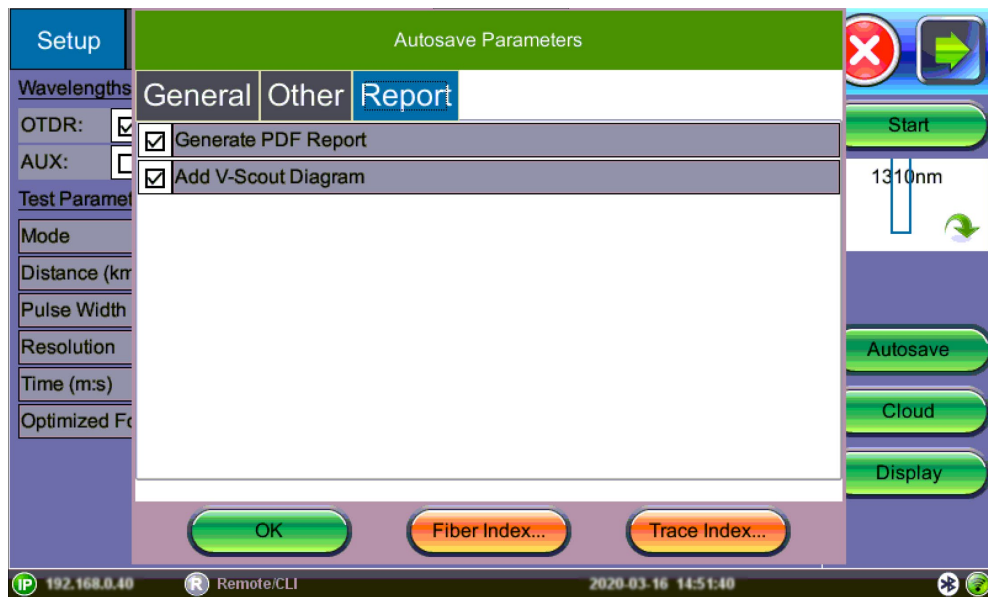
- **Add Index (Trace):** Test counter. When saving test results, count auto increments and is added to filename. To change the value, click Fiber Index and select Force to enter a specific value or Reset to reset the counter.
- **Wavelength:** Includes test wavelength used for each trace.
- **Pulse Width:** Includes pulse width used for test.
- **S/N:** Includes test unit serial number.



*OTDR Setup: Autosave Parameters-Other*

The following information can be pre-set and automatically saved in the file.

- **Orig. Location:** (*Originating location*) where fiber starts
- **Term. Location:** (*Terminating location*) where fiber ends
- **Comments:** Add information about the fiber ends, comment about the result, status or any other meaningful information about connector, application, or case. This information will be included in the report.
- **Node ID:** Node ID
- **Account:** Account number
- **Tech ID:** Operator ID (automatically populated when synchronized with R-Server)
- **Tech Name:** Operator name (automatically populated when synchronized with R-Server)



*OTDR Setup: Autosave Parameters-Report*

- **Generate PDF Report:** Check to generating a results report in PDF automatically. The PDF report can be exported from the File Management option. For more information about PDF reports, see [Section 9.1.1 Saving/Printing Results to PDF/USB/Bluetooth](#).
- **Add V-Scout Diagram:** If using V-Scout mode, check to add the V-Scout diagram of the trace to the results report. For more information about V-Scout diagrams, see [Section 7.4.1.2 V-Scout LinkMap](#).

## Autosave Results

To view or export a saved result, select the **Results** tab. For more details on the **Results** tab, see [Section 8.5 Results](#). Alternatively, files can be accessed by selecting **Utilities>Files>Saved** on the **Home** menu.

## 7.6 Cloud Credentials

Use the Cloud option to store test results and files to the cloud. Register for a Cloud account at <https://cloud.fiberizer.com>.

Tap the **Cloud** button to access the **Cloud Parameters** screen.

The screenshot shows the 'Cloud Parameters' configuration screen. It includes a sidebar with 'Setup' and a main area with the following fields and controls:

- User:** user@domain.com
- Password:** masked with dots
- URL:** http://fiberizer.com
- Check:** A green button to verify credentials.
- Project:** A text field for selecting a project folder.
- Select:** A green button to choose a project folder.
- Reset:** A red button to reset the information.
- Start:** A green button to begin the process.
- Message:** "Please proceed to fiberizer.com web site from your PC Internet browser to register."
- OK:** A green button at the bottom center.
- Right-side buttons:** Start, Autosave, Cloud, Display.

The status bar at the bottom displays: IP 192.168.0.113, Remote CLI, and 2020-02-05 13:50:54.

*Cloud Credentials*

- **User:** Enter the email address that was used to create the Cloud account
- **Password:** Enter the Password that was created with the Cloud account
- **URL:** The default is <https://fiberizer.com>. Consult factory to use a personal cloud account.
- **Check:** Verifies that the login credentials are valid.
- **Select:** Choose a specific Project folder. The default is the folder created at registration. Project folders can be used to create a folder shared by other team members or customers.
- **Reset:** Resets the Cloud account and Project information on the screen.

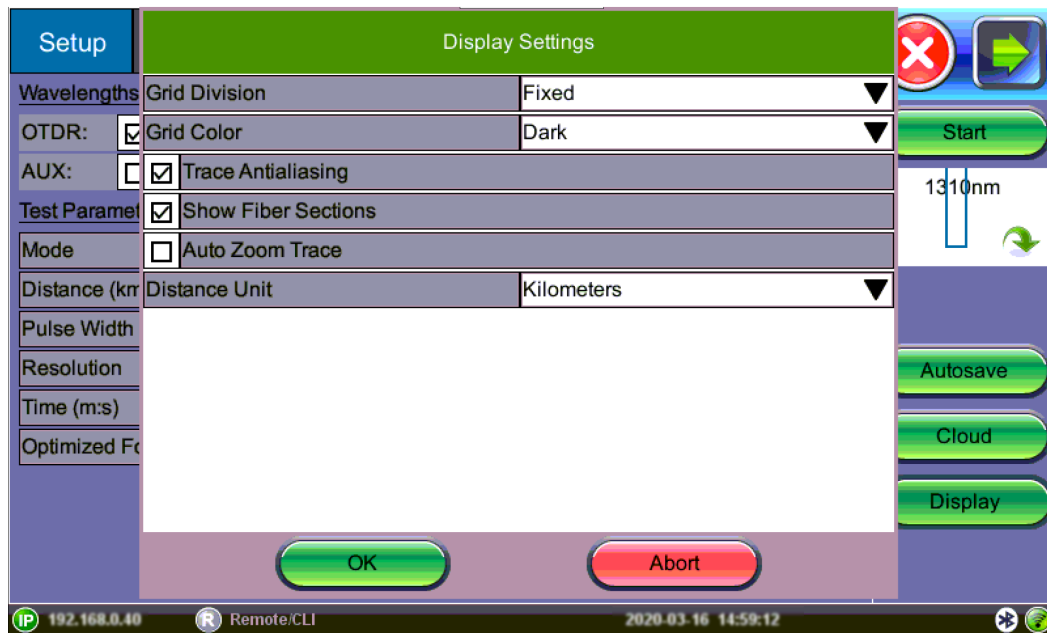
After setting up the Cloud Parameters, test results can be pushed to the account on the Cloud. For more information, see [Section 8.5 Results](#).

## 7.7 Display Options



This screen applies to OTDR software version 4912 or higher.

Tap the **Display** button to access the **Display Settings** screen and set display options.



*Display/Interface Settings*

- **Grid Division:** Fixed (even integer) or Auto (variable values)
- **Grid Color:** Light (grey) or Dark (red)
- **Trace Antialiasing:** Check for thinner trace line.
- **Show Fiber Sections:** Check to show fiber section results in the Event table.
- **Auto Zoom Trace:** Use this mode to auto scale the viewing window at the end of the test. Disable this option when using **Realtime** test mode.
- **Distance Unit:** Select the distance unit type for fiber length (Kilometers, Meters, Kilofeet, Feet, or Miles)



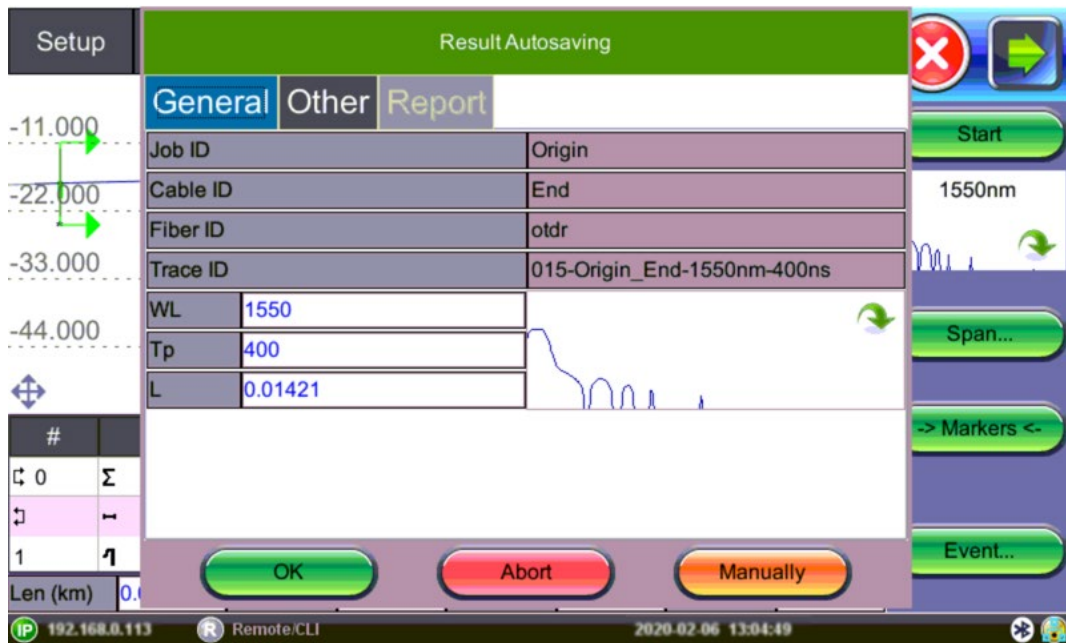
## 8.0 OTDR: Making Measurements

Tap **Start** and the **Measure** tab screen appears. The measurement will begin according to the test parameters entered in the **Setup** menu (see [Section 7.0 OTDR Setup](#)).

The elapsed time is indicated on the red stop button on the right side of the display. The stop button will revert back to a green **Start** button when acquisition is complete. For V-Scout measurements, the acquisition wavelength is also displayed.

Tap the red button to terminate the measurement manually, if required.

If **Ask Before Save** is checked in the **Autosave Parameters**, the **Result Autosaving** screen will appear once the measurement is complete. Tap **OK** to autosave with the default settings. Tap **Abort** to exit the screen.



*Autosave Results screen*

When a new measurement is started, only those traces will be displayed on the screen in the **Measure** tab ([Section 8.2 Measure Tab](#)). Any previous traces can be accessed via the **Traces** tab ([Section 8.4 Traces](#)) until the unit is switched off. Upon completion, the view will initially default to the selected test mode viewing screen (V-Scout, Event (Auto), or Measure (Manual)).

If multiple wavelengths are selected in the **Setup** menu, the measurement will be performed using all selected wavelengths one after another without stopping and will be overlaid on the screen for comparison and review. V-Scout traces are overlaid and displayed automatically.

Use the  **Home** icon to return to the Fiber Main Menu to select test application (OTDR, VFL, OLS, OPM).

## 8.1 Events



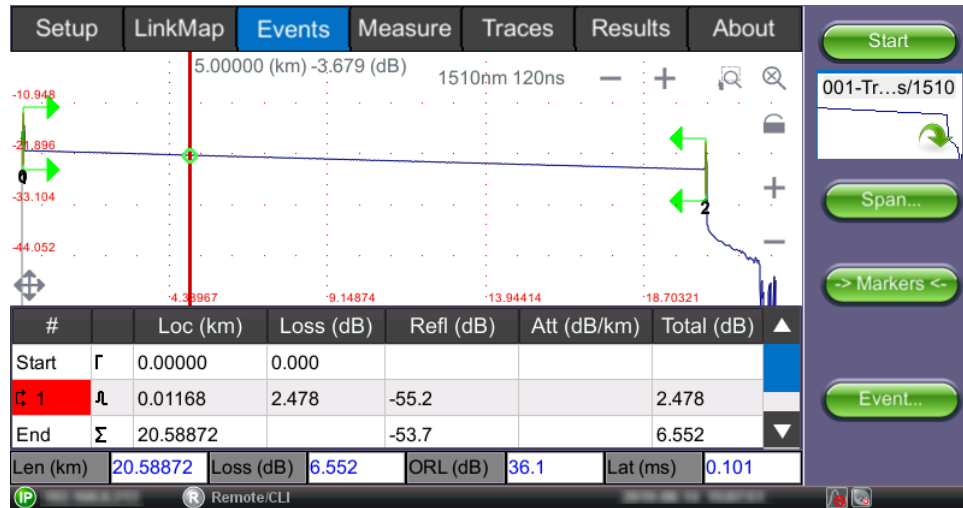
If a KNOWN event does not appear, try the following:

- Check an adjust Analysis threshold levels.
- If testing Long Fiber, make sure the range > FUT (fiber under test); increase time to 3 minutes.
- Change the test mode for which to optimize. For example, if optimizing for DZ mode, change to DR and vice versa.
- Use V-Scout. See [Section 7.4 V-Scout \(Custom Profiles\)\(optional\)](#) for more details.

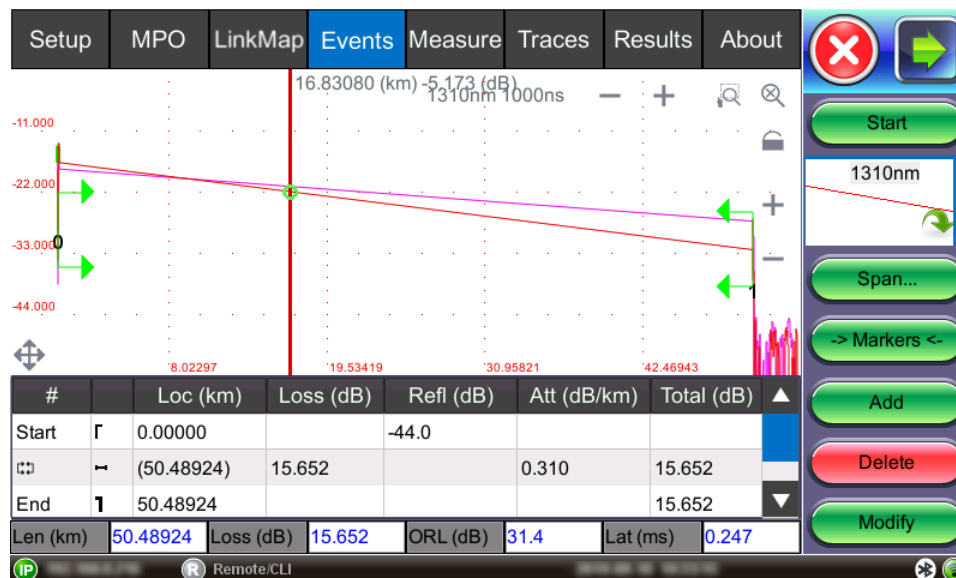
### 8.1.1 Event Table

The Events table is available in all measurement modes. Select the **Events** tab to display the trace with events. The Event table displays all events found during the analysis including those added manually.

To view contents of a merged event, double-tap the Event table.



Event Table (RXT-4113)



*Event Table – MPO test*

The Event table is displayed automatically when the Events tab is selected. It can be minimized by tapping the plus symbol just above the left of table. This optimizes the display area and allows better viewing of the OTDR trace.

Use Up/Down arrows to navigate the event table and to display or move to the highlighted event.








Use the green Left/Right arrows to move the marker between the start and end of fiber being tested.

To maximize the Event table, select the cross symbol again.



*The right green brackets (Span Start) indicate the 0km location and the left (Span End) is the end. The reported total loss and ORL is from this area of the trace only. For example, if there is a 1000m launch cable between the OTDR and FUT, then the Span Start of 0km is set at the end of 1000m.*

## 8.1.2 Event Types

Symbol	Event Type	Description
	<b>Start of fiber</b>	Start of the fiber under test.
	<b>End of fiber</b>	End of the fiber under test.
	<b>Fiber section</b>	Fiber section with attenuation.
	<b>Reflective Event</b>	Event with both loss and reflectance – typically caused by a crack, connection, or mechanical splice.
	<b>Non-Reflective Event</b>	Event with loss but without reflectance – typically caused by a fusion splice, macrobend, or PON splitter.
	<b>Gainer</b>	Event with 'negative loss' as viewed by the OTDR – typically occurs when two fibers with different backscatter coefficients are spliced together. Usually a gainer will be seen as a normal event with 'positive' loss when tested from the opposite end of the fiber.
	<b>Merged Event</b>	Event that consists of two or more real events that are spaced too close together to be resolved or measured by the OTDR.

The Event is color coded depending on Threshold settings defined in the test setup (see [Section 7.3.1 Threshold](#)).

- Red indicates the event fails or exceeds the Pass threshold criteria.
- Green indicates the event passes the Fail threshold criteria.

### 8.1.3 Event Editing



*To make changes permanent, you must re-save the trace.*

#### Adding events:

1. Ensure the Trace menu is active and the Event table is shown on the screen.
2. Position marker at the point where a new event will be inserted. You can use the Left/Right rubber keys to position the marker more precisely, if needed.
3. Tap **Event<Add** on the right sidebar. A new event number will appear on the trace and in the event table.
4. Select the new event in the event table and click **Event<Modify** on the right sidebar. Position the splice loss markers to measure the new event accurately. Once markers are positioned, click the **Accept** button. To analyze the new event, click **Analysis** before accepting. Click **Cancel** to exit the menu without saving changes.

#### Deleting events:

1. Select the event in the Event table or by using the marker on the trace.
2. Use the left/right arrows to position the marker more accurately, if needed.
3. Once selected, tap **Event<Delete** on the right sidebar. The event will now be deleted from the event table and the event number will no longer appear on the trace.

#### Modifying events:

1. Ensure the Trace menu is active and the Event table is shown on the screen.
2. Use the left/right arrows to highlight the event on the Event Table. Tap **Event<Modify** on the right sidebar. A marker with two small markers will appear on the trace. When markers and measurement is performed, click the **Accept** button on the right sidebar. To analyze the event, click **Analysis** before accepting. Click **Cancel** to exit the menu without saving changes.
  - **Span Begin** – Position the marker at the end of the Launch fiber and tap the green **Span Begin** button to set the beginning of fiber under test (indicates 0km location).
  - **Span End** - Position the marker at the end of the fiber under test and tap the green **Span End** (if launch box is used).
  - **Markers** - Brings a marker onto the visible area of the display.
  - **Event** – Add, delete, or make manual adjustments to the event table and reanalyze.

## 8.2 Measure Tab

There are several methods available to manually measure fiber characteristics. Prior to performing manual measurements, it is important you become familiar with the Markers and Zooming capabilities of the unit.



*Measure tab*

### 8.2.1 Markers Controls

Markers are provided to measure distances accurately. Depending on the measurement mode and viewing window, one or more markers are available for use. The Markers can be moved using the touchscreen or using the left/right buttons on the rubber keypad (not available on the MTTplus or FX150 units).

The Markers display the following:

- Distance from the start of the trace to Marker “A”
- Distance from the start of the trace to Marker “B”
- Distance between Marker “A” and Marker “B”



As you move the Markers, the distance information updates automatically.

The active Marker is depicted by two small arrows pointing inwards at the base of the Marker. The Marker is divided into a thick (bottom) and thin (top) line. To move Marker A or Marker B individually, select and drag the Marker on the thin portion of the marker. To move both Markers together, select and drag any Marker on the thick portion of the line.

If the Markers appear off screen, use the **Markers** button on the right side bar to display the Markers on screen.

If a marker is moved too close to another, both will move together to ensure minimal distance between them.

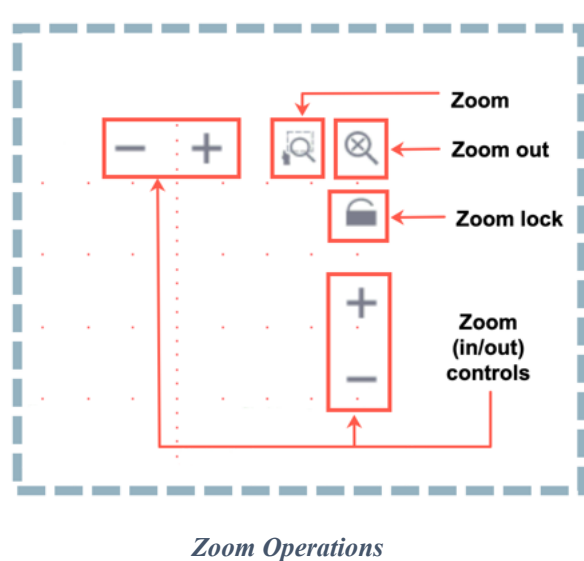
The markers can be moved separately or in tandem (or 5 markers simultaneously in the LSA attenuation measuring mode).

At the top of the screen next to the markers, the position of the marker with respect to the beginning of the optical fiber is indicated in kilometers, miles or feet.

The parameters of the trace corresponding to the markers' position and measurement mode will be displayed at the bottom of the screen.

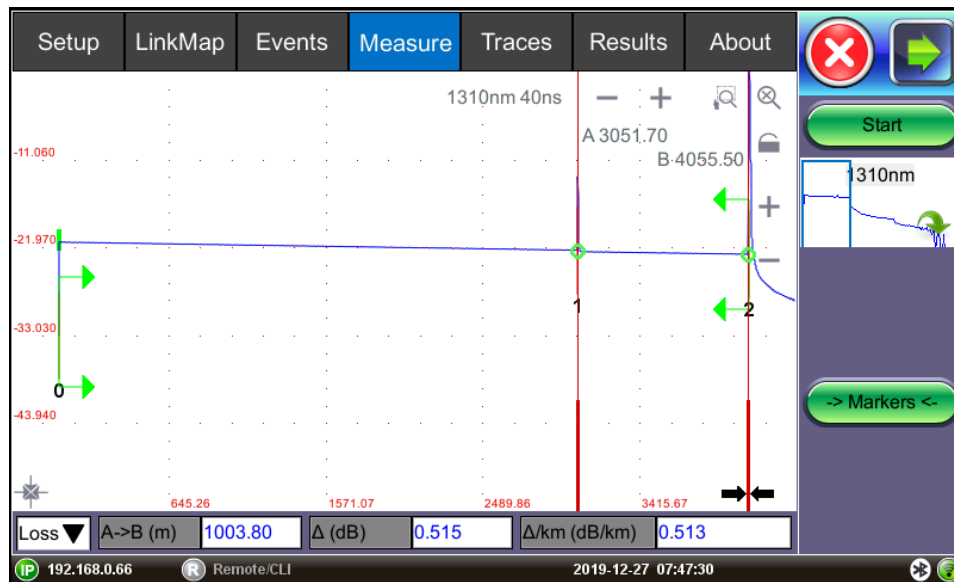
### 8.2.2 Zoom/Scroll Controls

Zooming operations are possible in both Events and Measure mode.



- **Zoom/Scroll icon** - Toggle between and enables Zoom/Scroll mode.
  - **Zoom mode** - Magnifying glass icon appears on screen. Draw a rectangular box over the trace with the stylus to create a zoom area. Visible part of the trace in Preview window is marked with dotted rectangle.
  - **Scroll mode** – Trace can only be scrolled after zooming. After the Hand icon appears on screen, the trace can be dragged in any direction. **The mode resets to Zoom immediately after one scroll operation has been completed.**
- **Zoom Out** - Resets display area.
- **Zoom Lock** - Locks horizontal and vertical controls so zoom aspect is kept uniform.

## 8.2.3 Distance Measurements



*Distance measurement – measure expanded trace view mode*

When a trace is displayed as show above, the fiber length is automatically measured from the start of the trace (or Span Begin) to each of the two markers and in between the markers. Proper marker placement is critical for accurate measurements. To position the marker/s accurately, expand the trace horizontally and vertically (using the Zoom Controls) and position the marker on event's left edge (first rising or falling pixel).

The distance (km, miles or feet) will be indicated next to the top of the marker.



*The distance accuracy depends on the correctness of optical fiber refraction index value setting.*

## 8.2.4 Loss Measurements

**Loss Modes** - Several Loss modes are available for manual measurements depending on measurement application:

- 2-Pt Loss
- 2-Pt LSA

Two Point Loss measurement

- Reflectance
- ORL (Optical Return Loss)
- Splice Loss



### 8.2.4.1 Two Point Loss (2-Pt Loss)

The 2-Point Loss mode uses a data point at Marker A and Marker B to calculate the dB level difference between the two points. Usually the backscatter level value of Marker A is greater than the level of Marker B and a positive loss measurement is displayed. If the loss value is reported as a negative quantity, it is termed a “gainer”. Measure loss between two points using the Loss (2-point) mode (using two markers):

- The data at the bottom of the screen displays: Distance between markers A-B
- Loss between markers A-B in dB
- Attenuation between markers A-B

### 8.2.4.2 Two Point LSA (2-Pt LSA)

To increase the accuracy of a loss or attenuation measurement, a section of the trace preceding and following the marker A and marker B can be approximated by a straight line. In this mode, a Least Squares Approximation technique is used to determine the best intercept values based on the marker positions. The length of these LSA sections is user selectable.



*Splice Loss using 2-Point LSA method (MPO)*

Select LSA from drop-down list - An approximation line will appear on the screen between markers. The data box at the bottom displays:

- Distance between marker A and B (km, miles, feet)
- Level difference in dB
- Attenuation based loss/distance



When using **Realtime** test mode, use the 2-Point LSA method to stabilize loss values.

## 8.2.5 Splice Loss Measurement

Determines the Splice Loss in the optical fiber connection using the five markers method.



*Splice Loss using 5-Point LSA method*

### To view the Splice Loss:

1. Select trace for measurement (if multiple traces are displayed on screen). The trace to be measured can be selected using the green arrow in the trace overview window.
2. Select **Splice (Spl)** from drop-down list.
3. Expand or zoom the trace horizontally and vertically (using Zoom Controls) and position event in the middle of the screen using the scroll function. Always ensure that a part of the trace is visible on either side of the event so you can place markers properly.
4. Position center marker on the event's rising or falling edge. You can use the rubber keypad to place the marker exactly, if needed.
5. Position the first two LSA interval indicators on a linear section of backscatter preceding the event and position the last two LSA indicators after the event, ensuring that only pre/post backscatter is used to make the measurement. The entire event including transition should not be included in either LSA intervals.



All four LSA interval indicators can be positioned independently in relation to the center Marker. When the center Marker is moved, the intervals will move simultaneously to maintain relative position.

The sections between the first two markers and the last two markers are approximated by straight lines (LSA). The value of event loss is defined by the position of the center marker.

The bottom of the screen displays:

- Spl (km, meters, miles or feet) - distance of center marker
- Loss of the event in dB based on the pre/post LSA sections and center marker
- Reflectance in dB if event is reflective

### 8.2.6 Reflectance Measurement

Reflectance is measured in -dB (negative decibels). A smaller negative value (-65dB) indicates a smaller reflection whereas a larger negative value (-45dB) indicates a larger reflection. Larger reflectance will appear as a higher spike or peak on the trace and shorter EDZ measurement.

#### To view the Reflectance:

1. Select trace for measurement (if multiple traces are displayed on screen). The trace to be measured can be selected using the green arrow in the trace overview window.
2. Select **Reflectance (Refl)** from the drop-down list at the bottom of the screen.
3. Expand the trace horizontally and vertically (using Zoom Controls) to display the reflection correctly. The entire reflection will be displayed including a small section of the trace preceding and following the event.
4. Place the left marker on the base of the event's rising edge. The right marker is placed on the peak of the reflection or after the peak. The software will look for peak value.

The bottom of the screen displays:

- Distance of A cursor (reflection) from Start of test fiber
- Distance of B cursor (top of reflection) from Start of test fiber
- Distance between markers A->B
- Reflection for this even (-dB)

### 8.2.7 ORL Measurement

ORL is the total amount of light being reflected back towards the transmitter or source. This includes all backscatter and all reflections.

#### To calculate ORL:

1. Select the trace for measurement (if multiple traces are displayed on screen). The trace to be measured can be selected using the green arrow in the trace overview window.
2. Select **ORL** from the drop-down list.
3. Place marker A at the beginning of the fiber under test and marker B at the end of the fiber span under measurement (just before end reflection, if available). Moving marker B beyond the end will not change the span ORL; moving marker B to less than the end will result in a change in ORL.

The bottom of the screen displays:

- Distance to A cursor
- Distance to B cursor
- Distance between markers A-B
- Loss between the markers A-B (dB)
- Optical Return Loss (ORL), dB

## 8.3 MPO Fiber Testing

Increasing bandwidth requirements for enterprise data centers have resulted in Multi-Fiber Push-On (MPO) cabling because they are pre-terminated and compact. These cables can handle up to 100 Gbps.

Testing the performance of MPO fiber can be time consuming and error prone. The OX-MPO-12 optical switch is designed to make MPO testing easier, faster, and more accurate.

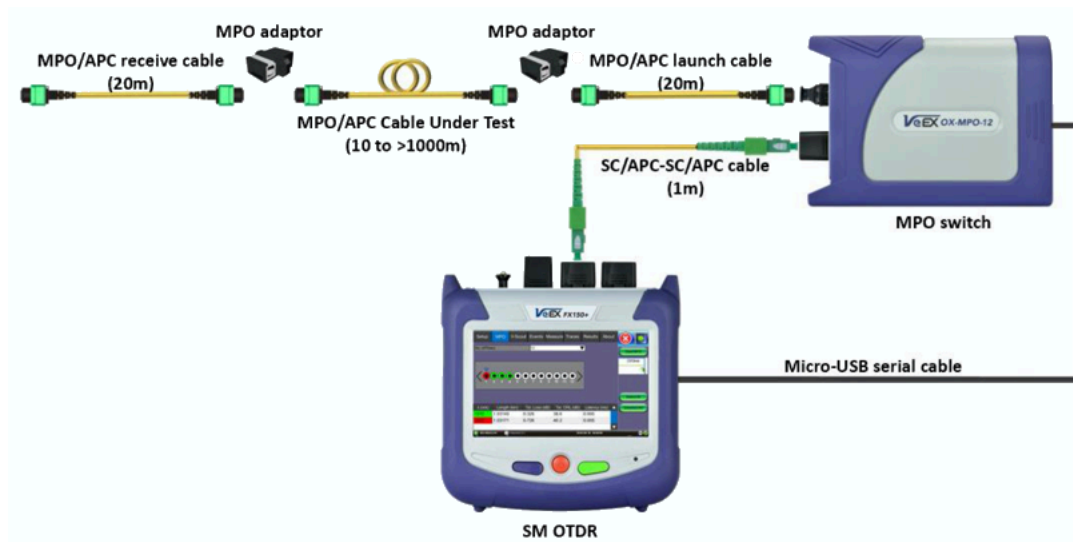
### 8.3.1 OX-MPO-12 Optical Switch Overview

The OX-MPO-12 optical switch is an ultra-compact, 12 fiber optical switch designed to operate with VeEX OTDRs via USB interface. It is optimized for high-density fiber test applications where MPO/MTP or ribbon cables need to be tested using an OTDR equipped with a single fiber output. It is powered by the test unit's serial interface.



*OX-MO-12 connected to FX150 test unit*

### 8.3.2 OX-MPO-12 Connections/Ports



*OX-MPO-12: Example of Connections*



*The MPO switch is detected automatically when powered on. However, the switch can be connected at any time; close and re-open the OTDR application and begin MPO testing.*

#### **To connect OTDR to Optical Switch:**

1. Use the Micro-USB (B) to Micro-USB (B) cable to connect the switch interface to the OTDR port.
2. Close and reopen the OTDR application to detect the switch.
3. Attach one end of the 1 m SC-APC to SC-APC simplex patch cord from the OTDR port to the SC-APC port of the switch.
4. Attach Launch and Receive patchcord cables to the output port of the OX-MPO-12 Switch.



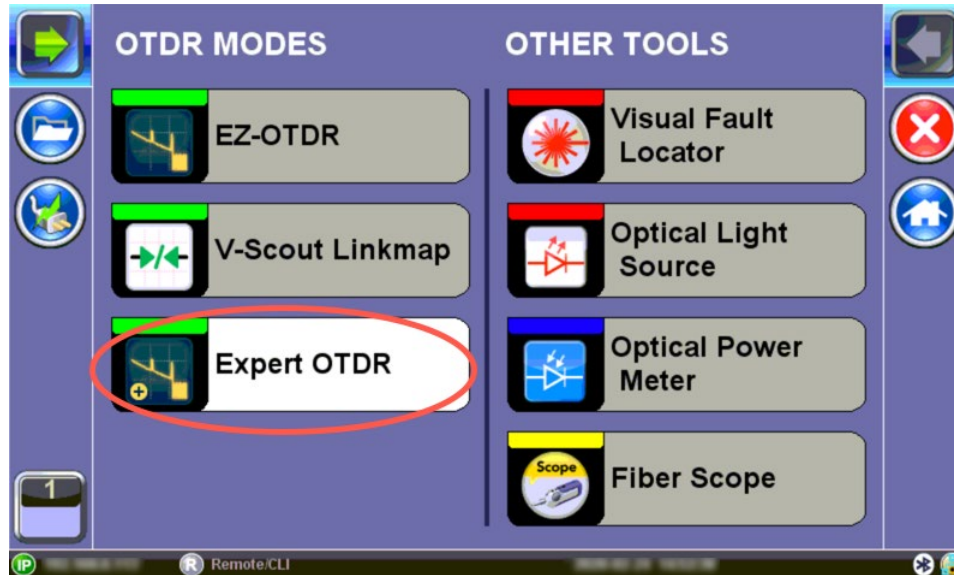
*Test Kit Cases to use with the MPO switch are available for purchase from VeEX.*

- *MPO/APC to MPO/UPC hybrid cable to test MPO/UPC FUT (Fiber under test) and receive cable.*
- *MPO/APC on both ends (MPO/APC FUT).*
- *MPO/APC to simplex cable fanout 2x (SC-APC, SC-UPC, FC-APC, FC-UPC, LC-APC, LC-UPC...) to test simplex FUT cable.*

Contact [VeEX Customer Care](#) for more information.

### 8.3.3 Using the MPO Switch

Select the Expert OTDR option to test one or all fibers in the ribbon cable in sequential order (minimum 1 up to 12/16 fibers depending on the strand count in the ribbon).



*Expert OTDR option*

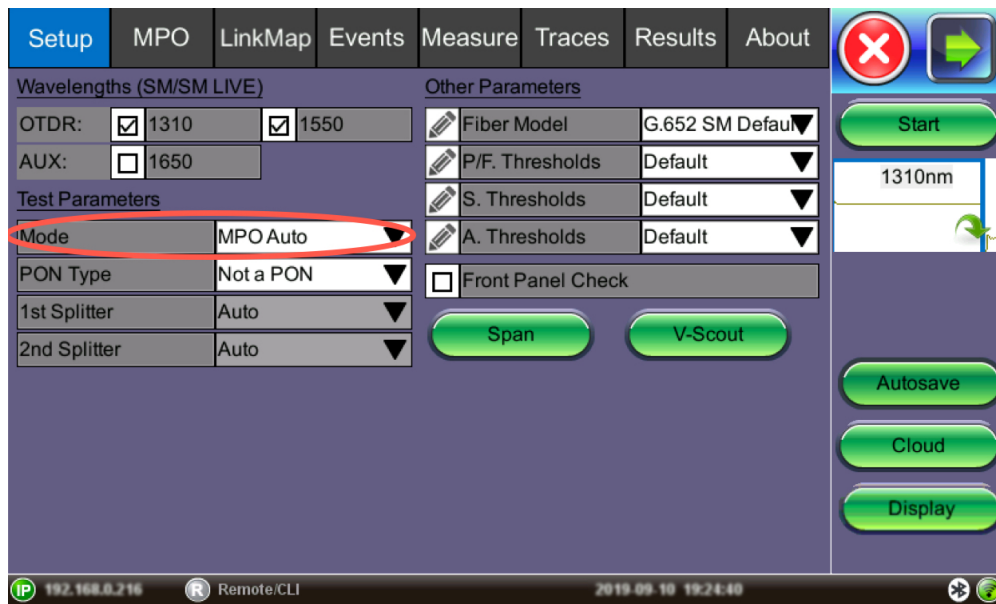
The **Results** tab allows you to save results and compile reports. See [Section 8.5 Results](#) for more information.

#### 8.3.3.1 Testing all MPO Fibers



*The **MPO** tab appears ONLY if the MPO switch is connected to the OTDR's microUSB port and recognized as being connected.*

In the **Setup** menu, select **MPO Auto** from the **Mode** drop-down list. Then, tap **Start** and the **Measure** tab screen appears. The measurement will begin according to the test parameters entered in the **Setup** menu (see [Section 7.0 OTDR Setup](#)). For more information about making measurements, see [Section 8.0 OTDR: Making Measurements](#).



*MPO Auto Setup*

After the ports are selected and a new MPO test is initiated, each strand will be tested sequentially and displayed one at a time in the **Measure** tab (see [Section 8.2 Measure Tab](#)).

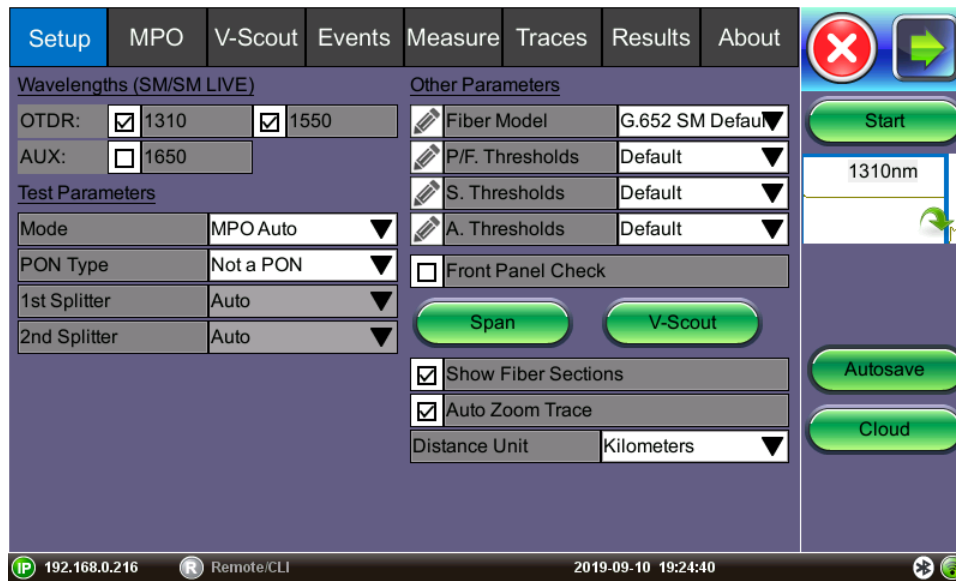
At the conclusion of the MPO test or at any time during testing, go to the **Traces** tab and select each strand to overlay all tests simultaneously. However, each test will clear the display and only show the current test.

### 8.3.3.2 Testing Individual MPO Fibers

**To test individual MPO fibers:**

1. On the OTDR's Home Screen, select the **Expert OTDR** option.
2. Select the wavelengths to test (1310 and/or 1550 nm).

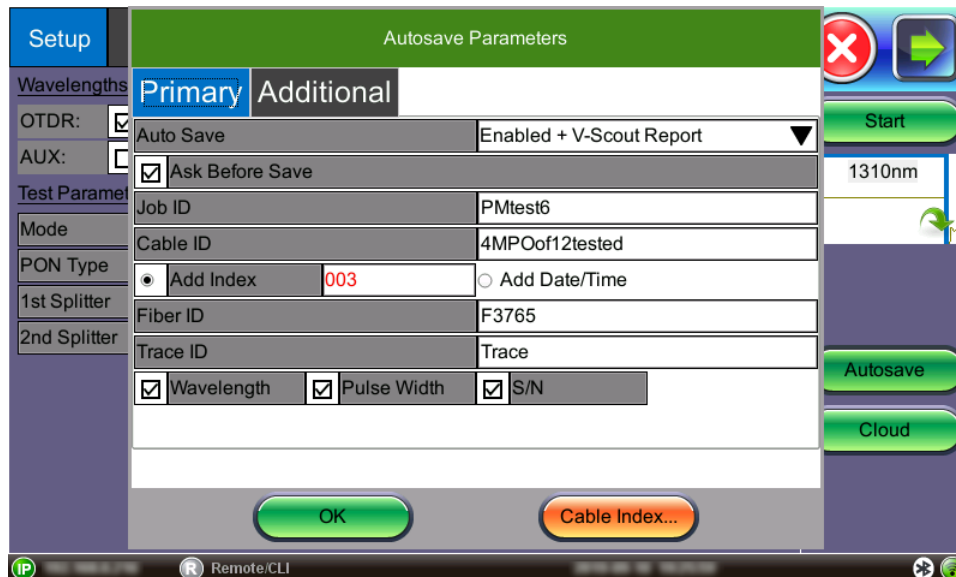




*MPO Setup*

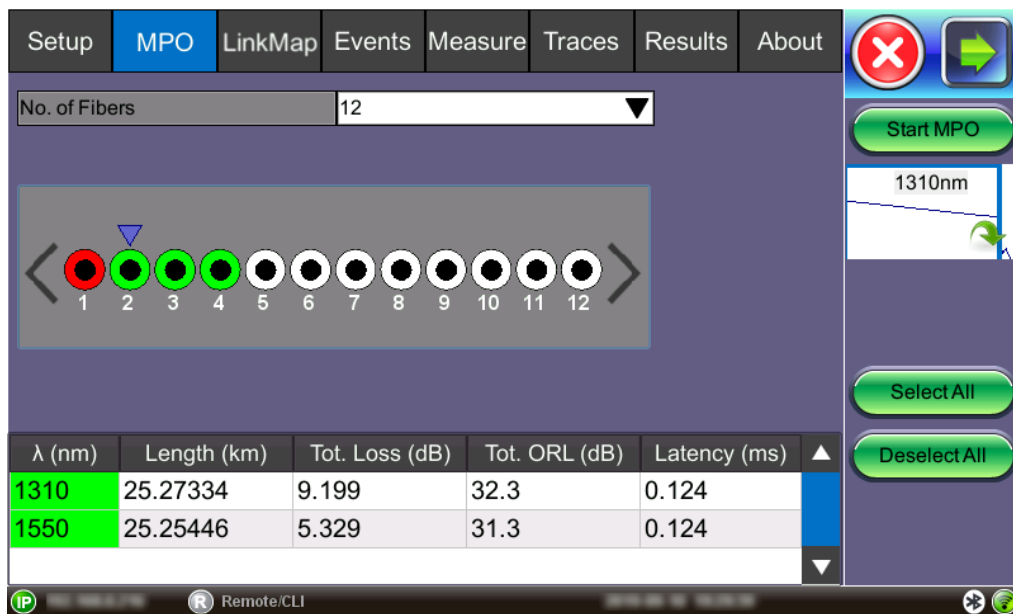


*It is recommended that you indicate the MPO fiber under test in the Autosave options (e.g., the Cable ID).*



*MPO Autosave Parameters*

3. In the **MPO** tab, tap the **No. of Fibers** drop-down arrow and select the MPO connector fiber count, **8** or **12**. Each fiber strand is represented by a circle. A black inner circle indicates an active fiber strand and a gray inner circle means inactive.
4. Move the blue arrow above the circles left or right and tap to enable testing for this MPO group.



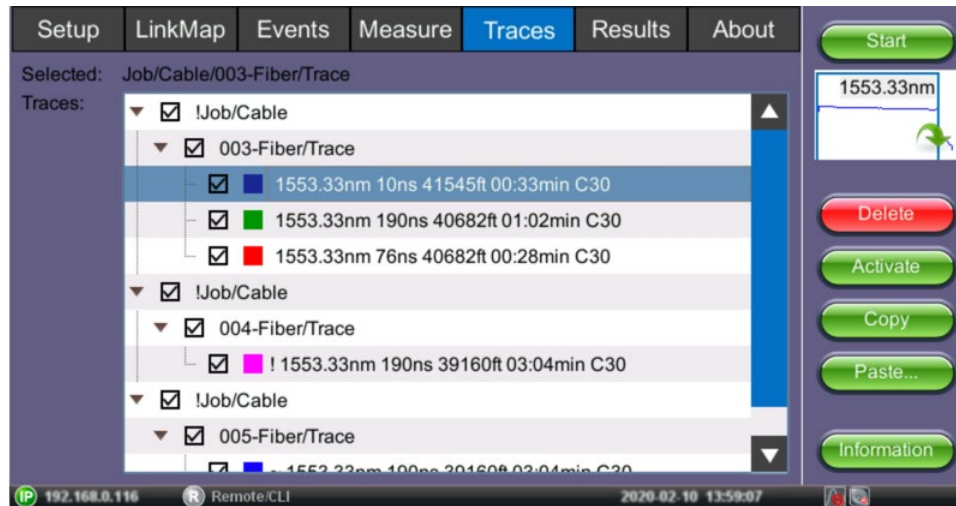
*MPO tab*

5. Tap **Start MPO** to begin the test. An error message will appear if NO fiber was selected. When the strand test finishes, the outer circle changes to green (PASS) or red (FAIL), depending on the Pass/Fail thresholds previously set, and moves to the next strand until all selected strands are tested.
6. To view all MPO strands, select the **Traces** tab and then select all fibers under the MPO group to overlay results for the ribbon. For more information about the Traces tab, see [Section 8.4 Traces](#).

## 8.4 Traces

Select the **Traces** tab to view the active or measured OTDR traces. The color-coded blocks represent the corresponding trace viewed in the OTDR display.

The OTDR can display up to ten traces simultaneously (i.e., an active trace and nine additional traces).



*Traces tab*

Traces are displayed along with the name, pulse width, distance range (LMax), and acquisition time used for the test. To view any trace, select the file(s) using the check box. All selected traces will be overlaid and can be viewed using the **Results/Traces** tabs.

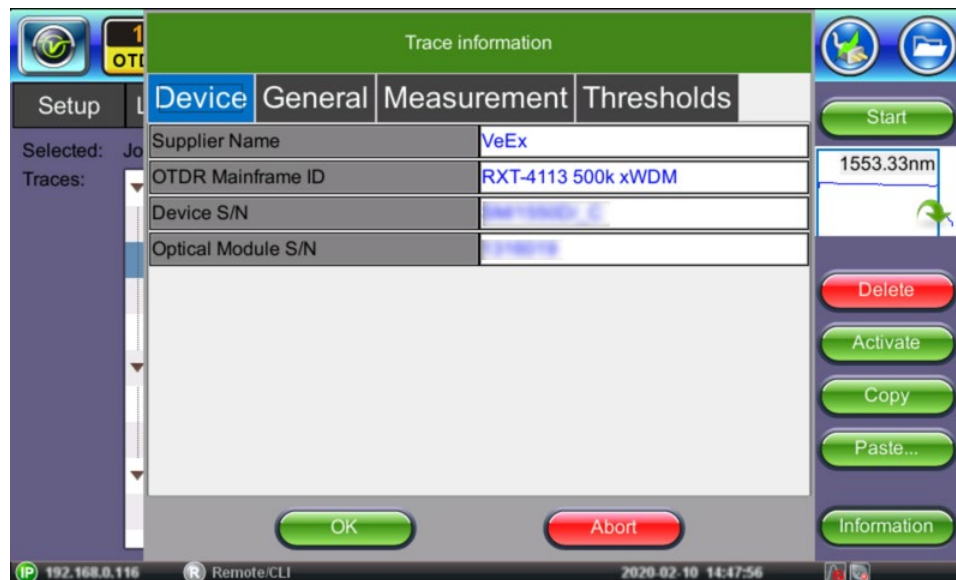
### 8.4.1 Trace Properties

The traces in the memory are saved in BELLCORE, version 2.0 format. The OTDR trace files have the extension **.SOR** which means Standard OTDR Record.

If the measurement was performed at several wavelengths simultaneously, the traces are saved as a group i.e. they will share the same common name but with wavelength added (e.g. 01\_meas\_1310, 01\_meas\_1550).

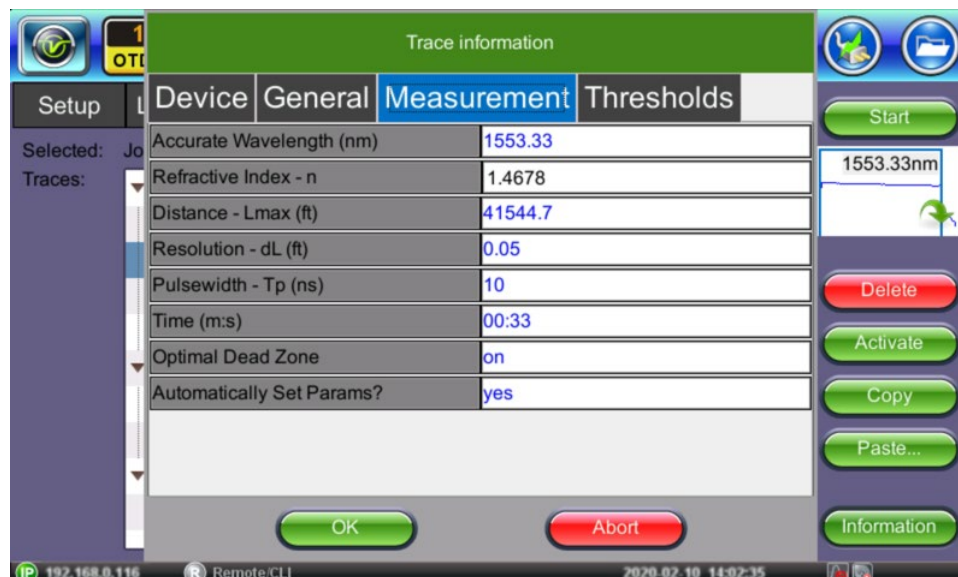
To edit information for an already measured trace, tap the **Information** button on the right sidebar to open the **Trace Information** window, containing the following information relating to the saved file:

- **Device:** OTDR supplier name, Mainframe ID and serial #, and optical module serial # (if applicable)



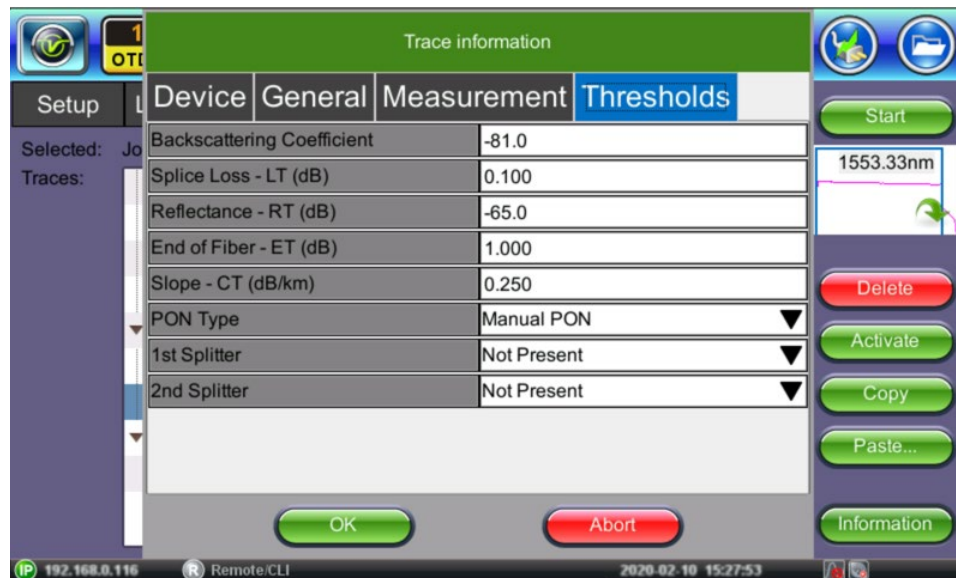
*Trace Information - Devices*

- **General:** Date/Time, Job ID, Cable ID, Fiber ID, Group ID, Fiber Type, Originating/Terminating locations, and Comments
- **Measurement:** Test parameters used to make measurement.



*Trace Information - Measurement*

- **Thresholds:** Analysis thresholds used to analyze the trace, as well as PON identification for LinkMap.



*Trace Information - Thresholds*



For more information on Span settings and Launch/Receive cable offset, see [Section 7.3.2 Span Settings](#).

**To edit the Refractive Index (RI) and Backscattering Co-efficient (BC) for an already measured trace:**

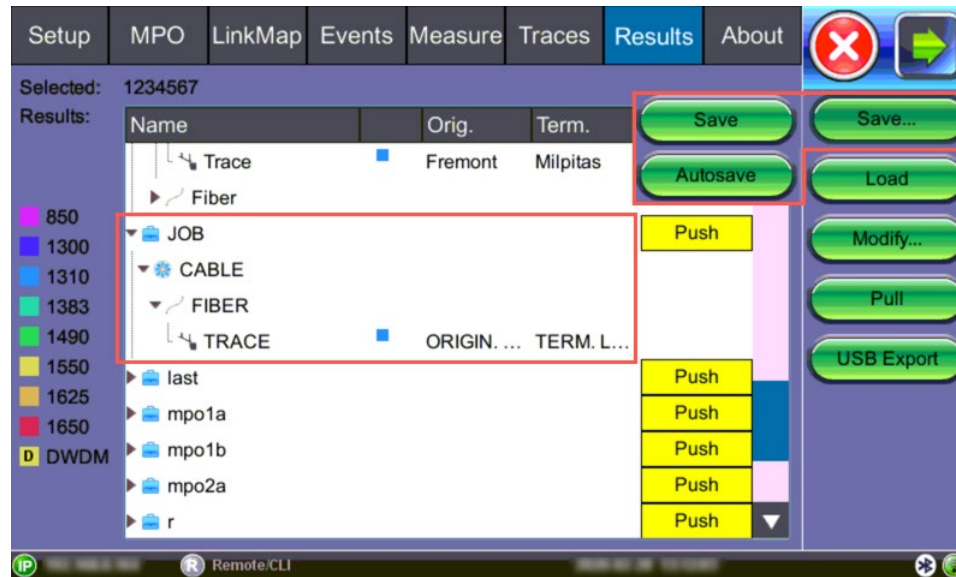
1. Select the trace you want to edit, then tap the **Information** button.
2. On the **Measurement** tab, change the RI as needed.
3. In the **Thresholds** tab, change the BC as needed.
4. Tap **OK** to apply changes. All changes will be applied immediately.
5. After carefully noting the **JobID/CableID/FiberID/TraceID** fields, save the trace. The Job/Cable/Fiber/Trace determine the location to which the trace is saved.



For multi-wavelengths/multi-pulsewidths, edit change trace separately.

## 8.4.2 Saving OTDR Traces

Configure **Autosave** in the **Setup** screen or save OTDR traces manually from the **Results** screen. The Autosave options can also be configured from the **Results** screen. See [Section 7.5 Autosave Parameters](#) for more information about Autosave options.



*Results tab: Save options*

The traces are saved in the following folder directory hierarchy:

- Job ID
- Cable ID
- Fiber ID
- Results – Traces

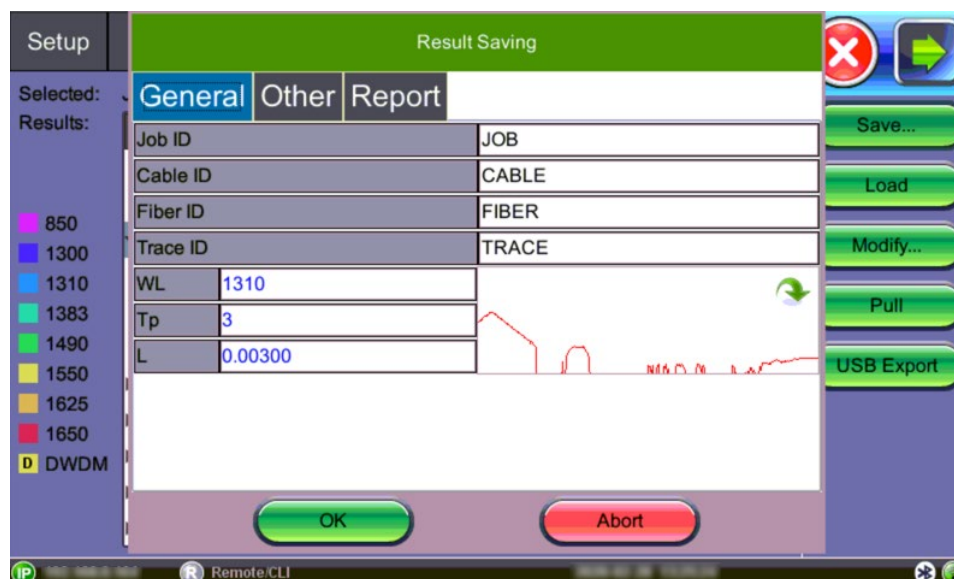


The **JobID/CableID/FiberID/TraceID** fields determine the location to which the trace is saved. If these settings are not set accurately, the trace will not save to the desired location.

### To save Traces:

1. On the **Results** tab, select the trace you want to save.
2. Click **Save**, then click **Save**. The **Result Saving** window appears.

### OTDR Traces: Result Saving Window



3. If needed, change default information on the **General**, **Other**, and **Report** tabs, and then click **OK**.

To view or print reports, use the File Management feature or one of the Fiberizer software applications. For more information, see [Section 9.0 File Management](#).

### 8.4.3 Third Party Viewers

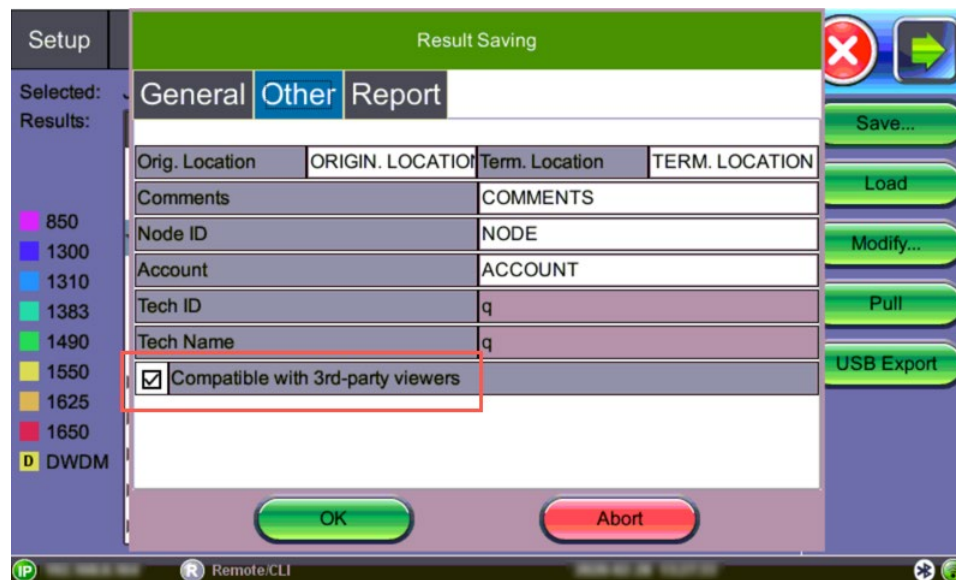
When third party viewing is checked, the OTDR saved results include a filter so that third party software will display OTDR traces identical to how VeEX test sets display them.



**Once saved in this format with the third party filter applied, it cannot be changed afterwards.**

To save a trace for third party viewing:

1. In the **Results** tab, tap **Save**. The **Result Saving** window appears.



*OTDR Trace: Saving file for Third Party Viewers*

2. Select the **Other** tab, and then check the **Compatible with 3rd-party viewers** checkbox.
3. After making any other changes, as needed, click **OK**.



## 8.4.4 Embedded GPS and Camera Image



*Saving OTDR Traces with Embedded GPS and Camera Image is optional and not available on all models.*

### 8.4.4.1 Obtaining GPS Coordinates (optional feature)

To obtain the GPS coordinates for your current location:

1. Access **Utilities>More>GPS/High Precision Clock**.
2. Connect the antenna to the RF connector port (brass) located at the top of the unit.
3. Turn GPS **ON** to begin searching until your GPS Status is **Lock**.



*GPS Coordinates screen*



*To include GPS coordinates and camera images with OTDR files, the test set must have the GPS option enabled, an external 'active' antenna connected, and the Camera option installed.*

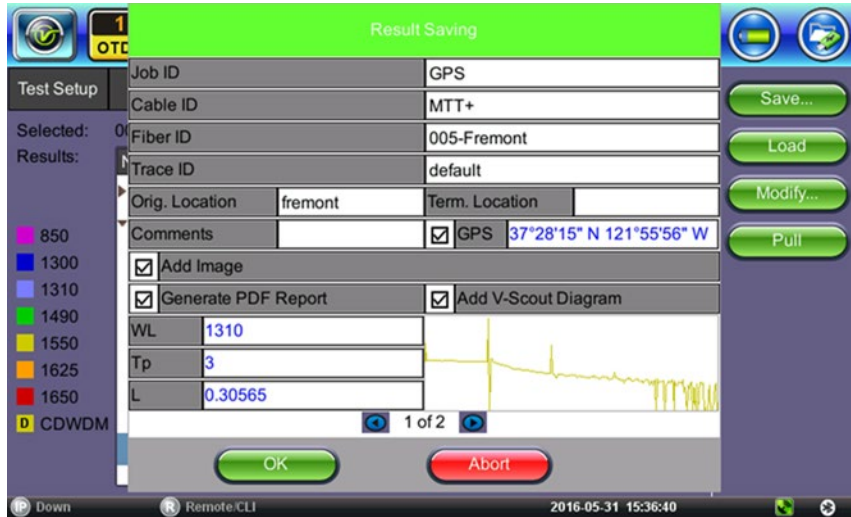
### 8.4.4.2 Adding GPS to OTDR file (optional feature)

The GPS coordinates can be added by using:

- **AutoSave**: Select the **Ask Before Save** check box.
- **Manual Save mode**: Select the **GPS** check box.

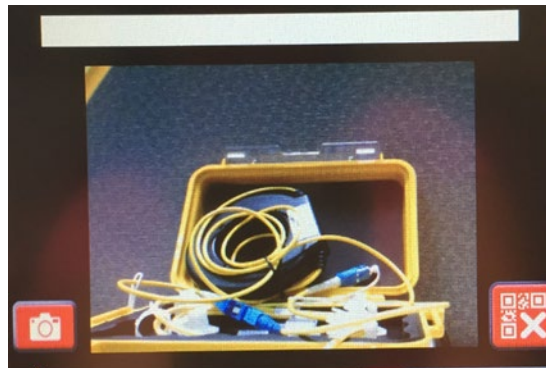
### 8.4.4.3 Adding Camera Image OTDR file (MTTplus only)

A Camera image can be added using the **Manual Save only** mode (AutoSave disabled) mode to display the Result AutoSaving pop up window. Enter all AutoSave field entries and select **Generate PDF Report** and/or select **Add V-Scout Diagram**.



*MTTplus Manual Save: Add camera image*

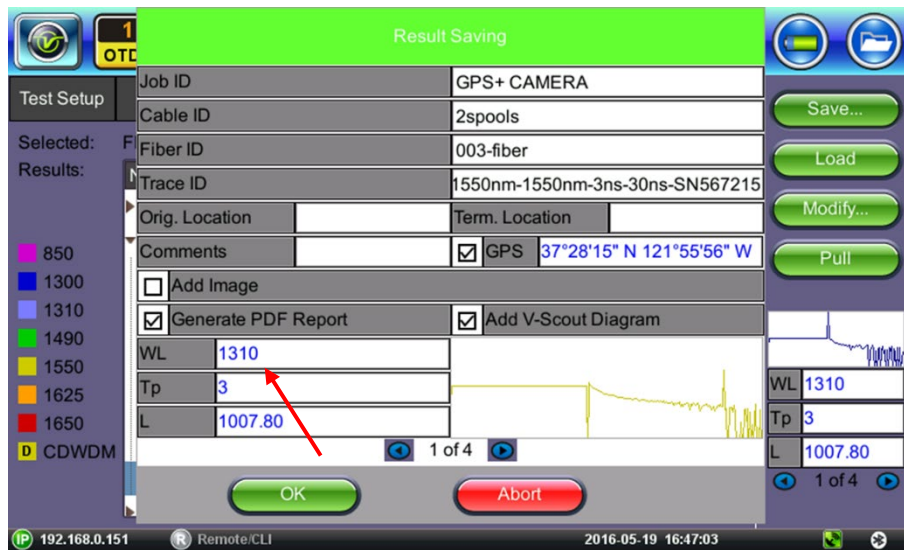
1. Select the **Add Image** to pop up the camera image.
2. Select red **Camera** button to capture results.



*MTTplus: Camera button*

or select red **X** button to exit Camera capture mode.

3. Click the green **OK** button to finalize the save process.



*MTTplus Manual Save: Image added to results*

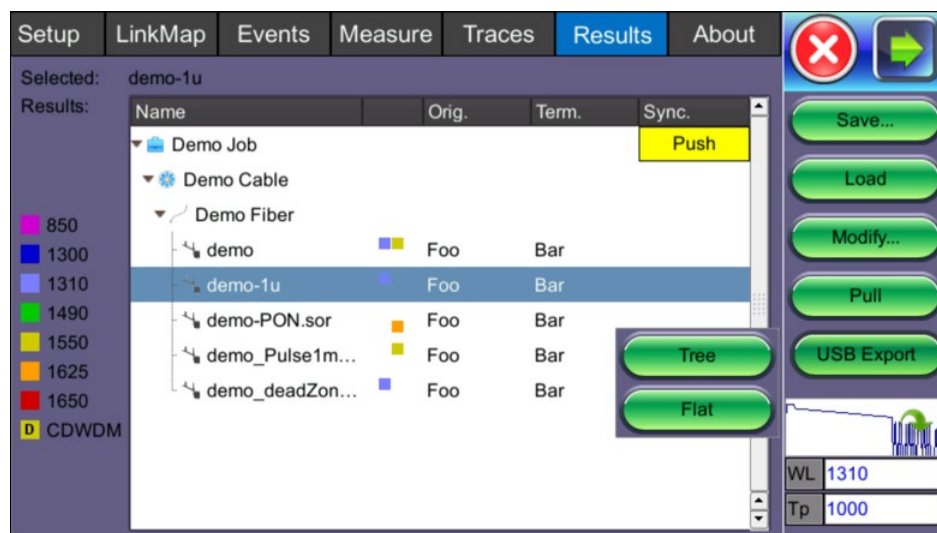
## 8.5 Results

### 8.5.1 Results View

The **Results** tab displays the following information pertaining to OTDR traces. To expand the selection or folder directory, tap on the arrow. An arrow pointing to the right indicates the branch is collapsed whereas an arrow pointing downwards indicates the branch is expanded.

The traces are saved in the following folder directory hierarchy:

- Job ID
- Cable ID
- Fiber ID
- Results – Traces



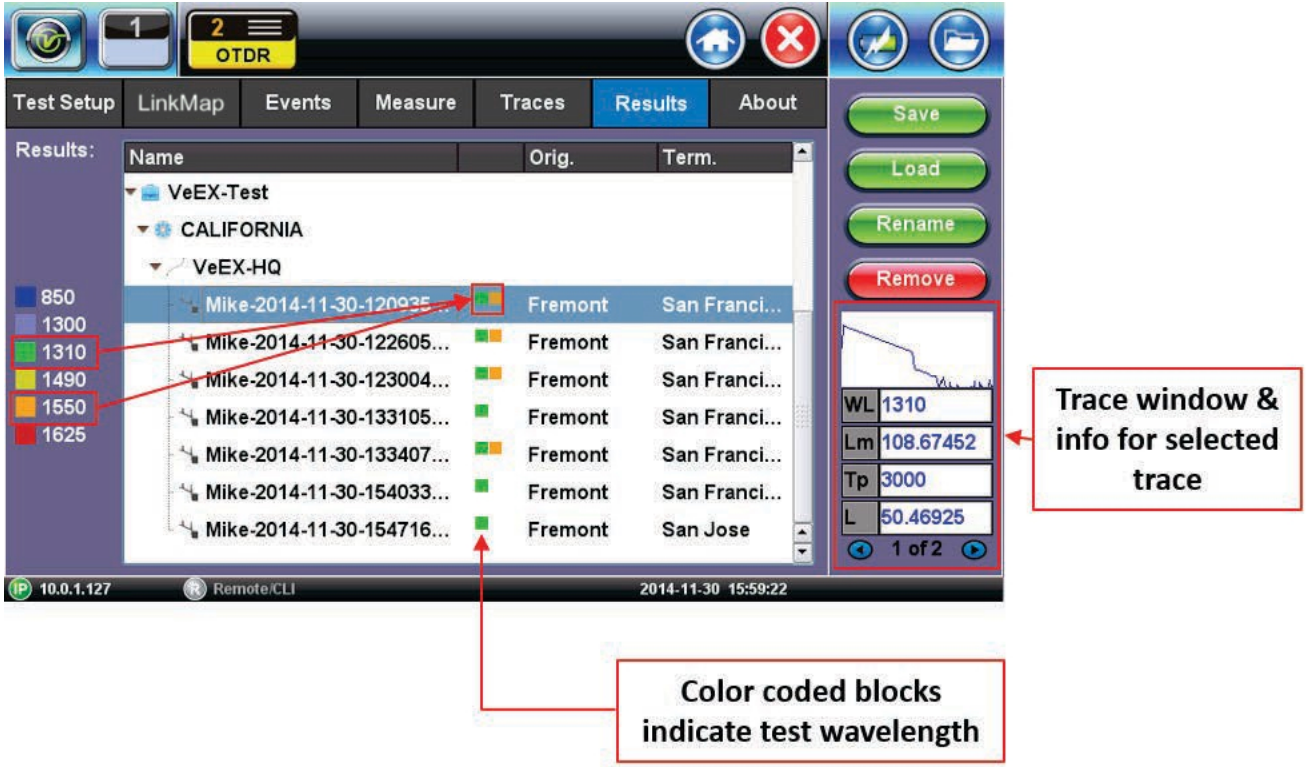
*Results tab*

To push test results to your Cloud account, select the **Push** command for the folder that you wish to upload to the Cloud.

- **Save:** Saves file when autosave is disabled. See [Section 8.4.2 Saving OTDR Traces](#) for more information.
- **Load:** Displays selected trace for viewing.
- **Modify:** Renames or removes selected file.
- **Pull:** When connected, pulls file from Fiberizer Cloud onto test set.
- **USB Export:** Exports selected test results to USB stick using the “MyVeEX” tree directory format or a flat file when all files should be saved in a single folder. The files can be found on the USB stick in the **OTDR Export** folder.



*Alternatively,* access and export files to a USB memory device by tapping **Utilities>Files>Saved**, then **To USB**. Each trace will be saved in a separate file folder. See [Section 9.1.1 Saving/Printing Results to PDF/USB/Bluetooth](#) for details.



*Results tab: Wavelength/Trace*

## 8.6 Bidirectional OTDR Testing (X-view)

When Bidirectional fiber testing results are available, the OTDR can be used to view the results using the X-format. The OTDR results table will be unidirectional, meaning results can be viewed from one trace at a time. Use the green arrow in thumbnail view to switch active trace/even table results.



*In some cases, a more detailed analysis may be needed. This can be accomplished by averaging the test results of both traces. Results are averaged to counteract variation in attenuation at connector junctions between fiber sections.*

*Fiberizer Cloud or Fiberizer Desktop Plus software is recommended to:*

- *Generate test reports that will include the results table that shows both individual results and averaged bidirectional results, along with traces in an X-view format.*
- *Automate bidirectional test reports for a batch of fiber strands, instead of individual strands at a time.*

*For more information on Fiberizer Cloud or Fiberizer Desktop Plus, go to [www.veexinc.com](http://www.veexinc.com) or contact Customer Care.*

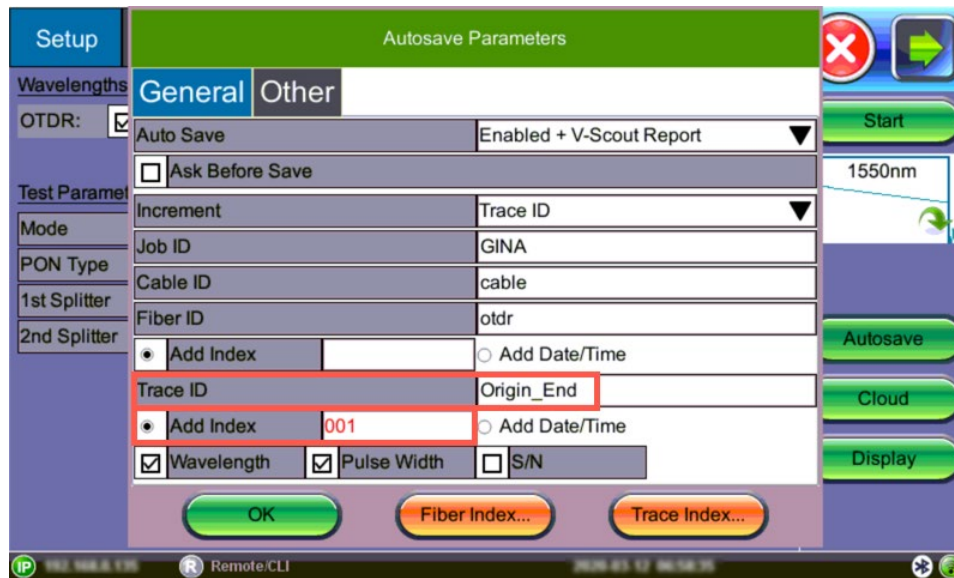
### To create a bidirectional X-view screen:

1. Before saving bidirectional test results, configure **Autosave** settings so that it is easy to track bidirectional results. In the **Setup** tab, tap **Autosave**. The **Autosave Parameters** window appears.
  - Set **Increment** to **Trace ID** and **Other** tab to enter *Origin* and *Termination* sites.
  - The **Trace ID** label should reflect the physical location for each direction (e.g. first trace labelled “origin\_end” and the second opposite end labelled “end\_origin”).



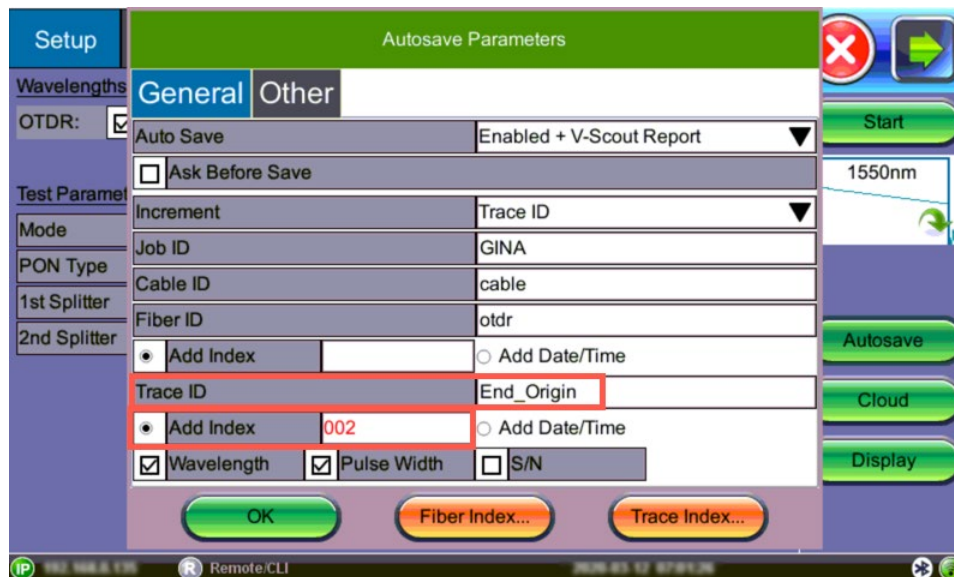
*Do not use “-“ in the **Trace ID** field.*

- Reset or Force the **Trace Index** counter number to the fiber port you are testing at; otherwise, it will continue incrementing from the previous test. To change the number, tap **Trace Index**.



*Bidirectional Trace – First Fiber to Test*

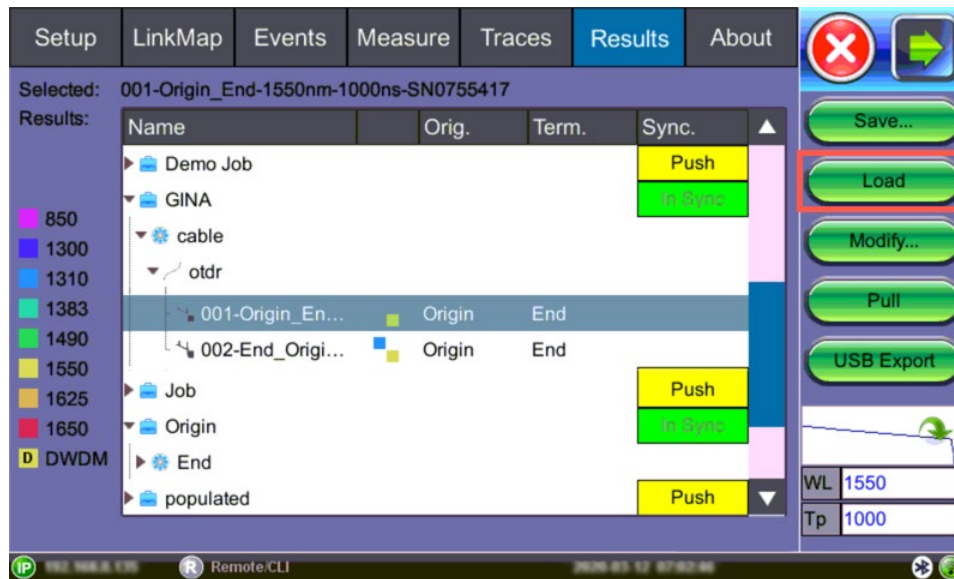
2. Before testing from the opposite direction, re-configure the **Autosave Trace ID** settings to reflect the new test direction so the filename will be correct with the first trace.
  - Set **Increment** to **Trace ID** and **Other** tab to enter *Origin* and *Termination* sites.
  - The **Trace ID** label should reflect the physical location for the opposite direction (e.g. first trace labelled “origin\_end” and the second opposite end labelled “end\_origin”).
  - Reset or Force the **Trace Index** counter number to the fiber port you began testing at; otherwise, it will continue incrementing from the previous test. To change the number, tap **Trace Index**.



*Bidirectional Trace – Reverse Direction testing*

To view bidirectional test results, load the bidirectional traces previously saved from opposite direction testing (e.g. load “Origin\_End” and “End\_Origin”). See **step 3**.

3. On the **Results** tab, select the required traces and tap **Load**.



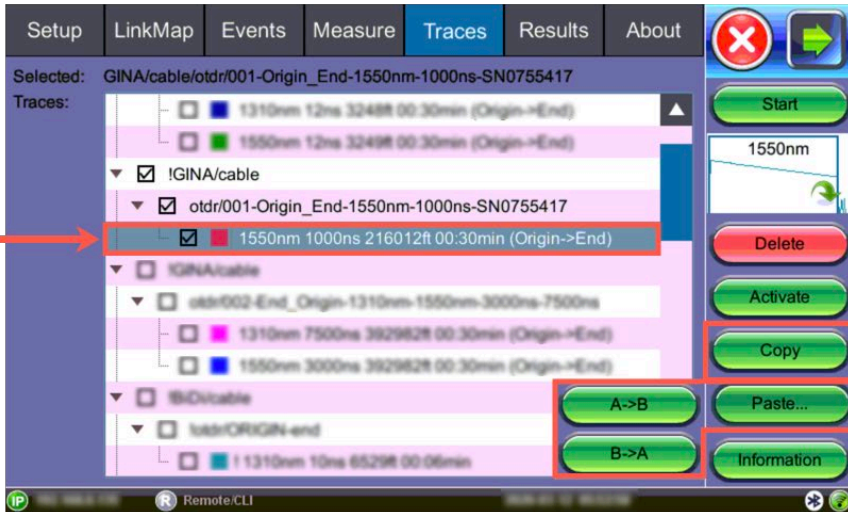
*Bidirectional testing: Results tab*



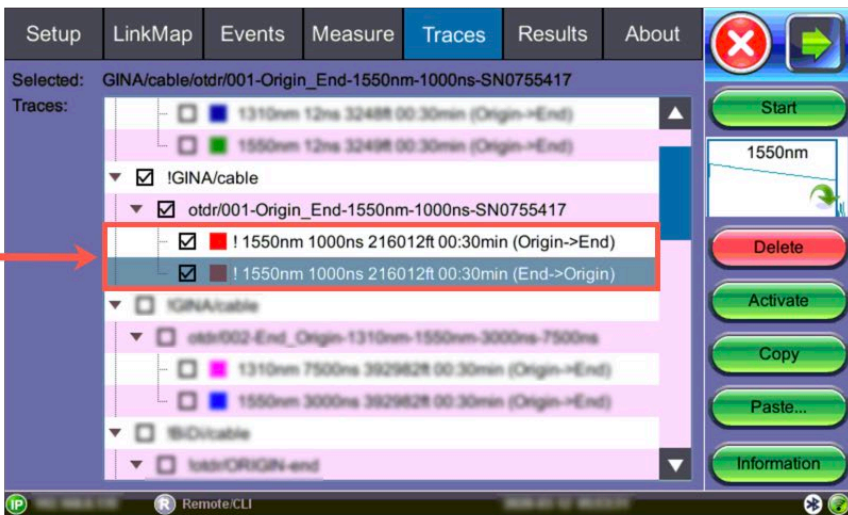
*Bidirectional View: First Trace loaded (before selecting reverse direction trace)*



- On the **Traces** tab, select one trace (End\_Origin) and tap **Copy**. Then, select the target tree node and tap **Paste>B->A**. The reverse direction file copies into the same folder. Select two files (Origin\_End) and (End\_Origin) to view results.



After loading traces in the Results tab, copy the trace to reverse. Then, select the target tree node and tap Paste.



Tap the green arrow in the plot window to switch between A->B.

*Bidirectional testing: Traces tab*

5. View the bidirectional trace in X-format on the **Measure** tab and **Events** tab.



Both traces must be checked in the **Traces** tab to view the bidirectional trace.



*Bidirectional test: Events view*

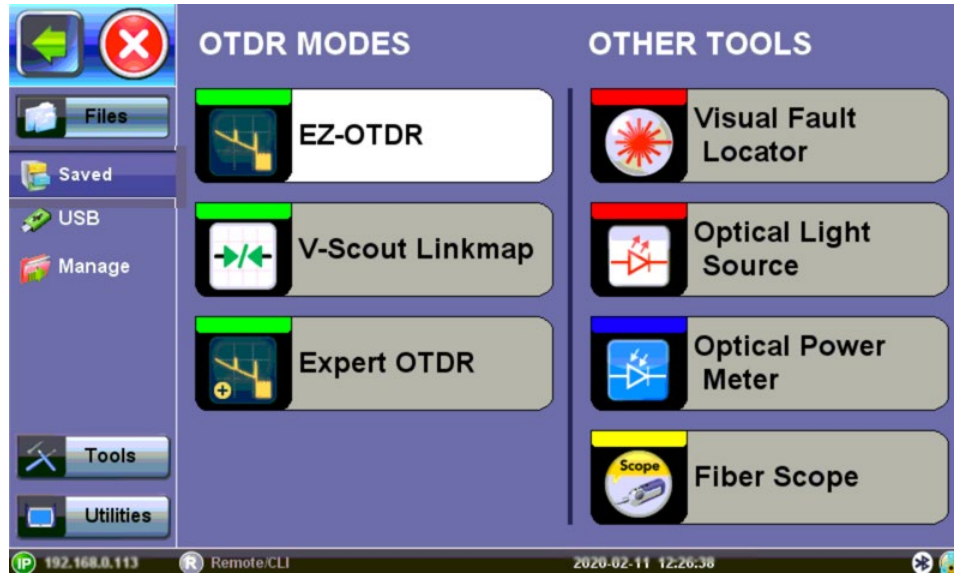
## 8.7 About Tab



*About tab*

The **About** tab shows the OTDR model, firmware type and build, platform serial number, and OTDR wavelengths.

## 9.0 File Management



*File Location*

Select **Files>Saved** to access saved traces or results. Then, use the stylus to select a file from the list of files. File types include:

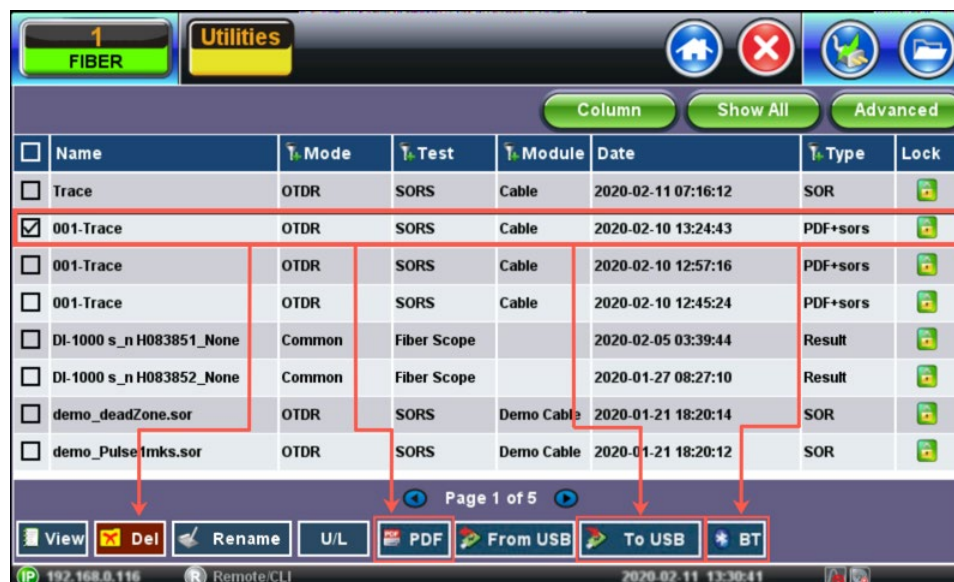
- OTDR traces are saved as SOR files
- Fiberscope images are saved as PNG files
- Optical Power Meter (OPM) results are saved as text/xml files



*File Manager*

- **View:** Displays the results on the unit.
- **Del:** Deletes the file.
- **Rename:** Renames the file.
- **U/L:** Unlocks/Locks the file.
- **From USB:** Imports files from a connected USB memory device.

### 9.1.1 Saving/Printing Results to PDF/USB/Bluetooth



*Printing/Saving Result to PDF/USB/Bluetooth*

The saved file can be exported to PDF, a USB stick, or through Bluetooth to a PC, Tablet or other mobile device.

- **To export to PDF:** Select the results file, then tap **PDF** at the bottom. A “PDF file will be generated to USB disk” message appears. Tap **Yes**.



Alternatively, when saving results ([Section 7.5 Autosave Parameters](#)), select the **Enable+Report (pdf)** or **Enabled+V-Scout+Report** options. The PDF report will appear in the File Manager list.

- **To save to USB:** Select the results file, then tap **To USB** at the bottom. If a USB memory device is plugged in, the file will be exported to it. Each file is saved into its own folder using the “MyVeEX” tree directory format.



Use the **USB Export** option on the **Results View/Tab** to save all the files in the same folder. See [Section 8.5 Results](#) for details.

- **To Export using Bluetooth (optional):** Select the results file, then tap **BT** at the bottom. The device automatically scans for devices. After pairing the device, tap **Send**. The OTDR sor file will be exported to the paired PC or Mobile device.

•



*Export using Bluetooth*

- **To Export to a Tablet:** Using a Bluetooth dongle accessory, select the results file, then click **BT** at the bottom. The device automatically scans for devices. After pairing the device, click **Send**. The OTDR sor file will be exported to the paired PC or Mobile device.

## 10.0 Certifications and Declarations



### What is CE?

The CE marking is a mandatory European marking for certain product groups to indicate conformity with the essential health and safety requirements set out in European Directives. To permit the use of a CE mark on a product, proof that the item meets the relevant requirements must be documented.

Use of this logo implies that the unit conforms to requirements of European Union and European Free Trade Association (EFTA). EN61010-1

**For a copy of the CE Declaration of Conformity relating to VeEX products, please contact VeEX customer service.**



### RoHS Compliance

#### VeEX QUALITY AND ENVIRONMENTAL POLICY

Our quality and environmental policy is to limit and progressively eliminate the use of hazardous substances and chemicals in the design and manufacture of our products.

VeEX products are classified as Monitoring and Control Instruments under Article 2, Section (1), Category 9 of the WEEE 2002/96/EC Directive.

ROHS Statement

#### RoHS and WEEE Position Statement

The Council of the European Union and the European Parliament adopted Directive 2002/95/EC (January 27, 2003), to Reduce the use of certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment, and Directive 2002/96/EC on Waste Electrical and Electronics Equipment (WEEE), with the purpose of reducing the environmental impact of waste electrical and electronic equipment. Both were later recast by Directives 2011/65/EU and 2012/19/EU respectively. All VeEX products being placed on the EU market conform with these directives.

Additional RoHS substance restrictions for the Monitoring and Control Instruments were adopted by EU Directive 2015/863 (March 31, 2015). These new restrictions will take effect from July 22, 2021. VeEX has established a program to ensure that from July 22, 2021, all its products to be sold and shipped into the EU market will conform with (EU) 2015/863.

VeEX Inc. is committed to comply with RoHS and WEEE Directives to minimize the environmental impact of our products.

For more information about RoHS as it relates to VeEX Inc, go to the VeEX web site at [www.veexinc.com/ROHS](http://www.veexinc.com/ROHS).

## 11.0 About VeEX

VeEX Inc., a customer-oriented communications test and measurement company, develops innovative test and monitoring solutions for next generation telecommunication networks and services. With a blend of advanced technologies and vast technical expertise, VeEX products address all stages of network deployment, maintenance, field service turn-up, and integrate service verification features across copper, fiber optics, CATV/DOCSIS, mobile 4G/5G backhaul and fronthaul, next generation transport network, Fibre Channel, carrier & metro Ethernet technologies, WLAN and synchronization.

Visit us online at [www.veexinc.com](http://www.veexinc.com) for the latest updates and additional documentation.

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