TREND NETWORKS

LanTEK IV

User Manual

Content

Safety instructions

Warnings for handling the rechargeable batteries of LanTEK IV.

All Lithium-Ion (Li-Ion) batteries generate a significant flow of electric current, irrespective of the indicated state of charge, which can cause personal injury and / or property damage.

Lithium ion (Li-Ion) batteries should not be burned or disposed of with normal waste. Lithium-ion (Li-Ion) batteries can explode if exposed to flame. Rechargeable batteries are special waste and can contaminate groundwater if not disposed of properly.

Automatic resetting fuses in rechargeable batteries, which cut off high current discharge as quickly as possible, ensure the greatest possible safety. However, these fuses cannot provide full protection against transient arc discharges, which can occur through a short circuit of the electrical contacts in the rechargeable battery. To avoid injury, the following instructions for handling rechargeable batteries must be observed.

When a rechargeable battery is not installed in the tester handser, it must be stored in clean, dry and non-conductive packaging.

Take care that the contacts of the rechargeable battery do not touch conductive materials.

Avoid touching the contact surfaces of the rechargeable battery.

Rechargeable batteries can be recharged when they are the tester or by the external charging port with the provided power supply. Charging the rechargeable battery in any other way may cause it to explode.

Rechargeable batteries should only be placed, transported, stored and charged in a non-explosive environment.

Observe service and storage temperatures.

Do not leave children or people who are not familiar with the safety instructions in this user manual, handle or charge the rechargeable batteries.

Do not open the rechargeable battery case. No part in the case needs to be serviced by the customer; rechargeable batteries cannot be repaired.

Responsibilities

TREND NETWORKS is not responsible for death, personal injury, device damage or property damage caused by improper use of rechargeable batteries.

TREND NETWORKS is not responsible for consequential damages caused by modifications of the rechargeable batteries or the charger and their subsequent use.

Subject to technical changes.

If you have any questions regarding these safety instructions, this user manual, or any doubts regarding the safe handling and disposal of the rechargeable batteries used in the LanTEK®IV cable certifier, please contact a TREND NETWORKS representative.

Work with LanTEK®IV cabling certifier

The default parameter settings in the LanTEK®IV cable certifier are based on general standards and recommended standards as well as the habits of the installation and maintenance worlds; and the expertise of TREND NETWORKS.

TREND NETWORKS recommends before testing commences, to define precisely with the end customer or with the team leader, or design office, the cabling standard to which certification must be carried out, to ensure that the parameters tested meet the expected requirements.

Indications

The following symbols used in this user manual indicate that the user must proceed with great caution, in order to avoid injury to persons or damage to the LanTEK®IV wiring certifier or the system tested.

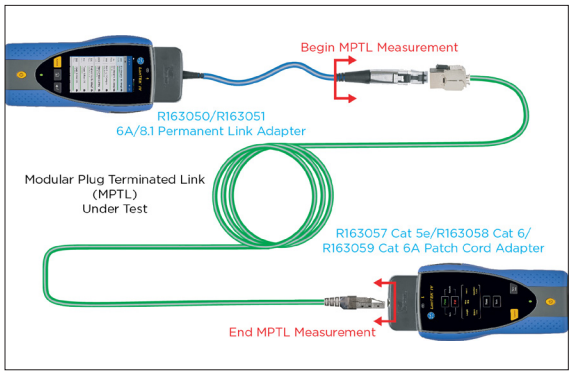
WARNING !
This symbol indicates life-threatening voltages. There is a danger of death and / or for the health of the person carrying out the action or of persons in the vicinity.

CAUTION!
This symbol indicates that the action concerned may possibly threaten the environment or damage technical equipment.

Typographic conventions

Bold: indicates a key from the LanTEK®IV cabling certifier.
Italicized characters: indicates menu option in this user manual
Quotation marks "": indicates a "message on the screen".

Certification Link Models



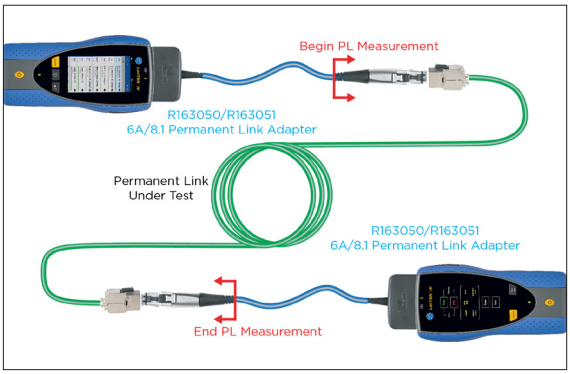
MPTL (Modular Plug Terminated Link) configuration

Included in the test:

- Connection between the Permanent link adapter plug and the MPTL socket
- Connection between MPTL plug and patch cord adapter

Not included in the test:

- Permanent link adapter cord



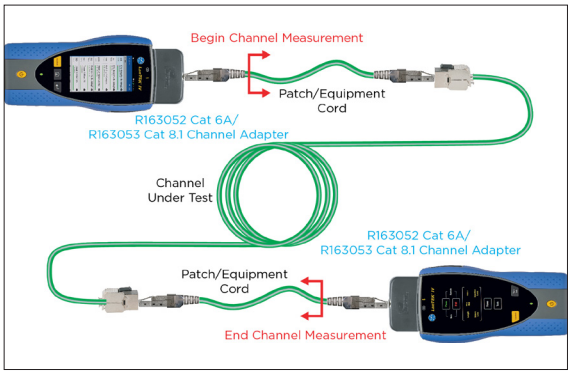
Permanent Link configuration

Included in the test:

- Connection between the permanent link adapter plug and the permanent link wiring

Not included in the test:

- Permanent link adapter cord



Channel Configuration

Included in the test:

- The patch cord wire
- Connection between RJ45 plug and permanent link wiring

Not included in the test:

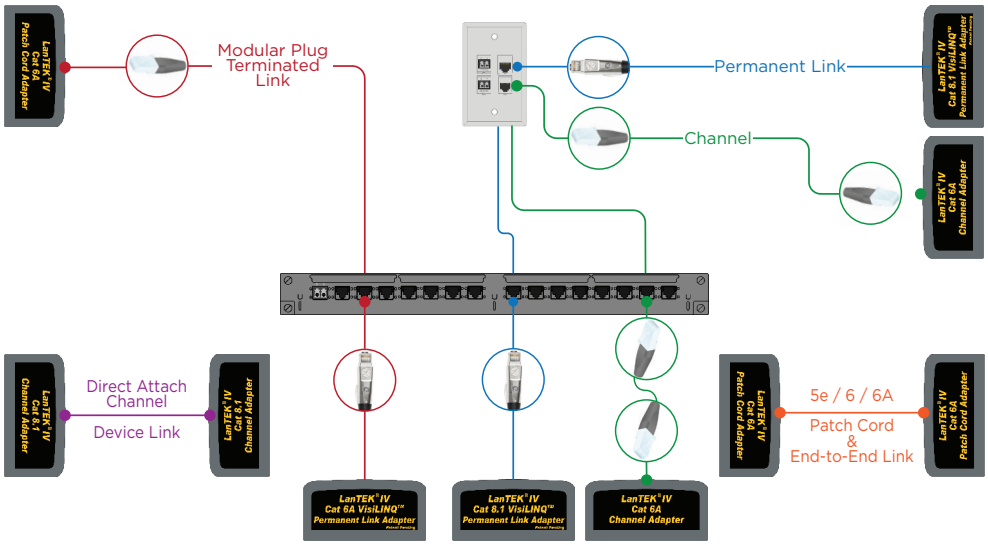
- Connections between the ~~2~~ patch cords~~s~~ plug and channel adapter~~s~~

Certification Link Models

The typical method is the Permanent Link to certify the infrastructure fixed wiring consisting of two female RJ45 sockets at each end and an optional consolidation point connector near the work area.

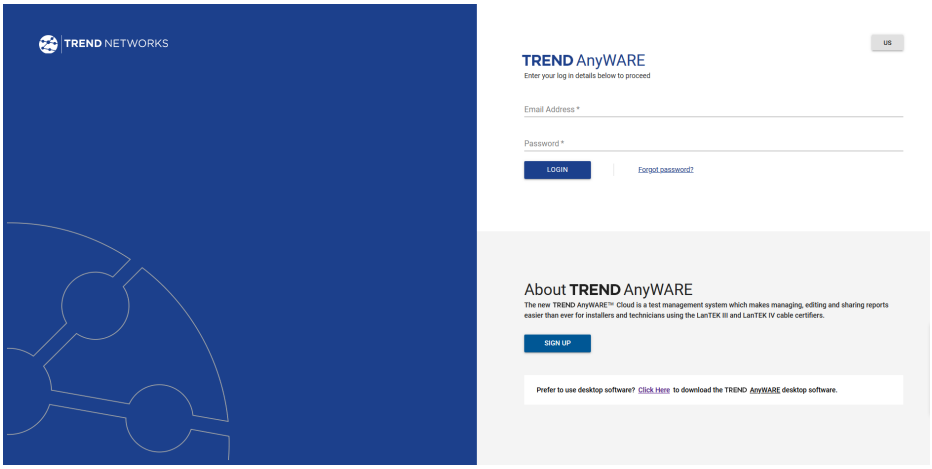
The Channel method has the advantage of also certifying the two patch cords connected to the permanent link thus measuring the entire channel from end-to end. The downside is that if the patch cords are changed, the channel must be re-certified.

The MPTL method makes it possible to certify a hybrid link consisting of a conventional female socket at one side and a male connector (plug) at the other side. MPTL's are used to directly connect to a PoE camera, Wi-Fi access point, access control and other devices that are installed in fixed locations. To certify an MPTL a Permanent link adapter is attached to the main handset and a patch cord adapter on the remote handset. The patch cord adapter must be of the same category rating as the components of the MPTL.



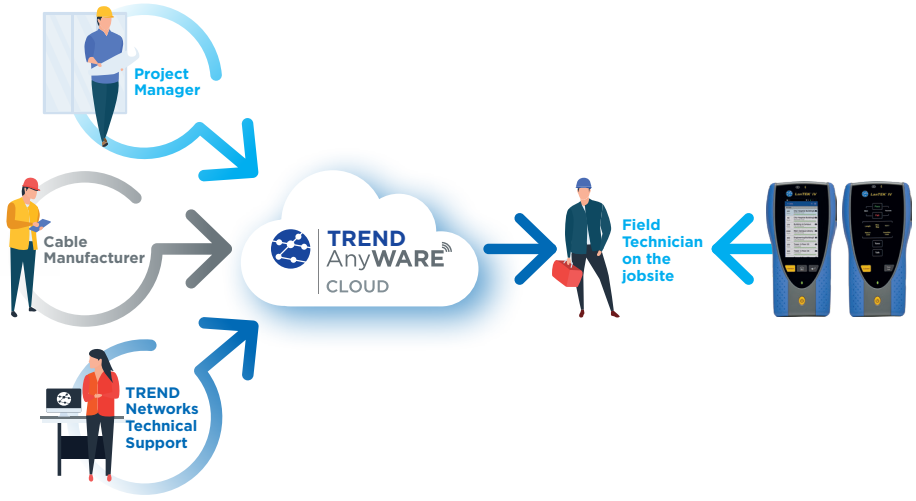
TREND AnyWARE Cloud

With TREND AnyWARE Cloud, you no longer have to download and install test management software to a PC.
Create an account at https://anyware.trend-networks.com
Please use: Google Chrome, Microsoft Edge, or Mozilla Firefox.



TREND AnyWARE CLOUD allows management of projects using LanTEK IV certifiers.

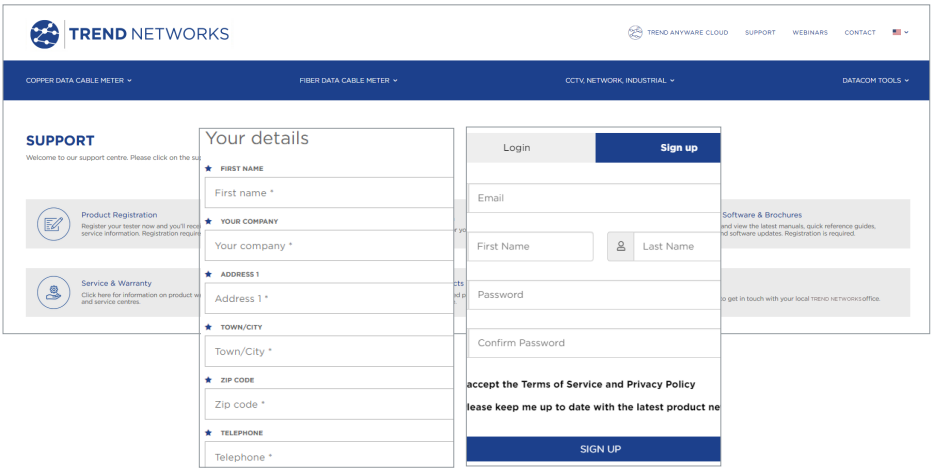
1. Who has the certifier
2. Date of last software update
3. Calibration date
4. When the results were last synchronized

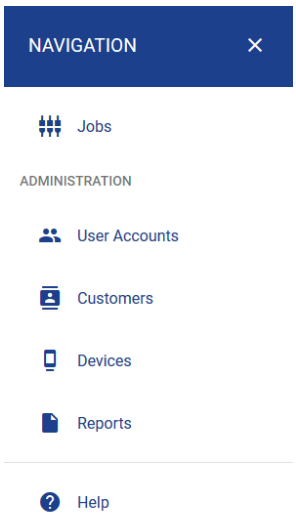


TREND AnyWARE Cloud

Please register your LanTEK IV to receive updated information at: https://

An account is required to download software and documentation.



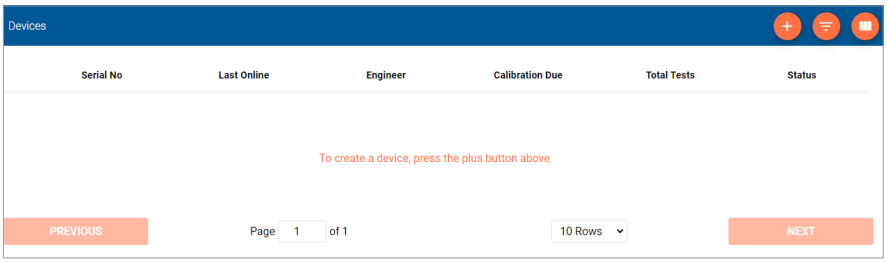


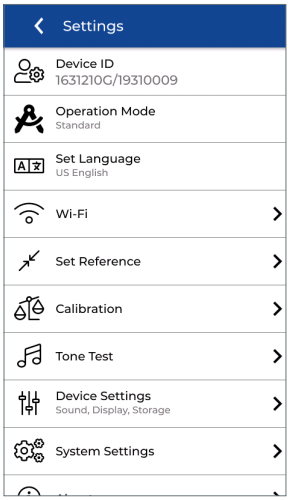
Link LanTEK IV to your AnyWARE account.
Select the Navigation menu:

Select "Device", add your LanTEK IV with + on the menu at the top right.

Enter the identifier of your LanTEK IV via the entry screen.

TREND AnyWARE Cloud

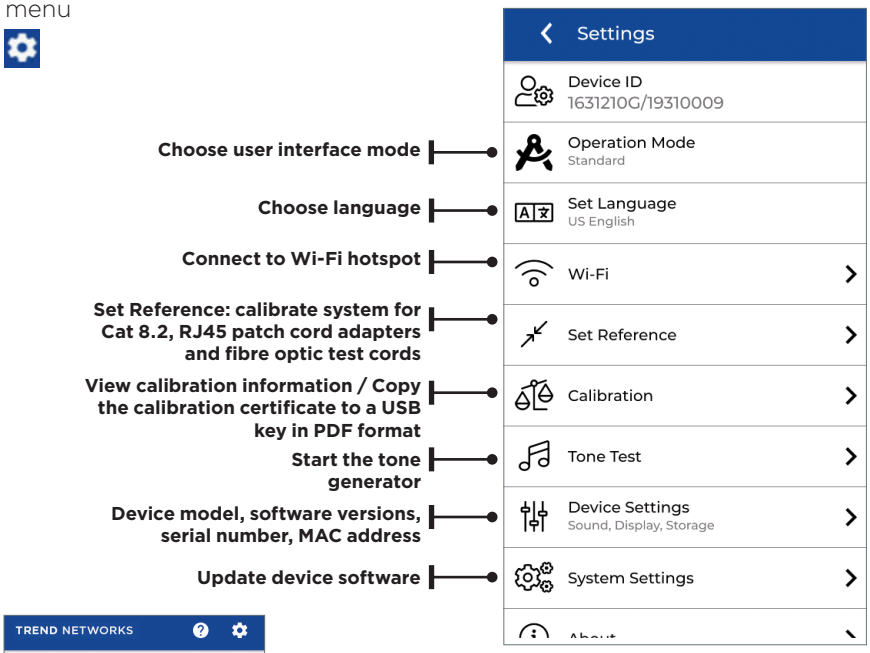


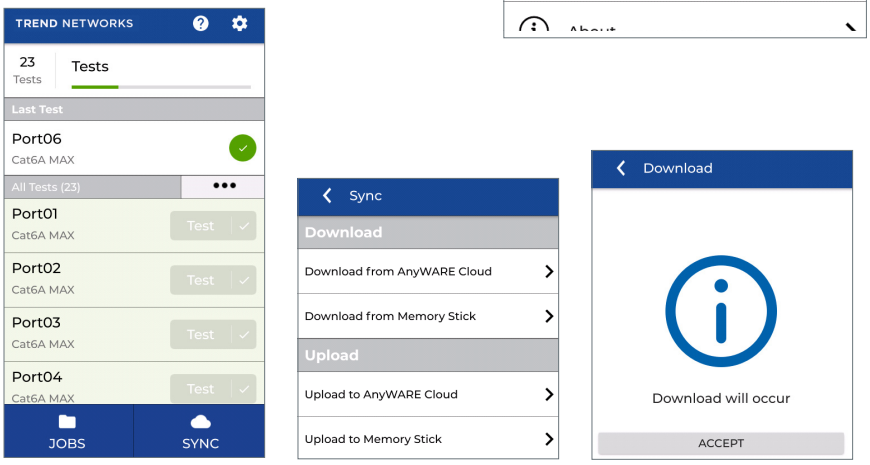


You will find the Device ID in "Settings" on the LanTEK IV.

LanTEK IV configuration: Settings menu

Press on the gear icon at the top right of the screen to open the Settings menu



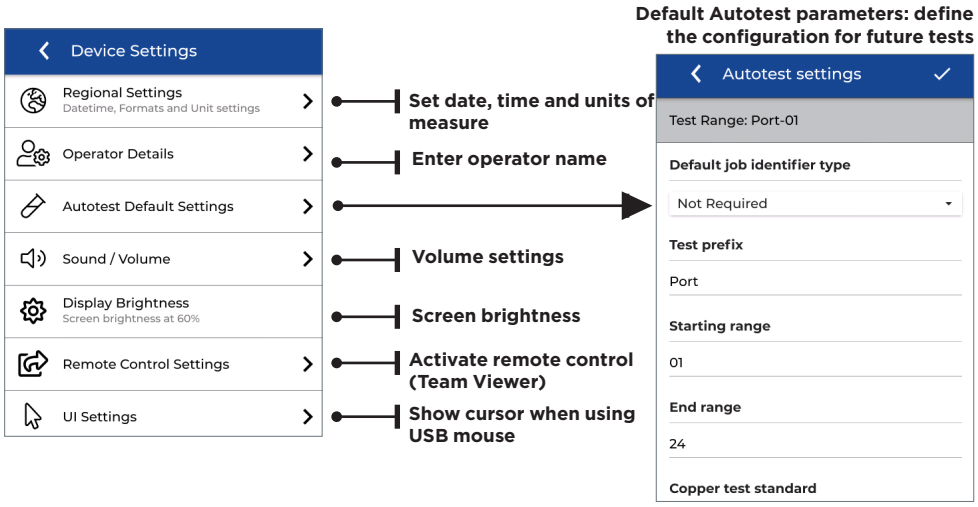


Press “SYNC” to import or export test files. Import transfers blank test files from a USB key or AnyWARE Cloud to the LanTEK. Export transfers completed test results to a USB key or AnyWARE Cloud.

Press Accept after choosing an option.

Default Autotest Settings

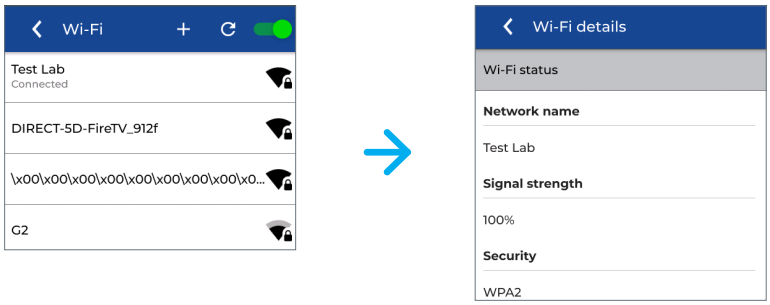
This will save a standard configuration in the tester that will be the default setting each time new tests are created, reducing setup time. The standard can be changed when creating new tests as needed.



Wi-Fi Settings

To connect LanTEK IV over Wi-Fi, tap Settings

Select “Wi-Fi” - then activate it using the switch at the top right (green when active)



Select a network and enter the password if required

Wi-Fi is then connected if the wave logo at the top right is not crossed out

Make sure that the signal strength is greater than 50%.
Once connected, tap on the network name to view Wi-Fi details including the security settings, IP address and MAC address.
On a site without a Wi-Fi network, use internet sharing with a mobile phone that will be on a conventional mobile network.
Once connected, tests can be uploaded/download to AnyWARE Cloud using “SYNC” from the home screen.

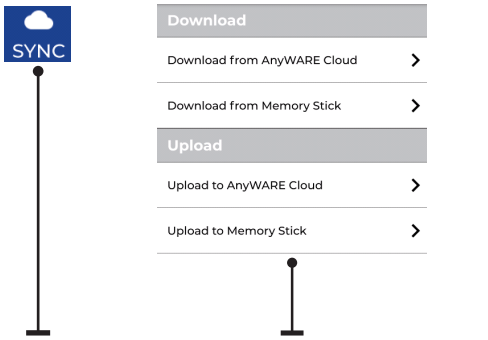
Importing/Exporting jobs

The SYNC menu allows importing pre-configured jobs from AnyWARE Cloud or Desktop software to the LanTEK IV.

Completed tests can be uploaded to AnyWARE Cloud when connected to Wi-Fi. Jobs are synchronized between AnyWARE Cloud and the LanTEK IV. Tests added to a job on AnyWARE Cloud will be downloaded to LanTEK and tests created on LanTEK will be added to the corresponding job on AnyWARE Cloud.

Alternatively, AnyWARE Desktop provides test management and reporting from a PC without using cloud services. Jobs created on AnyWARE Desktop can be exported to a USB key and downloaded to LanTEK.
Completed tests can be exported from LanTEK to a USB key then uploaded to AnyWARE Desktop and added to the corresponding job. Each test result is saved with a file whose extension is .res (result).

USB keys up to 512GB are supported and must be formatted as FAT32.



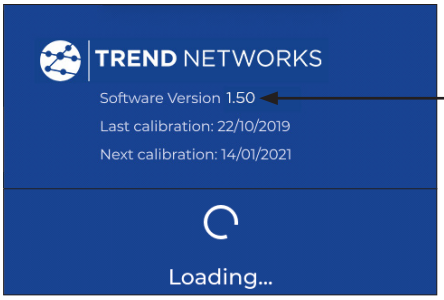
Select SYNC

Download imports jobs into the LanTEK for testing. Upload sends completed tests for viewing/reporting with TREND AnyWARE.

Note: the Memory Stick option is visible only when a USB key is connected to the LanTEK.

User Interface Operating Modes

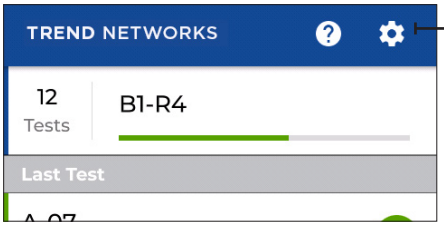
LanTEK IV version 1.50 software adds a new user interface mode that allows testing without the need to create a job with pre-configured tests.
The new mode is called “Standard” and the existing mode is called “Advanced”.



Ensure the installed software is version 1.50 or higher

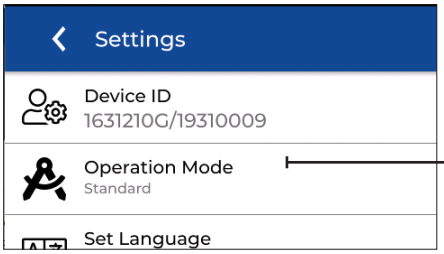
The installed software version is displayed on the information screen while booting.

Select the desired operation mode in the Preferences menu.



Open the Preferences menu

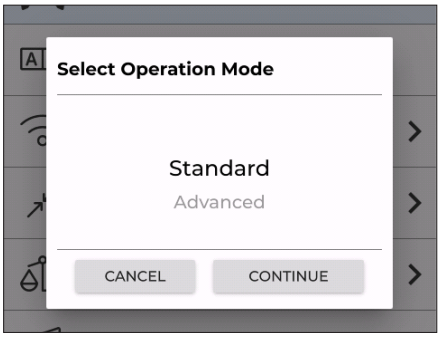
Press the gear icon to open the Preferences menu.



Open Operation Mode selection

Press Operation Mode to reveal the mode selection screen.

The currently selected Operation Mode is shown in small font.



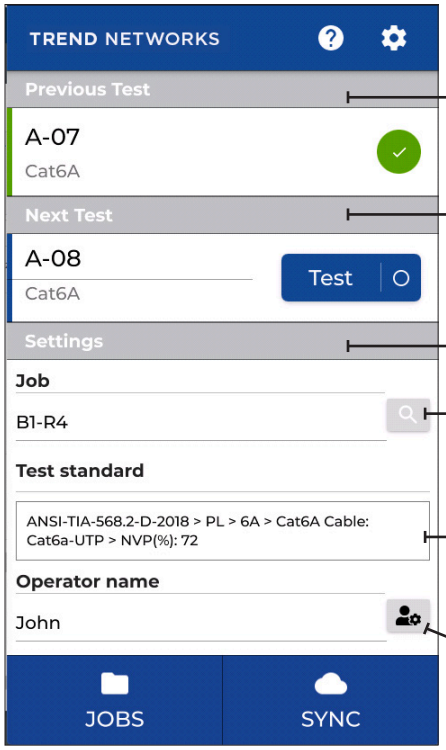
Choose desired mode

Standard = simplified mode that allows setting name and specifications for each individual test.

Advanced = mode that allows pre-configuration of jobs with names and specifications prior to testing.

Standard User Interface Operation

Testing with Standard mode requires setting four parameters before a test can be started.
All parameters can be set from the Home screen and each Autotest will be run with the same parameters as the previous test. The last character of the test name is incremented by one digit (either letter or number).



Previous Test - Name, type and result of the test that was previously performed. Touch the test name to open the results page.

Next Test - Name of the next test to be run. The last character increments with each test. The test name can be changed by touching the name.
Touch Test or press the Autotest key to perform a test.

Settings

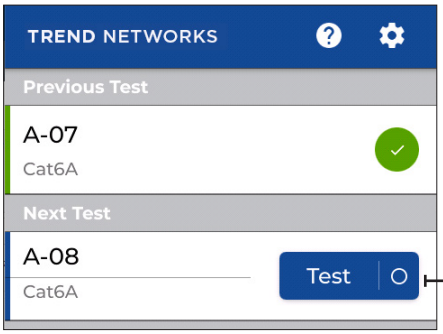
Job - Name of the folder where the next test will be stored.
Touch the “search” icon to create or select a different job.

Test standard - Summary of the test limit and cable type that will be used for the next test. Touch the box to change the test standard settings.

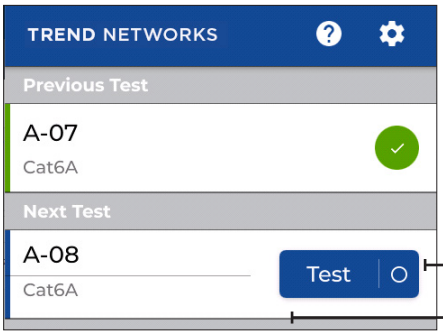
Operator name - Name of user that is stored with each test.
Touch the user icon to change the operator name or add a new one.

Next Test

The name of the next test to run is entered into the Next Test field. The name will automatically increment the last character following each test.

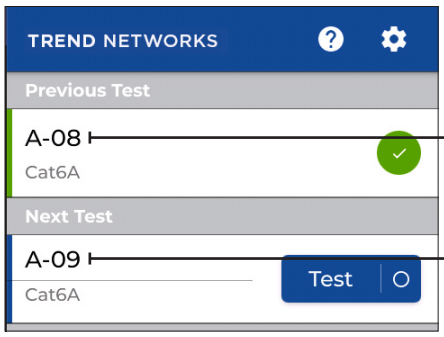


Press Test to perform a test and save it as ID “A-08”.



The Test icon turns grey when a test is running.

The status bar increases to show the test progress.

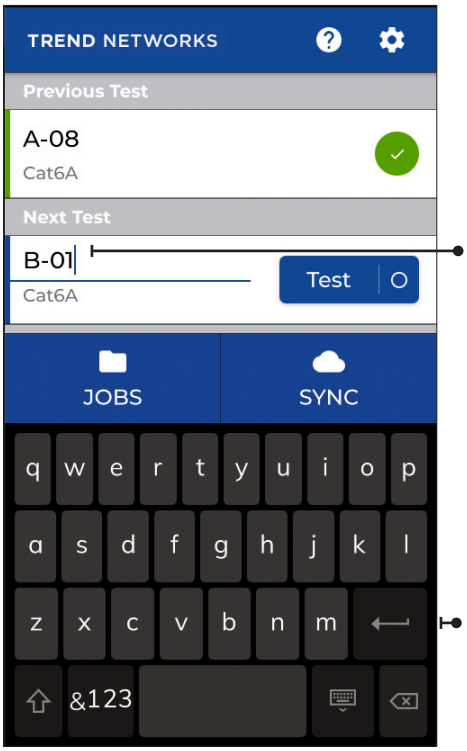


Test A-08 is saved and is now in the Previous Test section.

Next Test is incremented to A-09 and is ready for testing as indicated by the blue Test icon.

Edit Next Test

Change the Next Test name by touching the name and use the keyboard to enter the desired name.

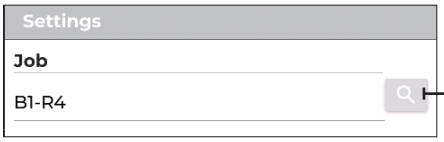


Type the desired name for the next test to perform and press the Enter key to accept.

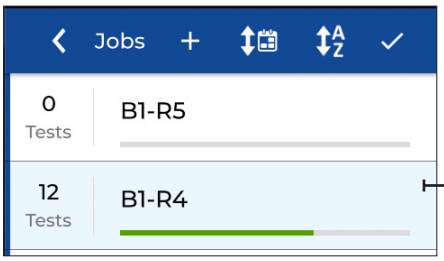
Press Enter when finished editing the test name.

Job Selection

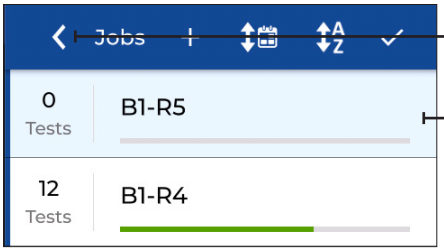
A new or existing Job can be selected for test storage.



Press the search icon to open the Jobs screen. to perform a test and save it as ID “A-08”.

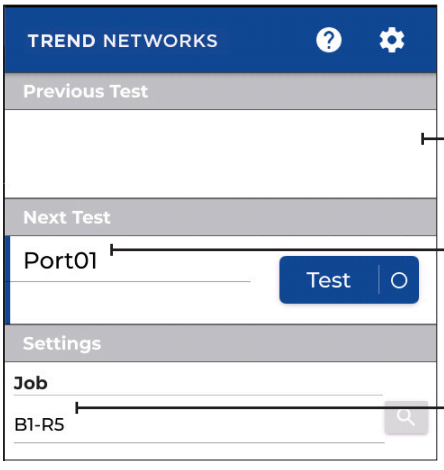


The currently selected Job is highlighted in blue.



Touch the back arrow when the desired job is selected.

Touch the name of an existing Job to make it active. The line will turn blue to indicate the selection

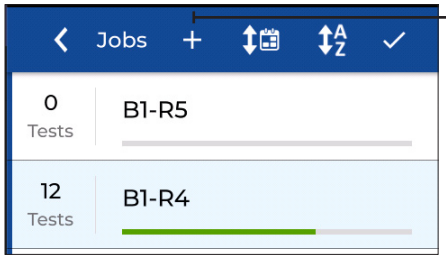


Previous Test is blank because there are no tests in the active Job.

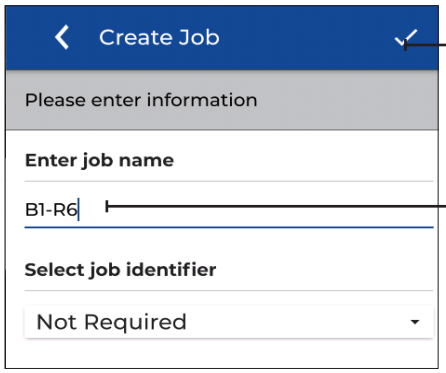
The default test name is Port01, touch the name to edit.

Job B1-R5 is now active.

Creating a new job

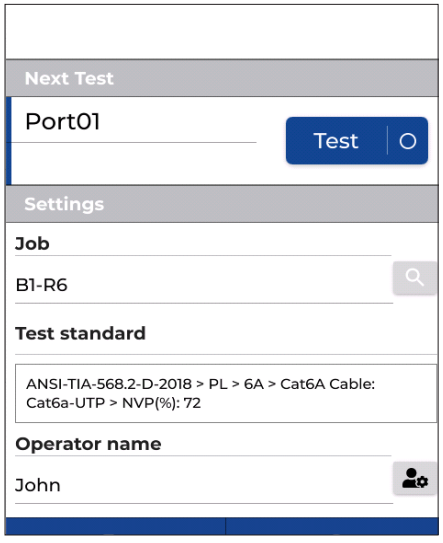


Press + to create a new job.



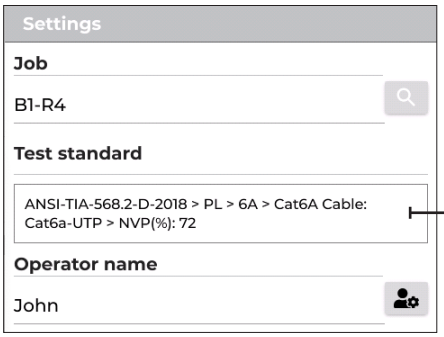
Press the tick when finished entering the new name.

Enter the name of the new job.

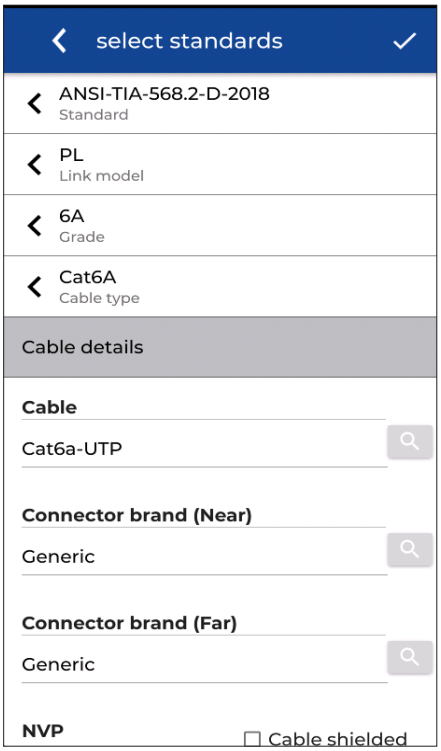


Selecting test standards

Test limits and cable type are changed by touching the Test Standards box.



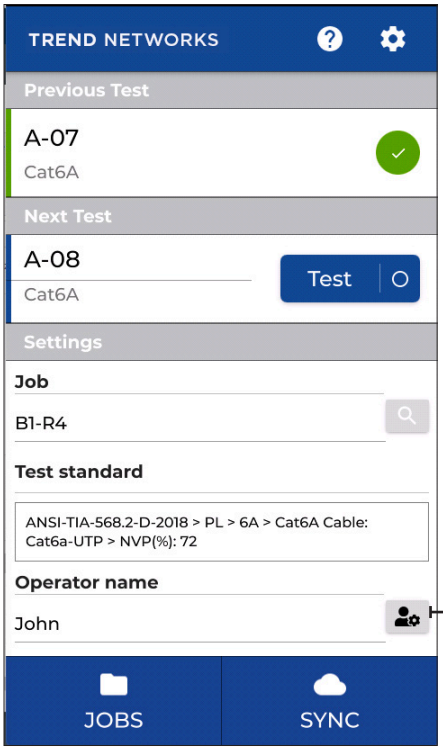
Touch the Test Standard box to open the settings.



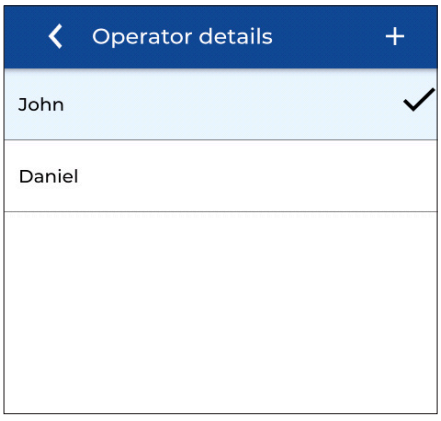
Select the required settings and press the tick when finished.

Selecting the Operator name

The operator name is can be selected from a list of previously entered names or a new name can be added to the list. The operator name is included with the test result and appears on printed certification reports.



Touch the operator icon to change the name of the current operator.



Choose a different operator name or press + to enter the name of a new operator.

Live wiremap

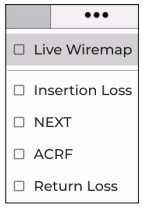
Live wiremap displays a real-time wiremap diagram without the need to run a full Autotest. This can be launched in two ways: as an optional display in the home screen test list, or directly from the pull-down menu from any screen.

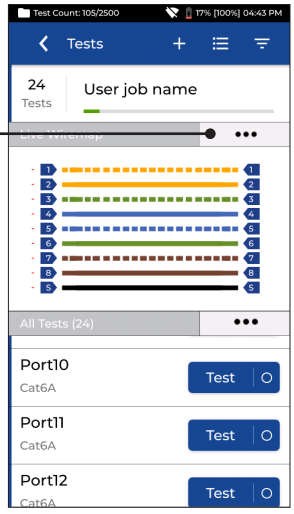
To activate Live wiremap directly: slide your finger down from the top edge of the screen to reveal the shortcut menu. Live wiremap is shown at the bottom half of the display.

To activate Live wiremap from the home screen tap options to open the selection menu.

Choose Live wiremap to enable the function.

Use the home screen options menu to deselect Live wiremap when desired.





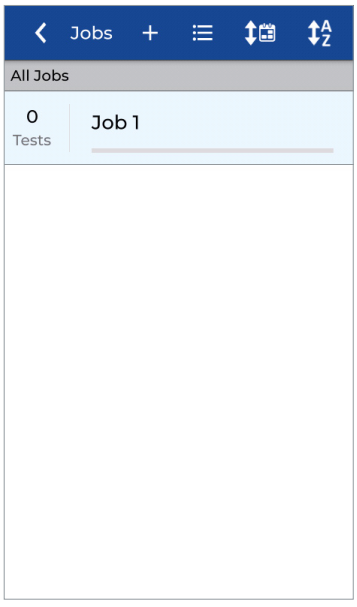
Creating test files

Note: most items in a list have secondary options that can be viewed by long-pressing the item, similar to the right-click function of a mouse.

The home screen shows the active job, the test that was previously run, and a list of remaining scheduled tests in the job.
A job named “Job 1” is the default job in a new LanTEK IV.

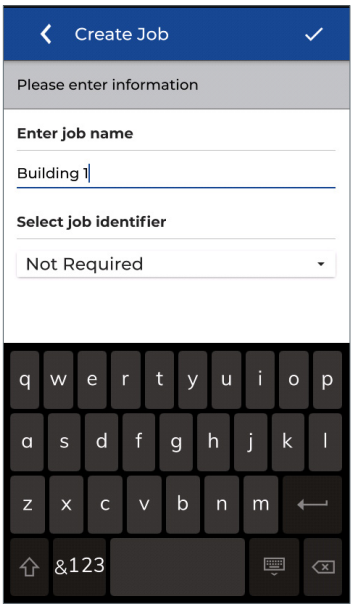
The operating workflow consists of creating a job for a customer, project, building, etc...
Then test files with unique ID’s are added to jobs with the performance standard to be tested.
This system allows quick testing of numerous tests with minimal configuration.

Press JOBS to open the list of available job folders.

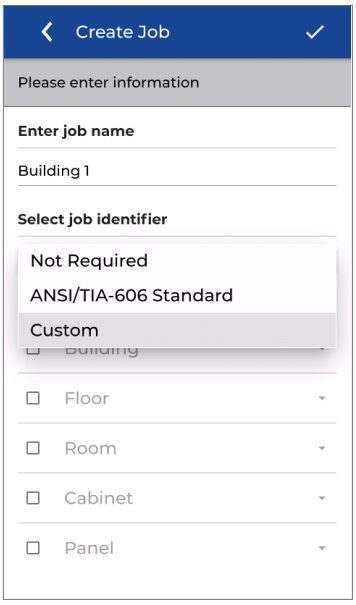


Press the + button to create a new job.

Creating test files



Enter the name of the new job using the touch keyboard; In this example, the name is "Building 1".
Confirm with the check mark at the top-right of the screen.

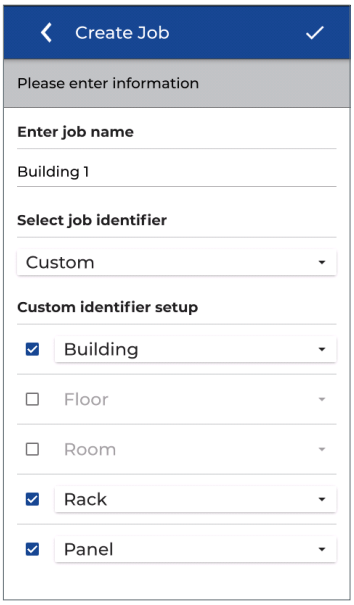


Optional test identifiers (building, floor, room, rack, panel, etc.) can be added to each test ID to provide more details.

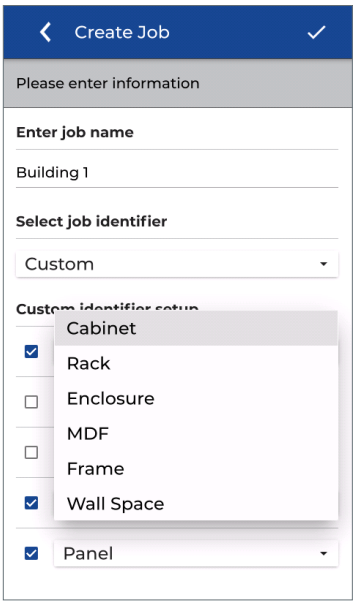
ANSI/TIA-606 mode follows the naming convention defined by the TIA-606 standard.

The Custom mode allows identifiers that describe the location of the cable under test.

Creating test files



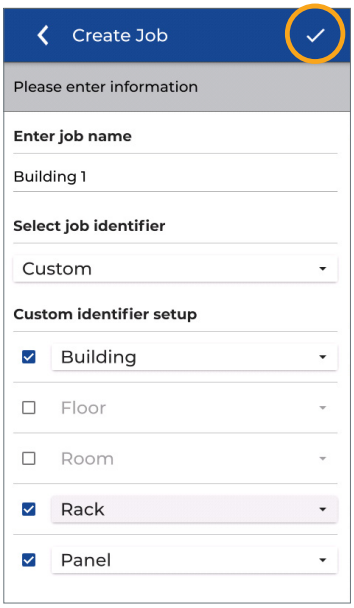
Add a tick mark next to the desired identifier categories.



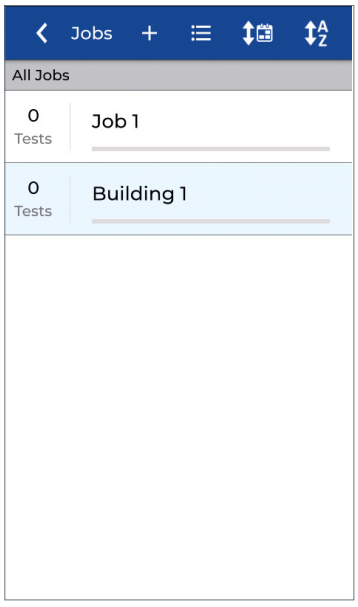
Several predefined options exist for each element of the identifiers

Tap the drop-down menu next to each ID to choose an identifier.

Creating test files



Press the check mark to save the configuration.



The list is updated with the new job called “Building 1”.

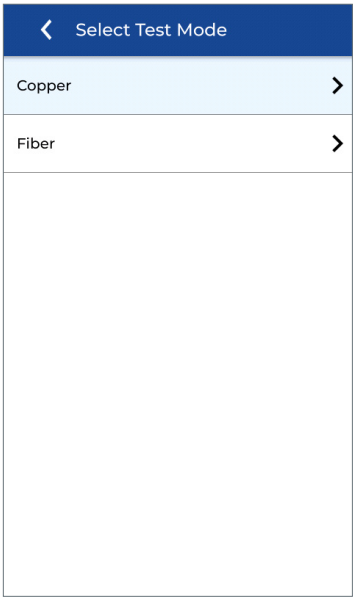
The next step is to open the job folder and prepare it by adding tests.

Press the name of the desired folder to open it.

Creating test files

The Building 1 folder is open - tests can now be added, deleted, or edited.

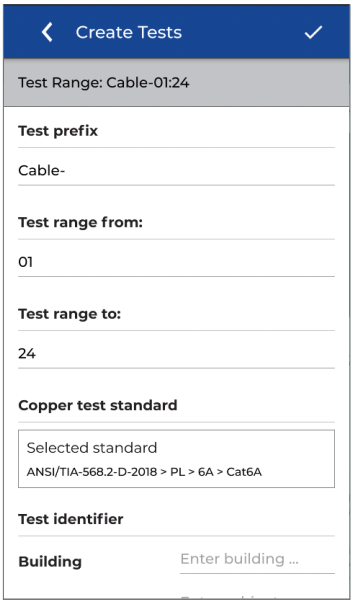
Press + to add new test files.



The first step is to select a type of measurement: Copper or Fiber optic.

Press Copper to continue.

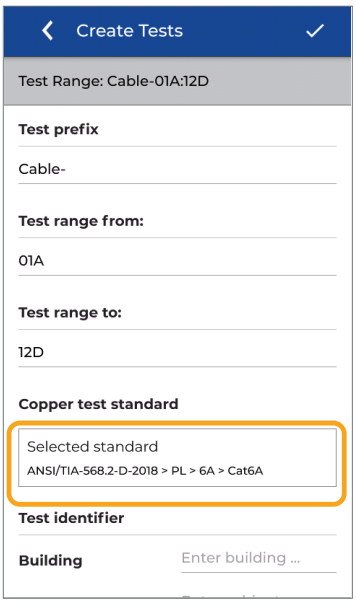
Creating test files



Test IDs consist of a prefix (fixed name - for example “Cable”) and a range of numbers (example “1 to 48”)
The prefix is the same for all future names created. Alphanumeric and special characters are allowed; while the "/" and "\" characters are not allowed. A space or dash after the name can be added as a separator, example “Cable-01”

The start and end range define the start and end limits of the counter. The numbers will be automatically incremented; in the previous example this will create Cable-01 to Cable-24.

This range is alphanumeric and no special characters are allowed. The number of characters in the start and end fields must be the same.

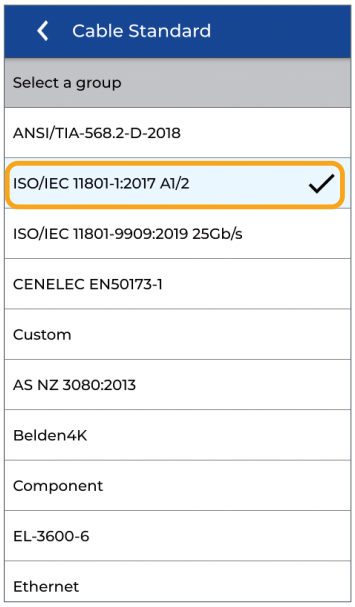


In another example, the range is from 01A to 12D. Test names will be created as follows:
Cable-01A
Cable-01B
Cable-01C
Cable-01D
Cable-02A
Cable-02B
...
Cable-12D

Automatic incrementing supports almost all combinations of numbers and letters.

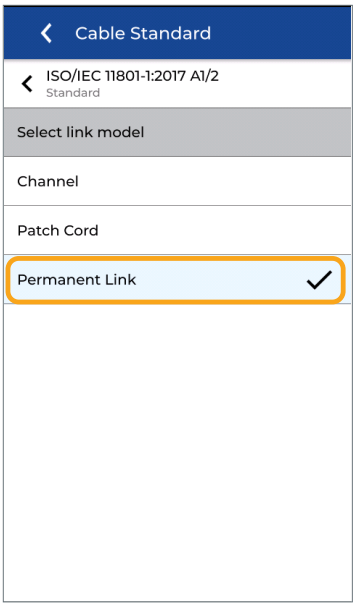
Press the “Test standard” box to continue the configuration.

Creating test files



Choose the desired test standard family.

In this example select:
ISO/IEC 11801-1: 2017 A1/2



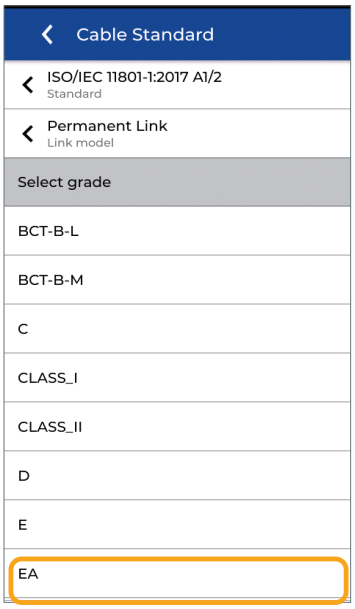
Select the certification method.

Permanent link is the most common and certifies from patch panel to work area outlet. Cable terminated with female connectors at both ends.

In Channel certification, two patch cords (equipment room and work area) are added. This is more complete since it also takes into account the quality of the cords in addition to the horizontal link.

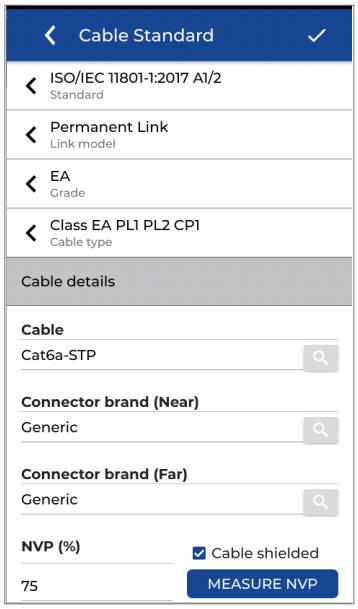
Channel adapters are required and the patch cords used for certification must remain in place after each test.

Creating test files



Choose the performance class for certification.

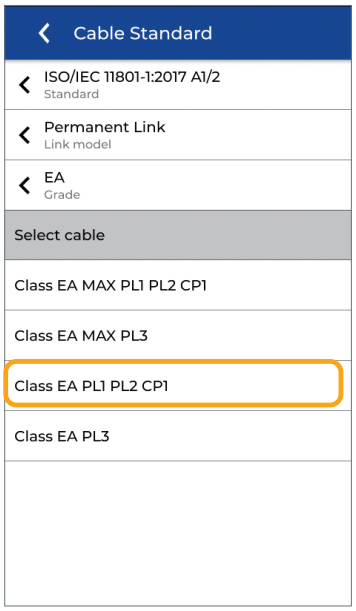
In this ISO example, Class EA certifies cabling up to 500 MHz for Ethernet applications up to 10 Gigabit.



In ISO / IEC there are different sub-families of link models within the EA Class.

- PL1 PL2 CP1 is a typical Permanent female / female link
- PL3 is a Permanent link with the addition consolidation point connection.

Creating test files

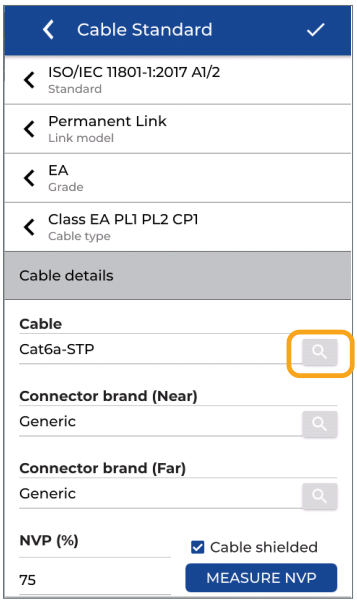


The MAX limit options test the same links with additional optional measurements carried out: TCL, ELTCTL, and DC resistance unbalance (DCRU).

LanTEK IVs always measure these parameters up to 500MHz and the results are displayed as informative with an “i” indicator instead of PASS/FAIL.

If the MAX test is selected then these measurements are marked PASS/FAIL according to the limits defined by the selected test standard.

Select Class EA PL1 PL2 CP1.

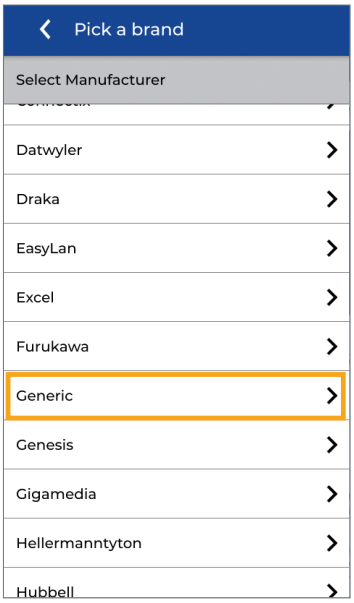


The Cable Type selection is intended to provide more detail on the nature of the components installed: the cable category, shield type, NVP and optionally the brand and model. The brand of the connectors may be defined if desired.

The options chosen here do not affect the test limits or performance measurements, the only exception being the length measurement.

Press the cable search icon to choose from the list of manufacturers of on-board cabling systems.

Creating test files



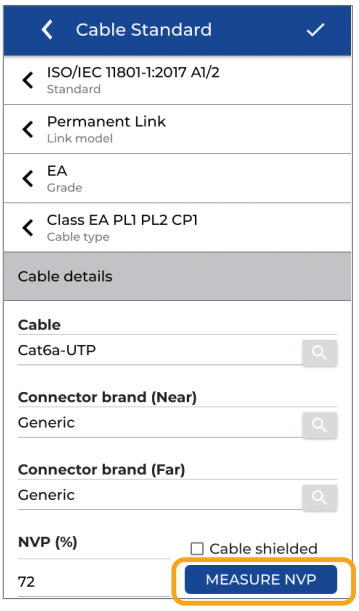
A specific brand and model can then be selected - or choose “Generic” if a specific brand is not desired.

The name of the selected cable will appear on the certification report.

Choosing a brand and model automatically sets the NVP (nominal velocity of propagation) as defined by the manufacturer.

NVP is important for correctly measuring the length of a link; it only affects this measurement and no others.

When the “Generic” is selected, the NVP can be manually entered or calculated using a cable link of known length.

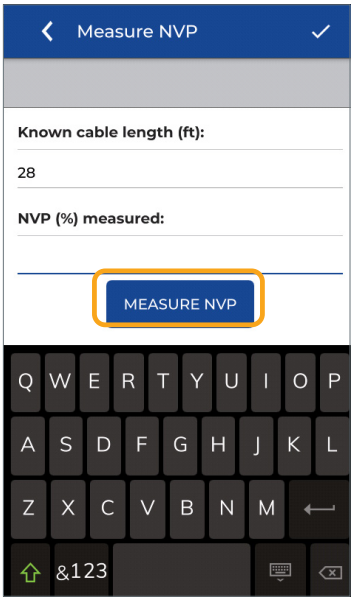


The connector brand is optional and will appear on the report. A list of brands is available by pressing the search icon.

In this example, a “Generic” cable is selected and the NVP will be determined by measuring a known length of cable.

Press “Measure NVP” to begin the measurement process.

Creating test files



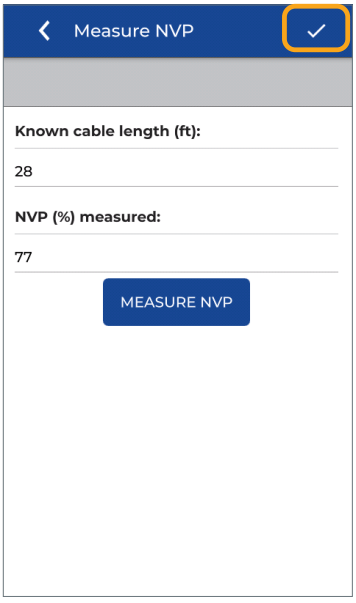
Connect a link of 20 meters / 65 feet minimum between the two LanTEK IV handsets.

Enter the length of the link including any test cords.

In this test, the link is 24 meters plus the 2 permanent link adapters of 2 meters each, for a total of 28 meters.

Enter 28 into the length field. Note, the units are set to meters or feet depending on the units set in the tester preferences.

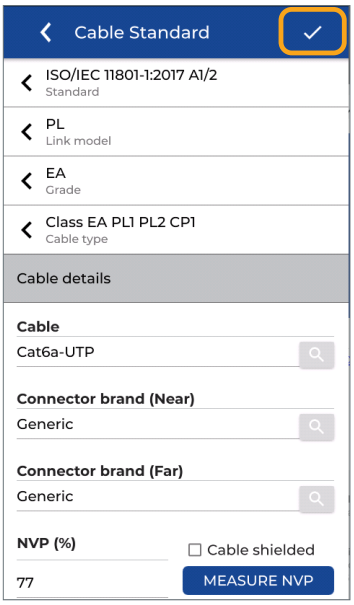
Press the blue “Measure NVP” button to continue.



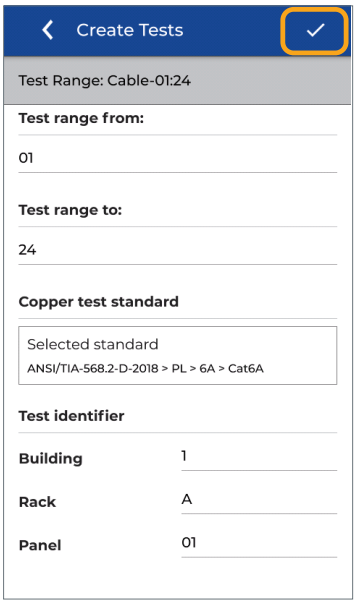
The calculated NVP will be displayed, here it is 77%.

Press the check mark to confirm and continue.

Creating test files



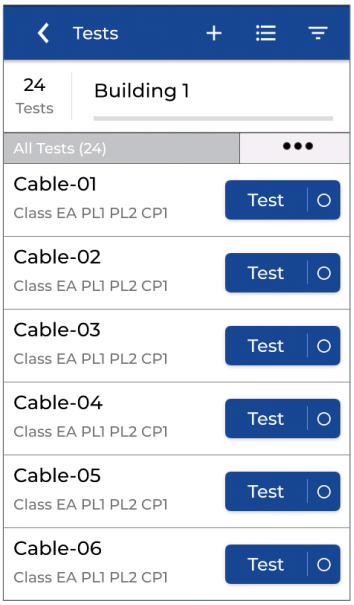
Review the configuration parameters and press the check mark to continue.



If all parameters are correct, press the check mark to confirm and create the list of tests.

Press the home button to return to the home screen.

Creating test files

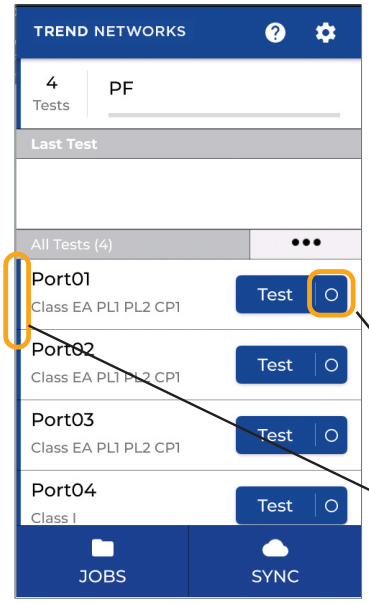


Here, the home screen with the new job and test ID's is shown.

The "Test" icon will turn blue when the main and remote handsets are connected to a link. If the icon remains gray it means that there is a problem: remote off, testers not connected to the same link or the link is broken.

The LanTEK IV handsets are able to communicate if at least two (2) wires in the cable have continuity. Even when the two wires are not of the same pair within the cable.

Presentation of tests

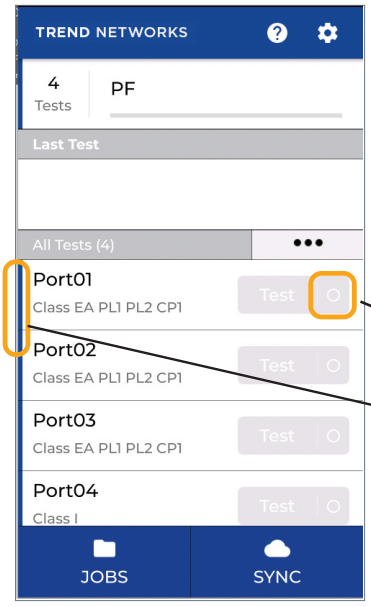


The colors of the test icon and the vertical bar to the left of the name indicate the status of each test in the folder.

In addition, the blue color of the Test icon and the circle symbol indicate that the two handsets are correctly connected and ready to test.

Circle: not tested

Blue bar = not tested

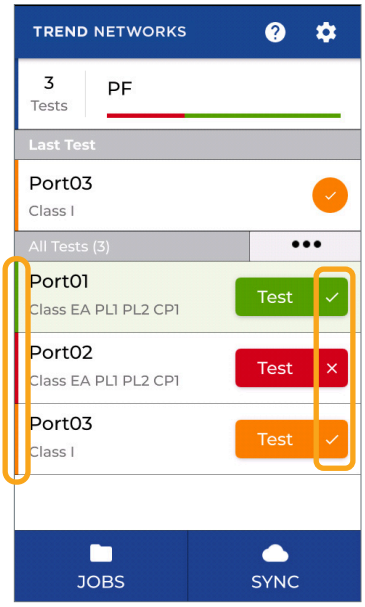


If the buttons are gray it means that the two handsets are not connected correctly and an Autotest cannot be started.

Gray button: handsets not connected
Circle: not tested

Blue bar = not tested

Presentation of tests



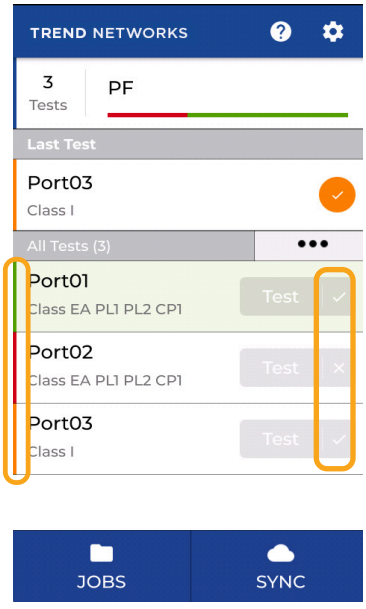
Colored test buttons:

Main and remote handsets are connected and ready to test

Green bar / green box = Pass

Red bar / red box = Fail

Orange bar / orange box: marginal Pass/Fail



Grey test buttons:

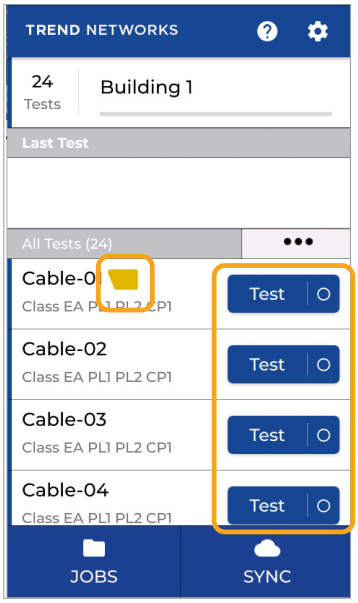
Main and remote handsets are not connected and an Autotest cannot be started

Green bar / green box = pass

Red bar / red box = failure

Orange bar / orange box: marginal Pass/Fail

Performing tests



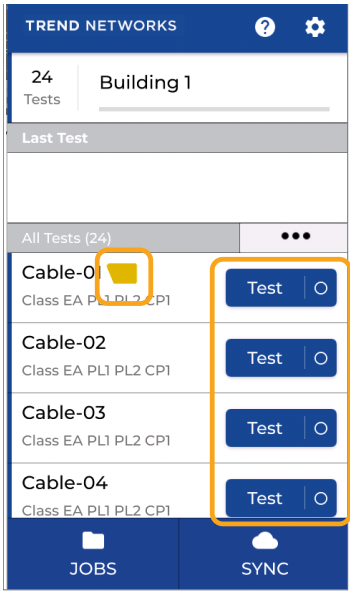
An Autotest can start only if the two handsets are correctly connected to the same link to be tested.

Ready to test indicators:

1. On-screen test buttons are blue
2. The Autotest icon is displayed

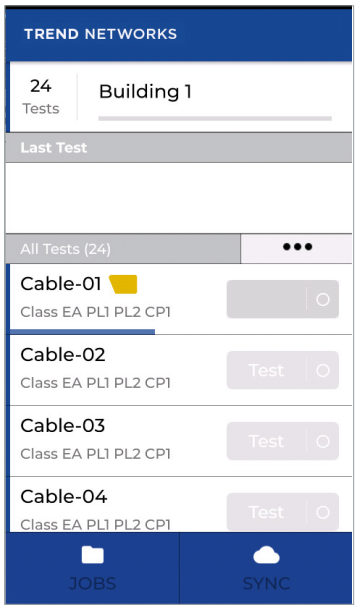
3. A musical melody is heard
4. The link symbol at the top of the handset lights up blue
5. VisiLINQ Permanent Link adapters light up blue

Performing tests



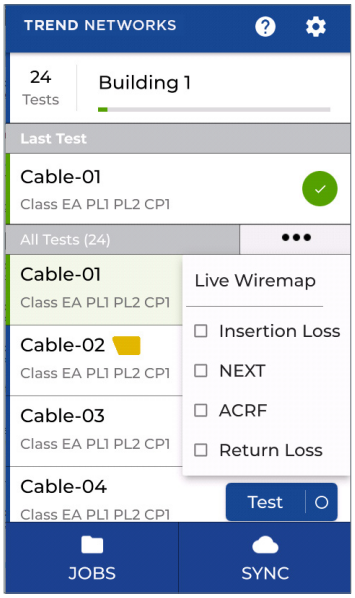
Options to perform an Autotest:

1. Press the Autotest key on each handset
2. Press the blue Test button on the screen
3. Press the black circular button on the end of the VisiLINQ adapter



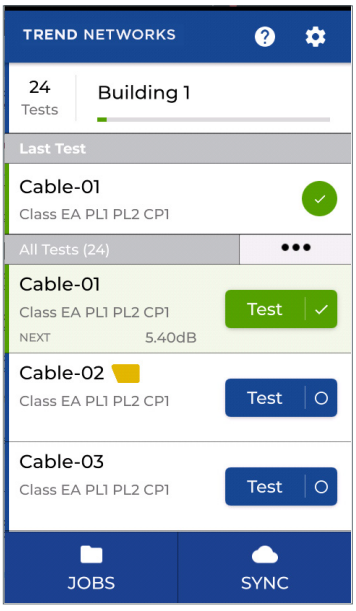
A blue progress bar is displayed while the test is running.

Display of test results



Information on the details and margins of the test measurements is available on the list of tests for completed Autotests.

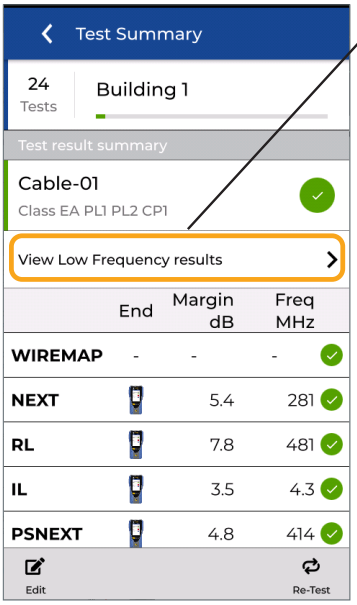
Press the ••• button to open the options on the Home screen. Select an option to display the desired measurement related to the test number.



When activated, the margin of the selected measurement will be displayed for each completed Autotest.

Press the name of the test to open the measurement results screen.

Display of test results



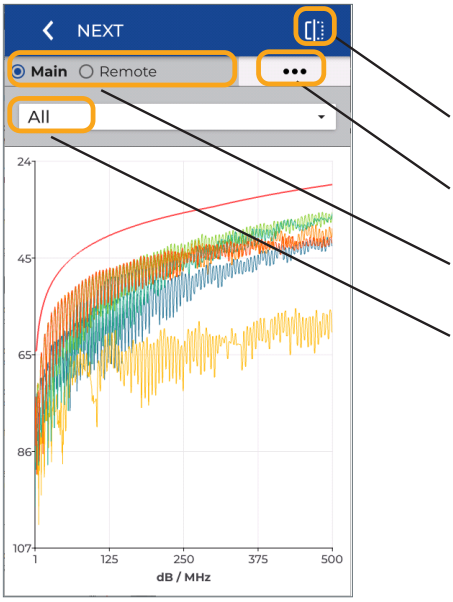
Press “View Low Frequency results” to display the measurements not present on the first page.

The measurements appear with the representation of the main or remote handset to indicate which side the link has the worst value or fault.

Scroll down to see the full list on the first page.

The wiremap is always at the top of the list because it is a common failure mode, unless there is a failed measurement.

You can re-run the test or edit it (to rename it for example) with the buttons at the bottom of the screen.



Tap a measurement from the summary screen to open the detailed view of the results.

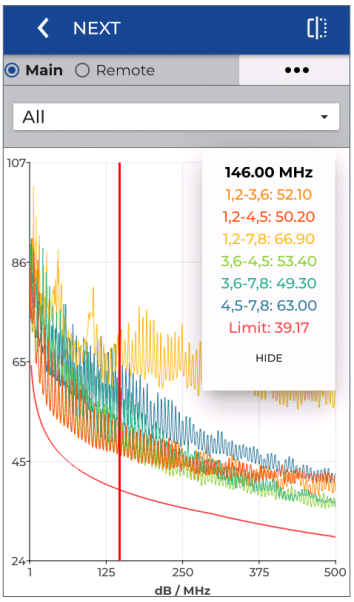
Switch between graphical or tabular view.

Graphic display options.

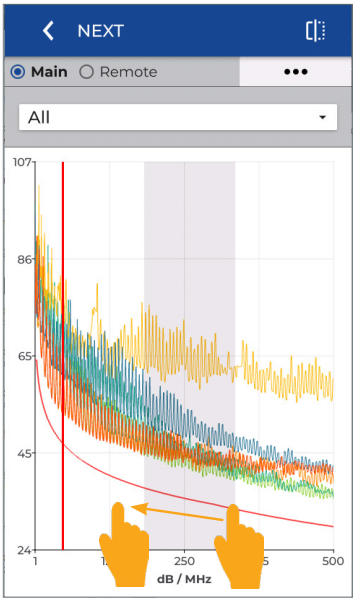
Switch between main and receiver handset view

Select the pairs to display on the plot.

Display of test results

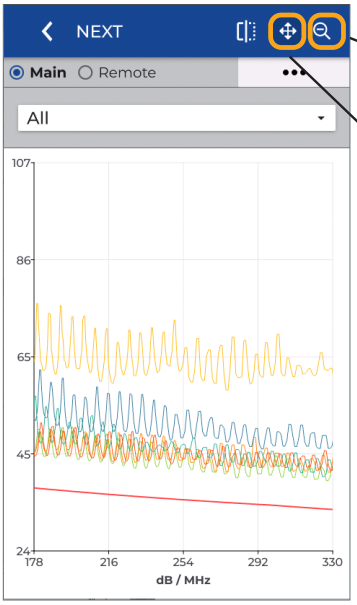


Tap any point on the plot to display the frequency, the measured value and the associated limit.



Slide your finger across a range to enlarge the view.

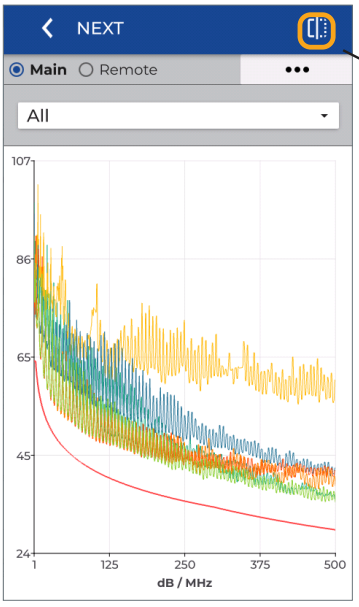
Display of test results



An enlarged view of the plot allows a detailed analysis.

Zoom out for normal view.

Switch between scroll and zoom functions. In scroll mode swiping the screen will slide the view of the graph while maintaining the current zoom level.

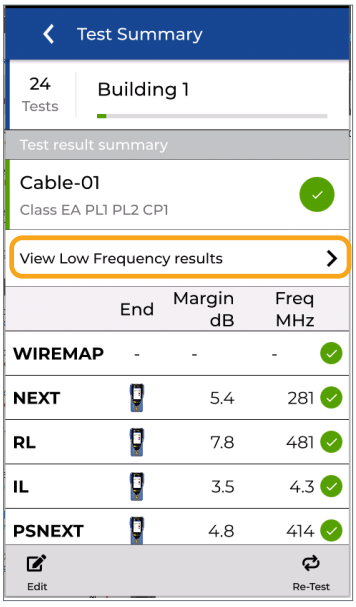


Switch to the tabular view of the data.

Display of test results

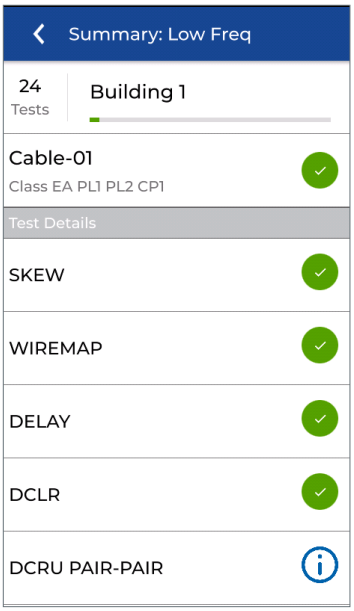
The tabular view of the measurements displays the lowest margin, and the frequency point where the measured value is closest to the test limit.

Press return to return to the test summary screen.



Press View Low Frequency results results to display the second page with low frequency/DC measurements.

Display of test results



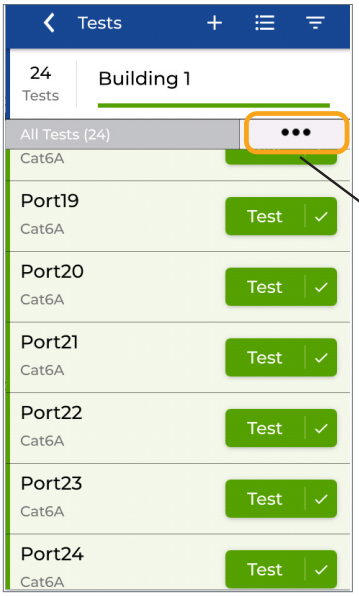
Presentation of the measurements on the second page.

The "i" symbol indicates that this measurement is either optional or meets certain criteria where a pass / fail result is not required.

Test list options

The list of tests can be customized to display the margin values for several key metrics, which provides additional information at a glance.

The filter function modifies the test IDs that appear to streamline operations on large projects.

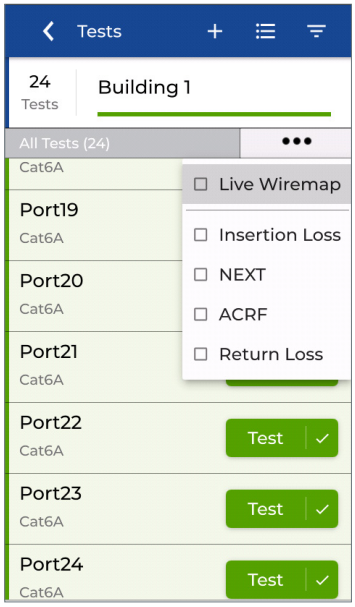


Open a job to view the list of tests.

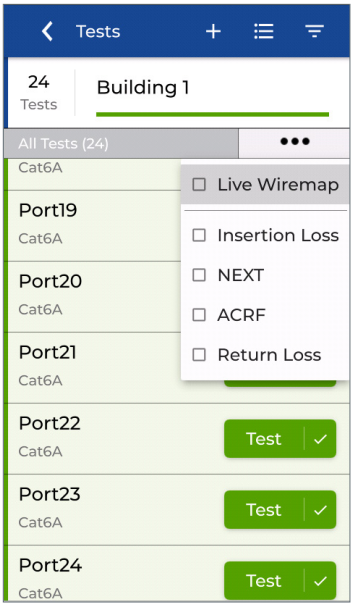
By default the test standard used is displayed under each identifier - and all the tests in the job are listed one below the other.

Press the Options button to change the information displayed on the second line of each test.

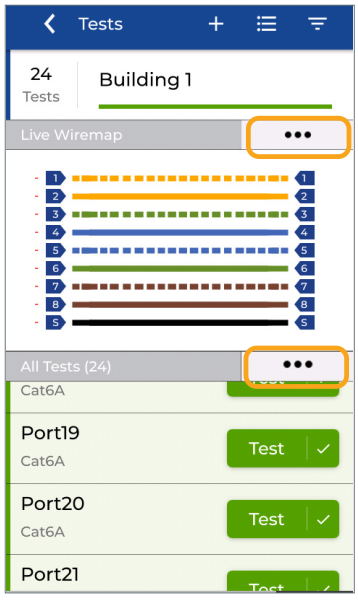
Select the desired measurement to display in the list of tests.



Live wiremap



Select Live wiremap to display a real-time measurement of cable continuity.

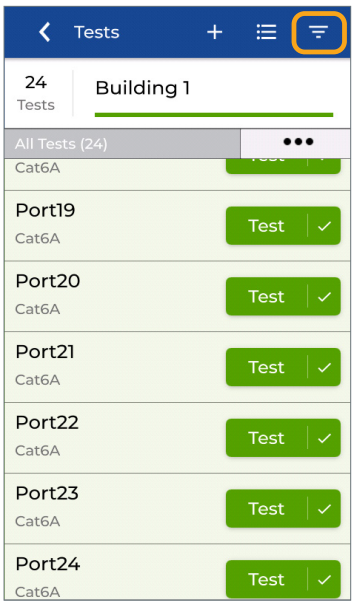


Live wiremap allows a check of continuity before performing the Autotest.

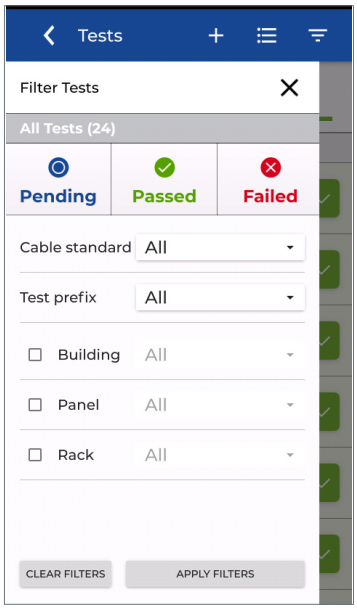
With Live wiremap active the upper options button changes the wiremap color code display.

The lower options button deactivates the Wiring Diagram or modifies the value displayed on the second line of the name of each test.

Filtering display of test results



Press the filter button to display only the desired tests in the current folder.



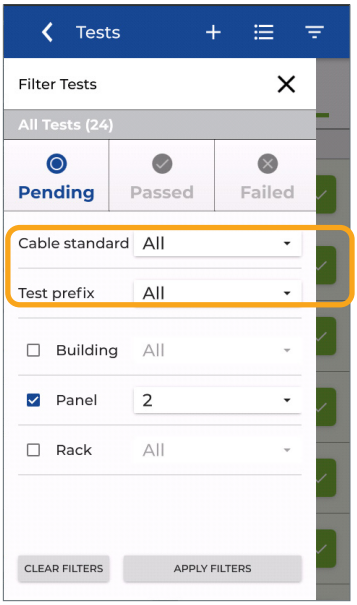
It is possible with the three buttons at the top of the screen to filter the tests that you want to display: Untested, Passed, or Failed results.

The tests in the folder will be filtered if the corresponding status box is colored. If you press one of the buttons the icon turns gray and hides test results matching that status.

For example, pressing Passed changes the button from green to gray, which means that passed tests will be hidden, while failed and unmeasured tests will be displayed when the filter is applied.

Press Apply Filters to confirm the choices - or Clear Filters to deactivate filtering and display all tests.

Filtering display of test results

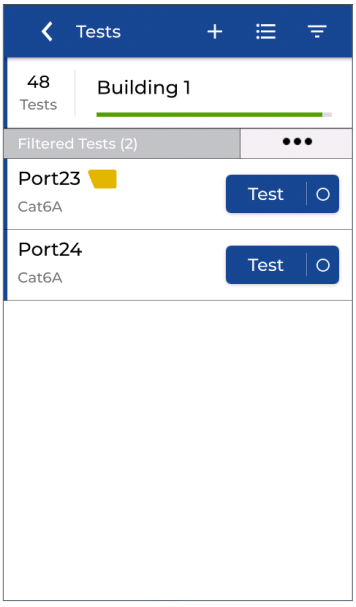


The other filter tools allow sorting according to the test standard, and/or the prefix of the test name, and/or the test identifiers as desired.

Multiple filters can be selected to narrow the tests displayed in the home screen.

In this example Panel 02 is selected and only the test ID's for Panel 02 will be displayed.

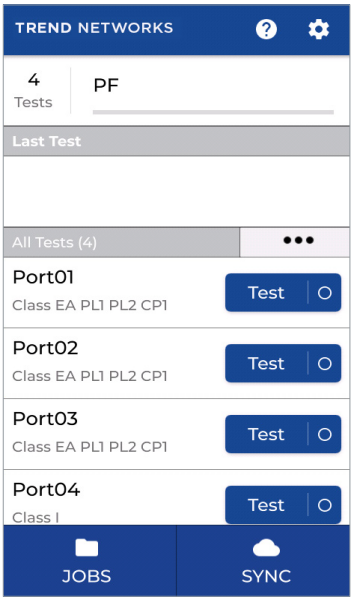
Press Apply Filters to confirm the selection.



The list of sorted tests dedicated only to Panel 02 will be presented.

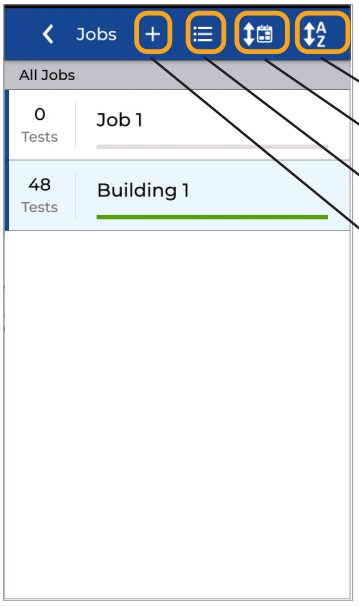
Return to the Filter screen and tap Clear Filters to remove them and view all tests again.

Jobs management and synchronization



Manage Jobs

Press JOBS to view the list jobs.



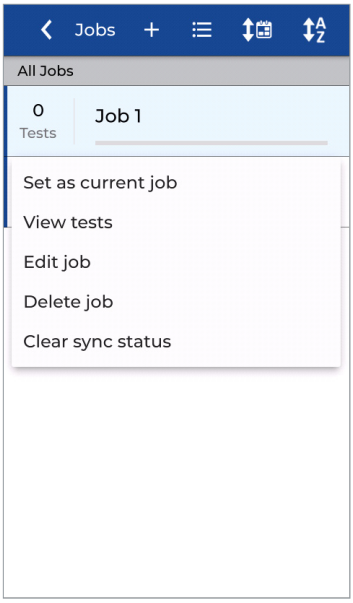
Sort the list of jobs alphabetically.

Sort jobs by creation date.

Select multiple jobs.

Create a new job.

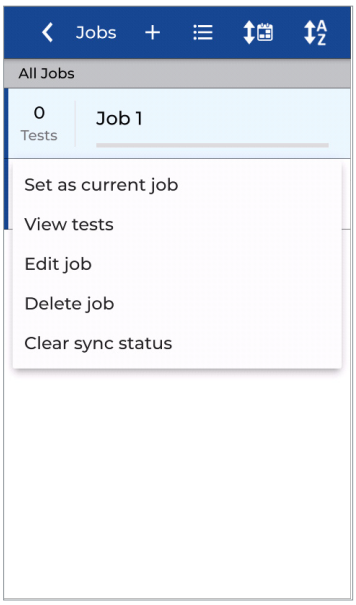
Job management and synchronization



Long-press a job to open the options menu.

The active job cannot be deleted. To delete the active job, first long-press the name of a different job to open the options menu.
Press Set as current job to make it the active job.
Then long-press the job to be deleted. The options menu including the option to delete the folder and all test results is now available.

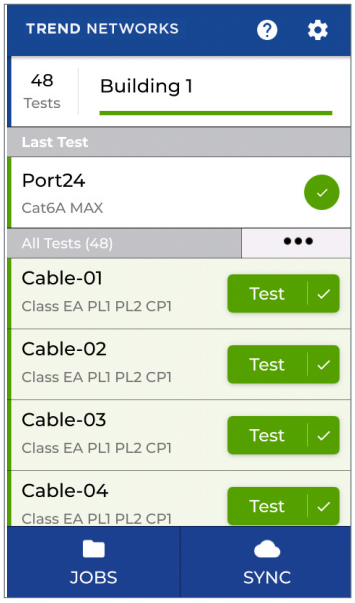
Please note that job deletion is permanent and cannot be canceled, all included tests will be lost.



When a folder has been synced to the cloud or to a USB drive, it cannot be synced again without clearing the sync status.

Tap Clear sync status in the folders options to allow the folder to sync again. This may be necessary when a folder has been synchronized with the cloud and another copy is desired on a USB stick.

Job management and synchronization

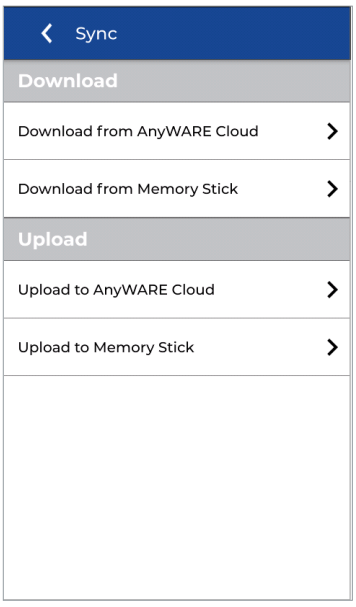


File synchronization

Folders can be synchronized between LanTEK IV and AnyWARE Cloud or Desktop software using Wi-Fi or a USB memory stick.

Once a folder has been synchronized, only the new tests will be synchronized unless the “Clear sync status” button is pressed to reset the job.

Press SYNC to open the import & export synchronization options screen.

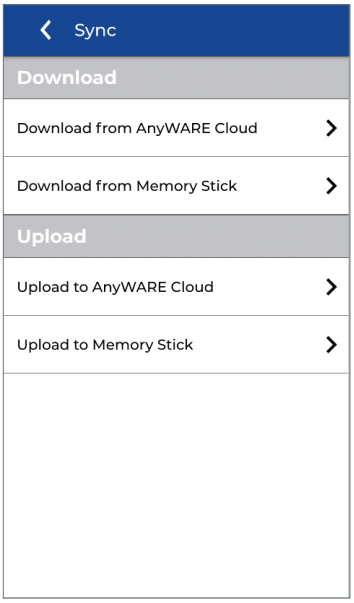


Import transfers files and tests to be done from AnyWARE Cloud or Desktop to LanTEK IV for pre-configured tests in advance.

Importing from AnyWARE Cloud checks the associated Cloud account and allows you to import all untested files or to select specific jobs to import.

Import from USB allows you to import folders created on AnyWARE Desktop and exported to USB.

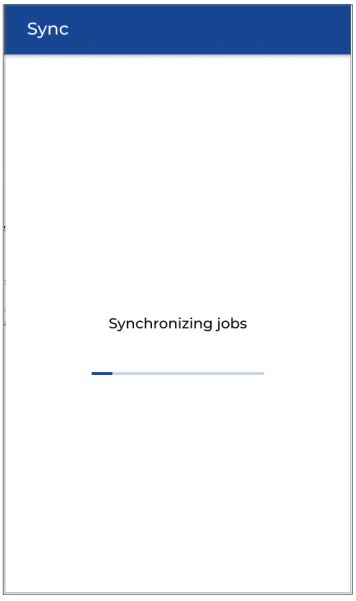
Folder management and synchronization



Export files containing completed tests to AnyWARE Cloud or AnyWARE Desktop.

Export to AnyWARE Cloud is only available with active Wi-Fi. Selecting this option will synchronize all folders and tests not previously synchronized with the Cloud account associated to the LanTEK IV.

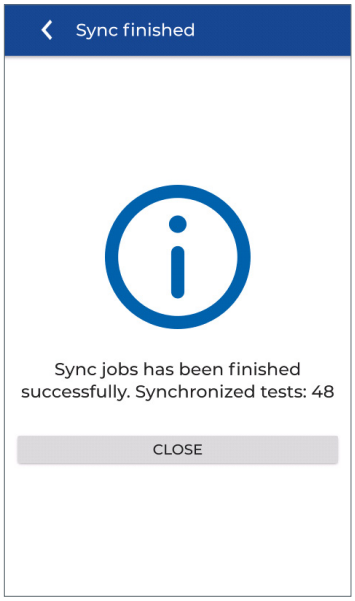
Press “Upload to AnyWARE Cloud” to synchronize all tests to the Cloud software.



Wi-Fi will turn on automatically if it is turned off when Upload to AnyWARE Cloud is selected.

The progress indicator will move from left to right to indicate the progress of synchronization.

Folder management and synchronization



Synchronization complete with the number of tests transferred.

USB flash drive key requirements:
Supported format - FAT32
Supported size - up to 512GB

Storage capacity:
Cat 6A/Class EA tests - 4000 tests per GB of storage space
Cat 8/Class I/II tests - 2000 tests per GB of storage space

Technical specifications of cable certifiers

LanTEK IV-500: Ref. R163000 - 500MHz
LanTEK IV-3000: Ref. R163001 - 3000MHz

Batteries

- Removable, interchangeable, rechargeable Lithium-Ion, 7.4V, 6.6Ah, 48.8Wh.
- Charge time - 8 hours in handset, 4 hours using external charging port.
- Typical run time - 8 hours
- Mains operation - handsets can operate from mains power with or without battery installed.

Screen: IPS capacitive color touchscreen, 480x854 pixels, 5 '' (12.7mm)

Weight of a handset with battery: 1.1 kg

Dimensions: 25.4 x 12.7 x 5.3cm

Operating temperature: 0 to + 45 ° C, non-condensing

Storage temperature : -20 to + 70 ° C, non-condensing

Vibration / shock: MIL-PRF-28800 F, Class 3 (by design)

User interface: English, French, German, Spanish, Italian, Portuguese, Polish, Russian, Chinese, Japanese

Internal memory: non-volatile flash with a capacity of 2500 tests with plots and troubleshooting data

Interfaces

- 2.4/5 GHz Wi-Fi - 801.11 b/g/n
- USB C (USB 2.0) & USB A (USB 2.0)
- 3.5mm headset jack

Data export

- USB memory key, up to 512GB
- Cloud via Wi-Fi

Project management software, for import & export

- TREND AnyWARE Cloud: cloud version which requires an HTML 5 compatible browser on Windows, Mac, Linux, and mobile devices (Android/iOS)
- TREND AnyWARE Desktop: computer version requires - Microsoft Windows 10, 2 GB RAM, 500 MB of disk storage + 1GB of storage for approximately for 1500 category 6/Class E tests
- All measurement points are saved in the devices and then transferred to the software. Full analysis of plot data available in cloud and desktop versions of TREND AnyWARE
- Re-certification to different test standards available for limits up to 500 MHz (LanTEK IV 500) or 3000 MHz (LanTEK IV 3000)

Supported cabling/test limits

- ANSI/TIA: Cat. 3, 5e, 6, 6A and 8.1/8.2 (100Ω)
- ISO/IEC: Class C, D, E, EA, F, FA, I/II (100Ω)
- Fiber optic via optional FiberTEK IV modules: multimode from OM1 to OM5 and single mode OS1-OS2

Supported test connectors

- RJ45 Permanent Link: TIA Cat. 6A / ISO Class EA up to 500 MHz (LanTEK IV 500)
- RJ45 Permanent Link: TIA Cat. 8.1 / ISO Class I up to 2000 MHz (LanTEK IV 3000)
- Field replaceable heads on RJ45 permanent link adapters, recommended replacement interval every 2000 insertions
- RJ45 Channel: TIA Cat. 6A / ISO Class EA up to 500 MHz (LanTEK IV 500)
- RJ45 Channel: TIA Cat. 8.1 / ISO Class I up to 2000 MHz (LanTEK IV 3000)
- TIA Cat 8.2/ISO Class FA/ Class II: TERA, GG45, EC7 universal adapters for permanent link and channel measurements
- Optional FiberTEK fiber adapters: interchangeable SC, ST and SC included, LC optional

Measurement time

- Certification for Class EA / Cat 6A up to 500 MHz with plots, DC resistance unbalance, TCL/ELTCTL, time domain NEXT/Return Loss: 7 seconds
- Certification for Class I/II, Cat 8 up to 3000 MHz with plots, DC resistance unbalance, TCL/ELTCTL, time domain NEXT/Return Loss: 25 seconds

Measurement details

- ETL verified to meet ANSI / TIA-1152-A Level 2G, IEC 61935-1 Level VI for 500 MHz and 3000 MHz models

User selectable optional measurements

- TCL, ELTCTL, resistance unbalance
- Time Domain NEXT - to locate distance to crosstalk events
- Time Domain Return Loss - to locate distance to impedance mismatch events
- Optional measurements do not increase test time

Measuring ranges

- Wiring diagram with distance to faults: resolution 10cm
- Length measurement: from 0 to 600m - display resolution: 0.1m
- Resistance measurement range: 0.02 to 200 Ω - display resolution: 0.1 Ω
- Propagation delay measurement range: 1ns to 1s - display resolution: 1ns
- RF measurement details: ISO / IEC 61935-1 Ed 5, ANSI / TIA-1152-A - display resolution: 0.1dB

Standard warranty

- 12 months for handsets and accessories
- 6 months for batteries
- Optional Sapphire Care Plan service contracts for extended warranties and calibration for 1, 2, and 3 year terms

Compliance

- IEC 61010-1: 2010 Ed 3 - Safety requirements for electrical equipment for measurement, control and laboratory use
- EN61326-1: 2013 - Electrical equipment for measurement, control and laboratory use. EMC requirements.
- EN55011: 2009 + A2: 2010 - Industrial, scientific and medical equipment. Radio frequency disturbance characteristics.
- ENGl000-4-2: 2009 - Electrostatic Discharge Immunity Test
- EN61000-4-3: 2006 + A2: 2010 - Radiated, radio-frequency, electromagnetic field immunity test
- EN61000-4-4: 2004 + Al: 2010 - Electrical Fast Transient / Burst Immunity Test
- ENGl000-4-5: 2006 - Surge Immunity Test
- EN61000-4-6: 2009 - Immunity to conducted disturbances, induced by radio-frequency fields
- EN61000-4-11: 2004 - Voltage dips, short interruptions and voltage variations immunity tests

- Devices: CE, C-Tick, FCC Part 15, Class A
- Batteries: DOT 49 CFR 173.185, UN Part IV - section 38.3

Notes:

FIBERMASTER

OPTICAL TIME DOMAIN REFLECTOMETER, POWER METER AND LIGHT SOURCE MANUAL

TREND NETWORKS

Depend On Us

Contents

Chapter 1 Using This Manual

This manual contains operation information for the TREND Networks, FiberMASTER Optical Time Domain Reflectometer. This includes the standard Dual and Quad wave OTDRs. For most situations the difference between these OTDRs are the available wavelengths.

The touchscreen is a resistive style screen and only proper stylus devices should be used while operating this product.

Precautions

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

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

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

Warning

A warning alerts to situations that could cause personal injury.

Caution

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

Note

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

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

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

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

Warning

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

Warning

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

Warning

To Prevent Fire or Shock Hazard:

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

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

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

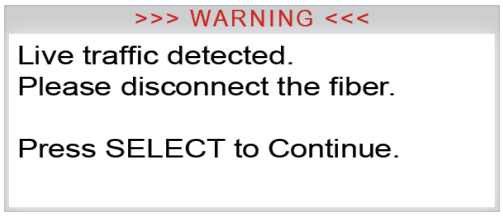
Caution

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

Caution

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

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



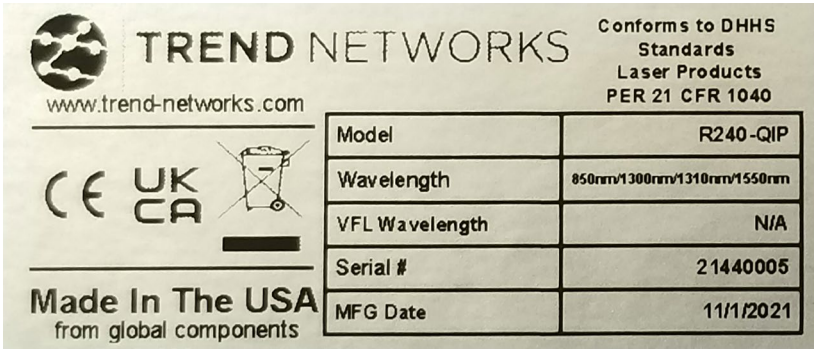
Chapter 2 Inspection

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

The shipping carton contains the following:

1. OTDR with Protective boot
2. Hard carry case with shoulder strap
3. USB 5 Volt charger and cable
4. 2 x Stylus
5. Quick Reference Guide
6. SC OTDR adapter
7. LC, SC ST, FC, 1.25 universal and 2.5 universal Power Meter adapters

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



Chapter 3 Physical Description

3.1 OTDR Handset and Ports

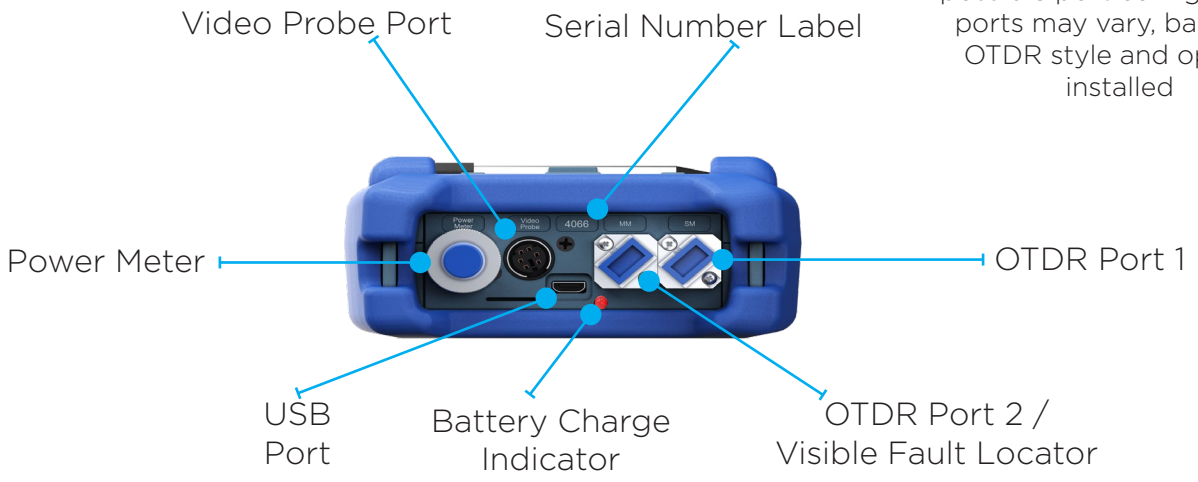
Instrument Enclosure

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

Front View

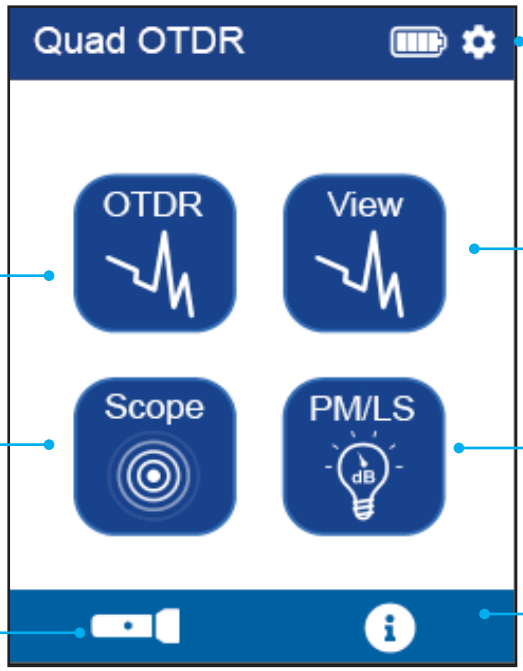
Top View

NOTE
This is an example of a possible port configuration, ports may vary, based on OTDR style and options installed



Chapter 4 Main Screen

This unit is equipped with a 3.5 in (8.9 cm) color TFT resistive touch display.



Settings
Set language, date and time

View Last Trace
Opens the last run trace for viewing and analysis

Power Meter/Light Source
Opens the power meter and light source controls

Version and Model Information
Touch this icon to display the installed options, port configuration, model number and version number for the unit

OTDR
Configure the OTDR settings and run a test

Scope
Open the video scope interface

VFL (VisualFault Locator)
(not shown on Quad OTDR, PON OTDR, and Quad light source models)

Chapter 5 Power Requirements

5.1 Battery

The FiberMASTER OTDR is equipped with a 3.7 V, 8000 mAh Li-polyer battery.

The FiberMASTER OTDR is supplied with a 100-240V USB power adapter with 5VDC, 2.1A output. A fully charged Li-poly battery will typically enable approximately 10 hrs. of use and require approximately 4 hours of recharging.

Warning

To Prevent Fire or Shock Hazard:

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

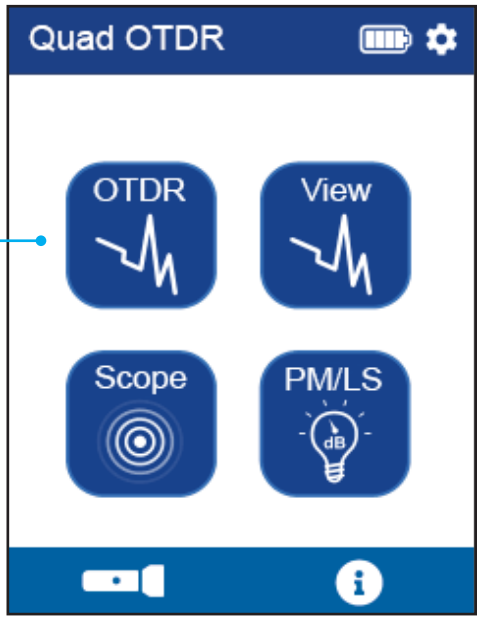
Failure to follow these caution statements could cause unsafe conditions for the operator and equipment and may void the warranty.

Chapter 6 OTDR Operation

6.1 Entering OTDR Function

Press the power button the to turn on the FiberMASTER OTDR.

Touch the OTDR icon to enter the OTDR function.



6.2 OTDR Setup

The OTDR menu is divided into three sections.

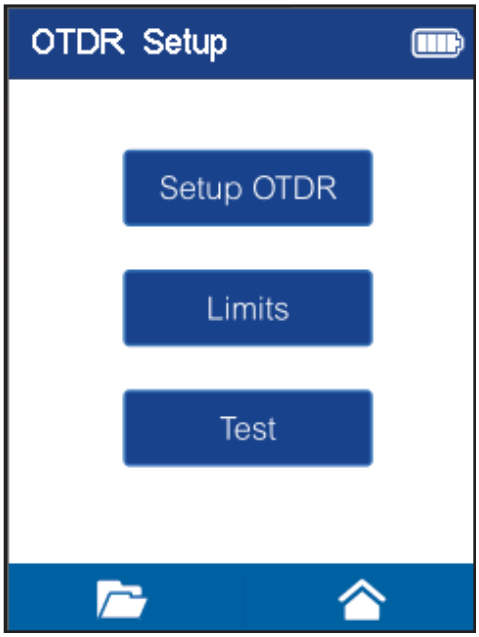
Setup OTDR
Configures the parameters used to acquire a trace. Affects what the trace will look like and what events are detected.

Limits
Sets the pass/fail criteria for the test. Settings include cabling standards, application standards and manually configured limits.

Test
Starts the test after confirming the acquisition and limit settings.

Project Manager (Folder icon)
Manage stored project folders and stored tests. Open/delete/edit projects and tests.

Home
Return to the main OTDR home screen.



Press Setup OTDR to configure the OTDR acquisition parameters.

Several pages are available. Press the < or > button to change pages and press ☑ to accept the configuration and return to the previous screen.

6.3 Launch / Tail Cable Selection

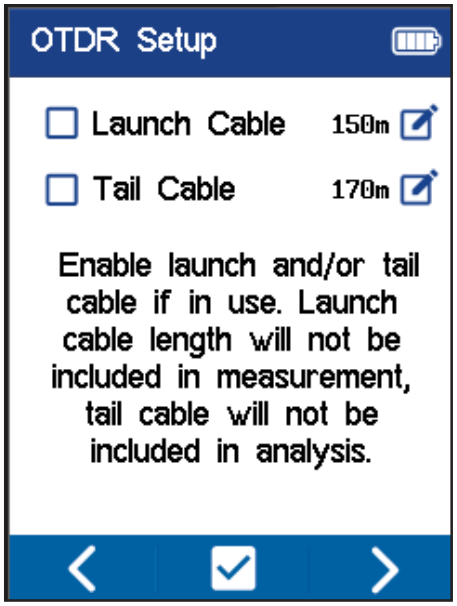
The first setup screen is the Launch/Tail cable selection. A launch and tail cable is necessary to measure the quality of the end connectors in the cabling system under test.

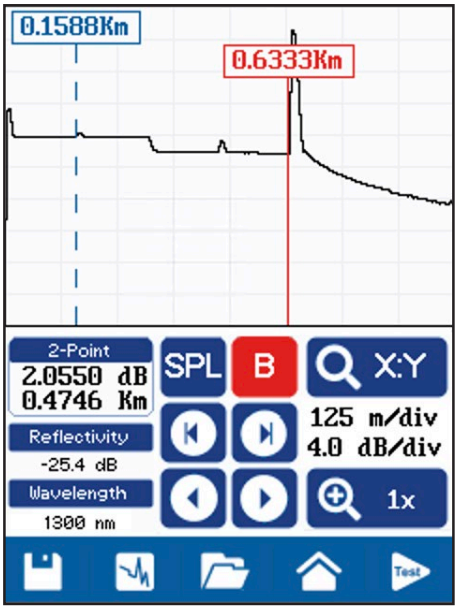
By pressing ☑ next to Launch Cable or Tail Cable, the OTDR will exclude the length of the Launch and/or Tail cables while including the connectors on either end.

Enter the length of the Launch/Tail cables using the edit buttons.

The software will use the entered length and search within +/-10% of the entered value for a connector.

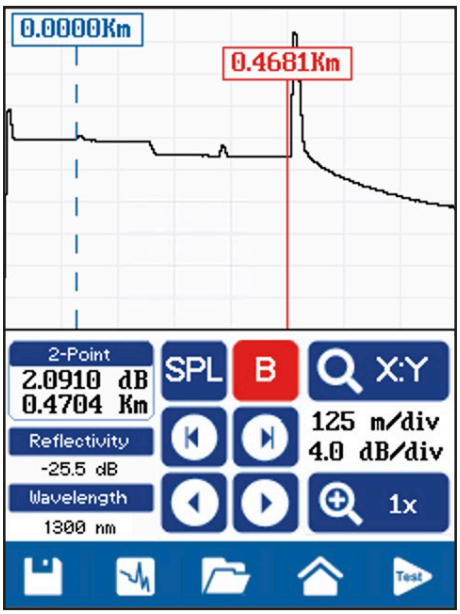
The first trace shown is with the launch cable setting disabled. Cursor A (blue) is at the first connector, and the distance of 158.8 meters is the distance from the front of the OTDR to the end of the launch cable.





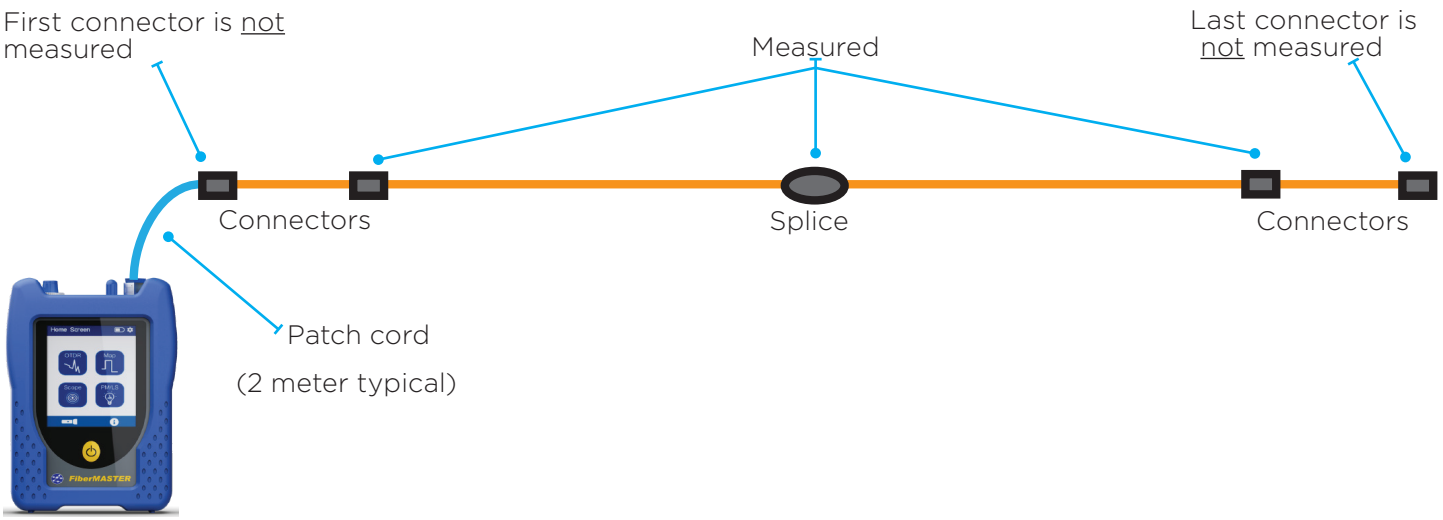
The second trace is with the launch cable setting enabled. Cursor A is in the same position, on the first connector at the end of the launch cable. Now the distance reads 0.0 meters because the OTDR is ignoring the length and loss of the launch cable.

With the launch cable setting enabled, the distance to events is measured from the end of the launch cable and not from the OTDR port. This eliminates the need to subtract the launch cable length when locating faults on the physical cable using distance measurements from the OTDR.

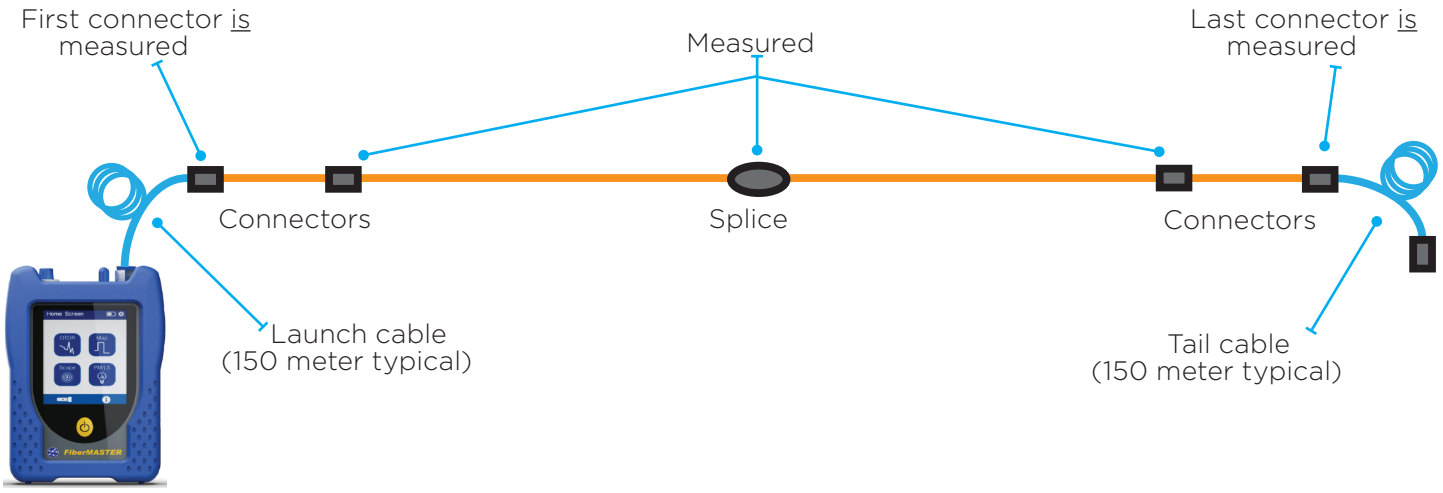


Measurement Without vs. With Launch and Tail Cables

Without Launch/Tail cables



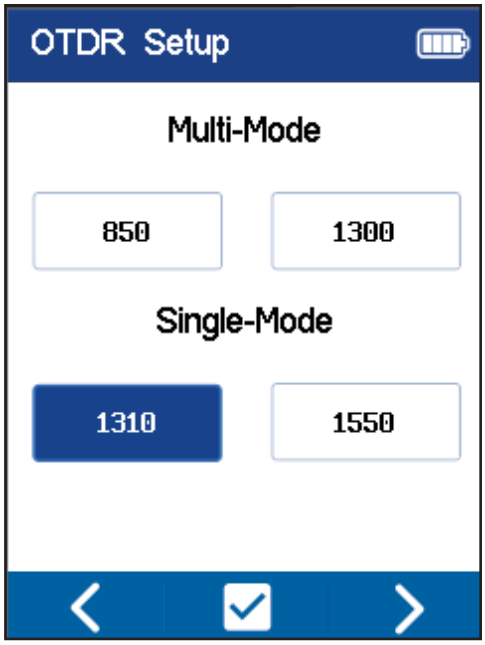
With Launch/Tail cables



The length of a launch cable should be 5-10x the pulse width setting of the OTDR. The table below shows the suggested launch cable lengths for a range of pulse widths.

Pulse Width	Suggested Length	Pulse Width	Suggested Length
5 ns/0.5 m	2.5-5 m	1 µs/100 m	500 - 1000 m
10 ns/1.0 m	5 - 10 m	3 µs/300 m	1500 - 3000 m
30 ns/3.0 m	15 - 30 m	10 µs/1 km	5000 - 10,000 m
100 ns/10 m	50 - 100 m	20 µs/2 km	10,000 m - 20,000 m
300 ns/30 m	150 - 300 m		

6.4 Wavelength Selection

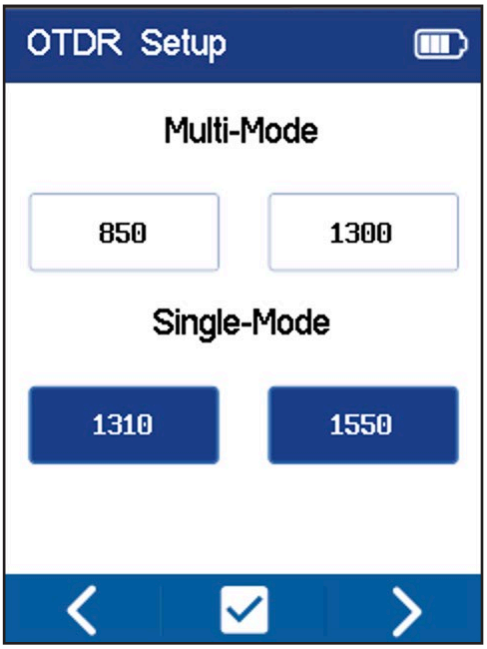


Touch the desired wavelength to test. Both wavelengths can be selected to perform a dual-wavelength test which can be helpful in locating macro bends in single mode cabling.

When using a quad wavelength OTDR only one mode (multi-mode or singlemode) can be selected at a time.

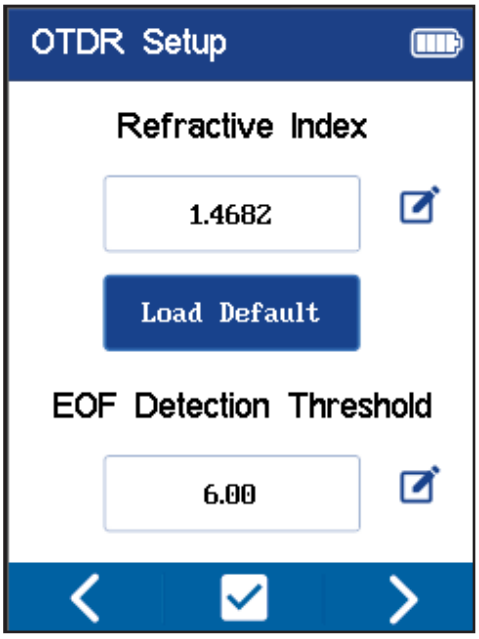
Multi-mode tests are conducted using the left side OTDR port.
Single mode tests are conducted using the right side OTDR port when looking at the tester from the front.

Both wavelengths selected for a dual-wavelength test.



Note:
If both 1310 and 1550 wavelengths are selected one of them must be de-selected before a multi-mode wavelength can be selected. The same applies if both 850 and 1300 are selected before the system can be changed to singlemode.

6.5 Refractive Index and End of Fiber (EOF) Threshold



The Refractive Index (RI) setting calibrates the OTDR so it measures the correct length of the fiber under test. The RI setting is a ratio of the speed of light in the fiber to the speed of light in a vacuum.

The correct RI can be found on the data sheet from the fiber cable manufacturer. If it is unknown, press the Load Default button to use a setting that is approximation of most typical fiber types.

EOF (End of Fiber) Detection Threshold

The End of Fiber detection is a setting that tells the OTDR at what loss should be considered the end of the cable. Any loss equal or greater than this setting will signal the end of cable. Typical values are 3-6 dB.

Setting the value too low may cause the OTDR to falsely trigger EOF on high loss splices or connectors, and not scan the fiber beyond those events.

Setting the value too high may cause the OTDR to not detect the EOF if the attenuation roll-off is too gradual and it does not detect a sharp end event.

6.6 Auto / Manual Mode Selection

Choose whether the OTDR should automatically choose the remaining acquisition parameters, or allow the user to configure the parameters manually.

Auto Mode

The OTDR will set the acquisition parameters using values that balance dynamic range and dead zone performance to provide a balanced trace image.

When Auto is selected the > button is locked out to block access to the manual settings.

Manual Mode

All of the acquisition parameters are available for adjustment. The following pages in the Setup screen are: Averaging Time, Event Sensitivity, Range, and Pulse Width.

6.7 Launch Control Warning

Launch Control Warning evaluates the reflection of the front end connector to determine whether any parameters exceed thresholds that may cause an erroneous OTDR acquisition.

Enabled: Provides a warning whenever any of these criteria are met,

- Saturated initial reflection detected - there is significant reflection from the connector attached to the OTDR. Most likely causes are a dirty connector, damaged connector, misaligned connector, APC-to-UPC (Angled Physical Contact to Ultra Physical Contact) connection.
- Low backscatter level detected - the level of reflected energy after the initial pulse is lower than expected. Most likely cause is the connector plugged into the OTDR is not fully inserted/secured, or the fiber is broken immediately in front of the OTDR connector.
- No launch detected - there is no reflected energy coming into the OTDR detector. This is likely caused by damage to the OTDR's internal optics which requires factory service.

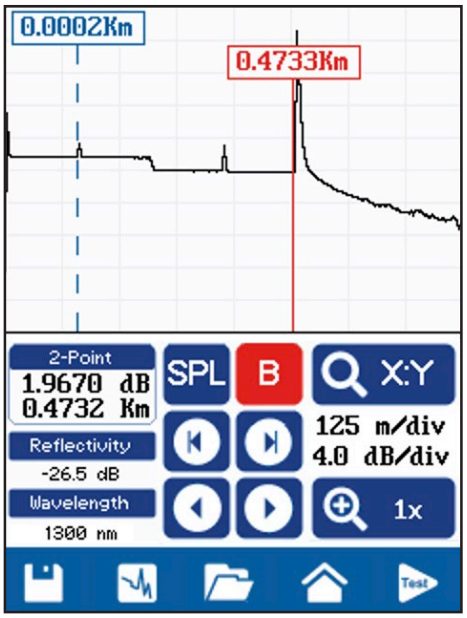
Launch control should be set to Enabled unless there are specific conditions which are causing a warning that do not otherwise impede testing.

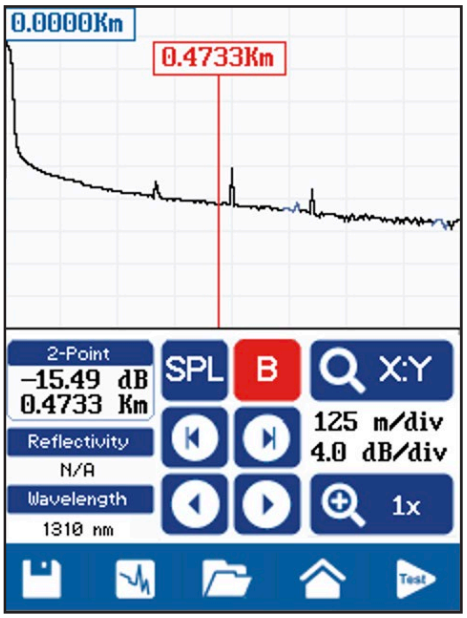
The first example trace is with the launch cable fully seated in the OTDR port. The trace is clean and all of the events are easily recognizable.

The second example trace has a saturated initial reflection. Note the height of the spike at the start of the trace followed by the slow fall-off compared to the first example. This is typical of a damaged connector or when an APC connector has been connected to a UPC port.

APC connectors can be identified by a green colored sleeve/shell and should never be mated to a non-green colored connector. The ferrule (tip) of an APC connector is angled at 8 degrees to reduce back-reflection. Mating APC to UPC connectors creates an air gap that causes a large reflection and loss between the connectors.

Beside a poor optical connection, the OTDR port can be permanently damaged if the incorrect type of connector is inserted into the port.



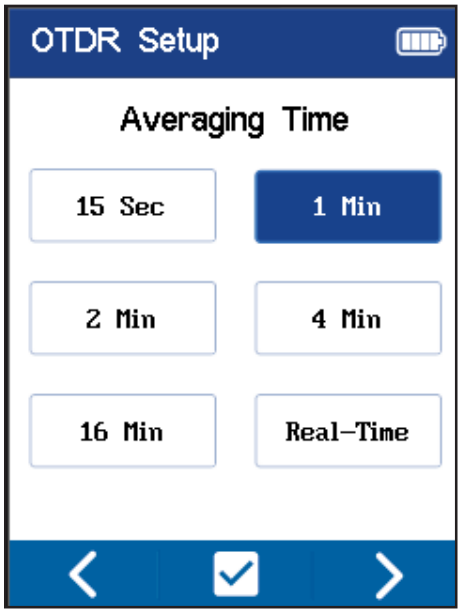


6.8 Averaging Time

Averaging time is the amount of time that the OTDR runs and captures data during the test. During the test, thousands of samples are taken and averaged together to reduce noise in the traces.

Reduced noise will make it easier for the OTDR to detect low loss events such as fusion splices that may be obscured by noise when the averaging time is too short.

Longer averaging times increase the dynamic range of the test by averaging the noise floor at the end of the fiber.

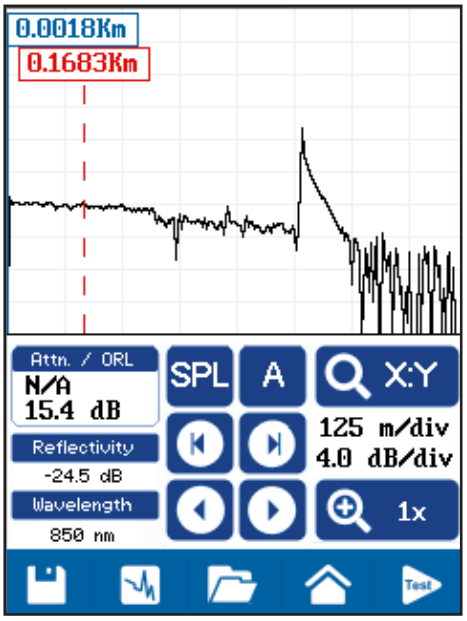


Short Averaging vs. Long Averaging Times

A comparison of averaging times reveals the how it affects the trace result.

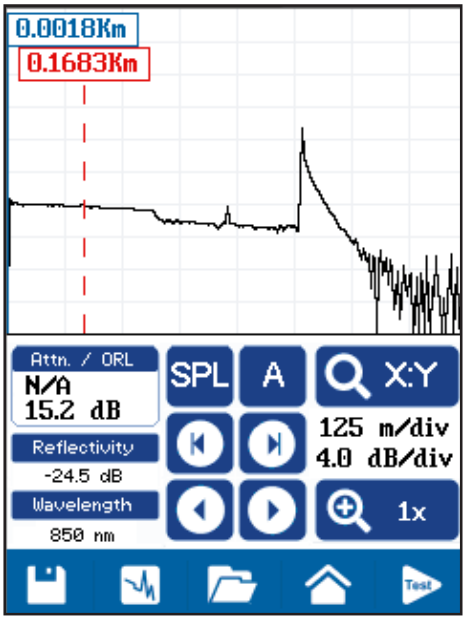
15 Second Average
The first trace was captured using a 15 second averaging time on a multi-mode cable that is 620 m/2000 ft in length.

Because of the high loss at 850 nm, the power returned to the OTDR quickly diminishes and the signal trace becomes noisy as the signal gets closer to the noise floor.



2 minute Average
The additional averaging time reduces noise in the trace and increases the dynamic range (difference between launch power and noise floor).

The fusion splice and connector are clearly visible and can be accurately measured. In the 15 second test the instrument will not be able to detect each event and measure the losses.



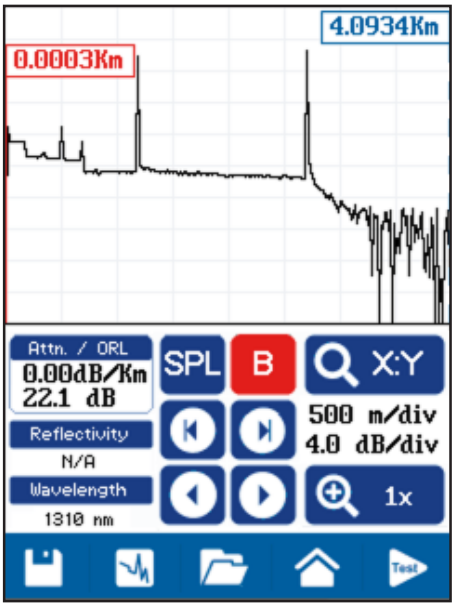
Real-time Testing
Real-time tersting can be selected for troubleshooting operations. In real-time mode the screen updates three times per second which allows the operator to detect intermittent problems or terminate mechanical splices. Real-time testing does not perform any averaging of the pulse samples and

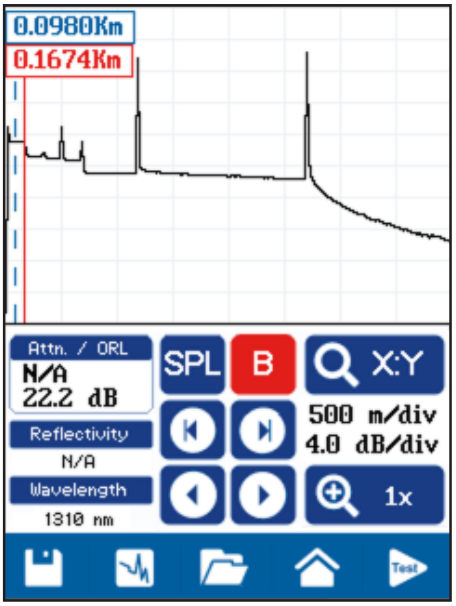
as a a result the noise floor will be very high. It is recommended that high pulse widths be used to compensate for the lack of overaging and the increased noise floor.

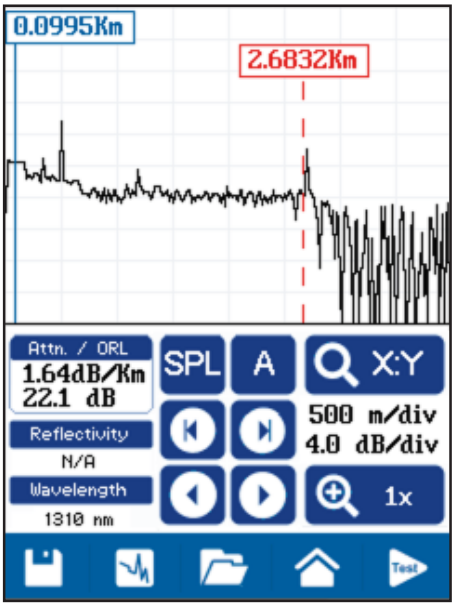
Low loss events such as high-quiality fusion splices are likely to not be visible in real-time mode, it it best used for detecting reflective events or high-loss fusion splices or splitters.

The first trace to the right shows a cable tested in real-time mode while the lower trace shows the same cable tested with a 2 minute average. Both are taken with 100 ns pulse widths.

The bottom trace is a real-time test of the same cable with a 30 ns pulse width. Here, there is not enough power to see anything but the distance to the most reflective events in the cable which may be fine for some troubleshooting applications but not for qualification of the instalation.







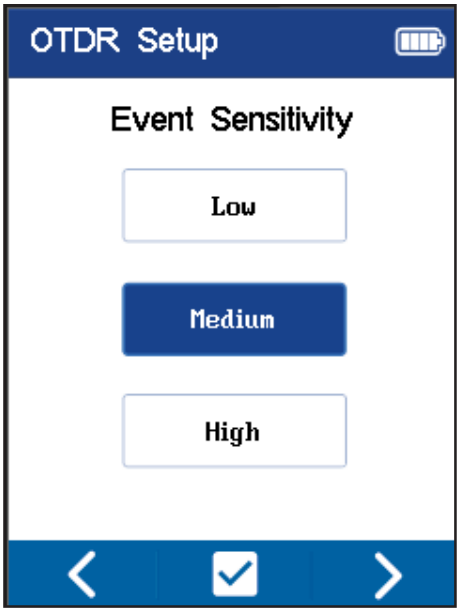
6.9 Event Sensitivity

Controls the noise filter in the OTDR firmware that minimizes false events from being detected.

Low = events must be very discernible from noise to be detected.

Medium = some amount of noise can be in the trace and the firmware will still identify them. This is the recommended setting.

High = The firmware will use minimal filtering and on a noisy trace there is a possibility that false events will be identified.



6.10 Range

Sets the distance of the X-axis scale and controls the distance the OTDR will stop evaluating returned reflections.

The range setting should generally be set to 2x the actual fiber length. If the length is unknown, test at a long range setting, then reduce the range to approximately 2x the fiber length.

The 2x length range setting is recommended to provide the best sampling resolution possible.

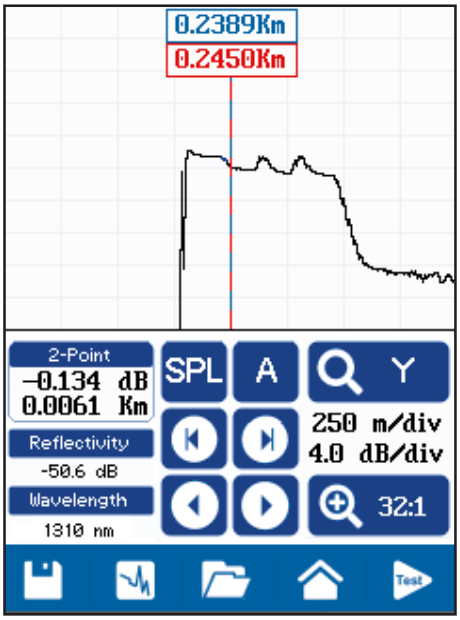
The OTDR has a maximum of 128,000 sample points, meaning the distance of the X-axis is divided into 128,000 points. By using a range scale that is 2x the fiber length, the cursor step size will be as small as possible and the OTDR will provide the best resolution of small events such as fusion splices.

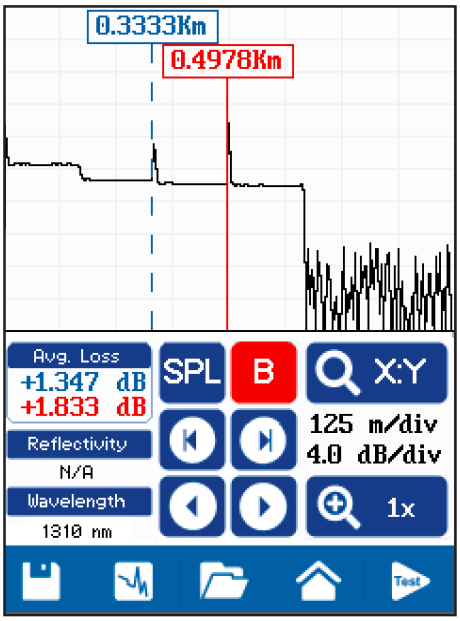
In these examples the same 470 m long fiber was tested with the range set to 64 km and 1 km.

The first trace is the 64 km setting. The A & B cursors are as close to together as possible and the step distance is about 61 m.

The second trace is the 1 km setting. Here the A & B cursor step distance is less than 1 m.

Also notice the improved sharpness of the 1 km trace with the finer resolution.





6.11 Pulse Width

Pulse Width (PW) setting adjusts the amount of power the OTDR sends into the fiber with each pulse. Rather than adjusting the brightness of the laser, power is controlled by the amount of time the laser fires for each pulse.

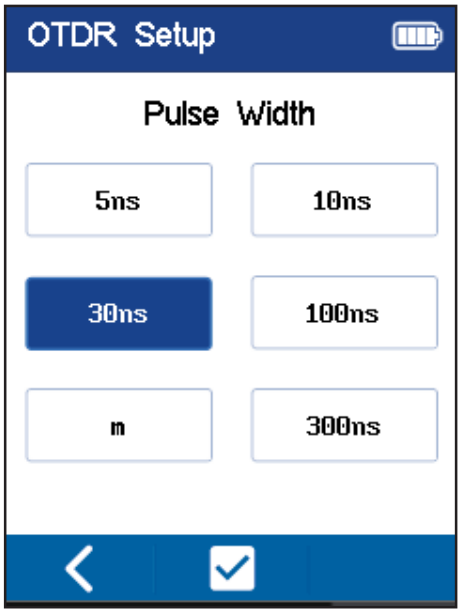
The higher the PW, the more energy is input into the fiber and the farther the OTDR can measure. The PW needs to be set high enough that the end of the fiber can be reached before the signal runs into the noise floor. Visually, the effect of increasing the PW raises the trace vertically, increasing the dynamic range of the system.

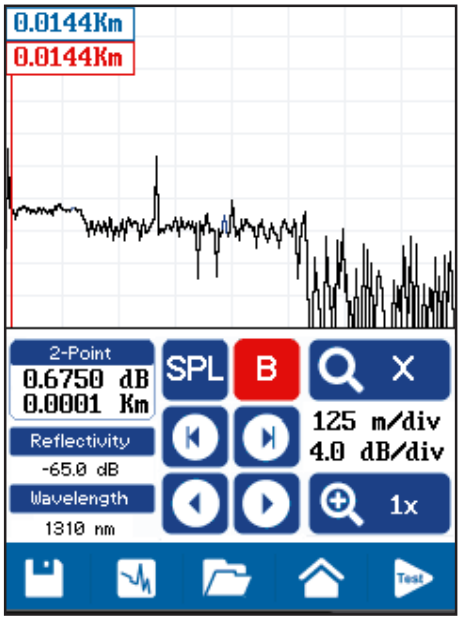
The downside to high PW settings is that the dead zone after a reflective event is increased. Meaning the OTDR is blind to connectors or other events for a greater distance than with a smaller PW setting.

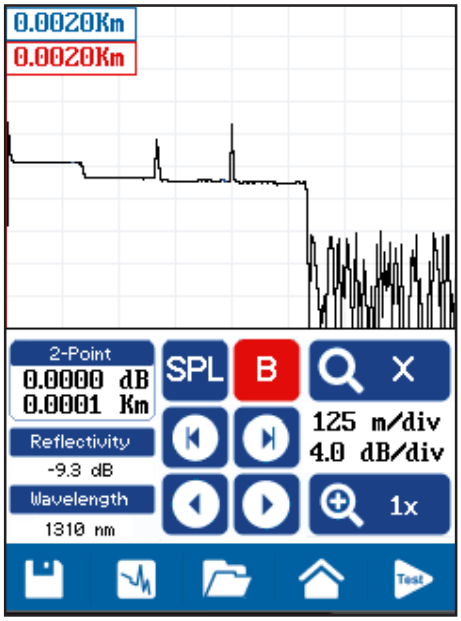
Generally the PW needs to be set high enough to reach the end of the fiber and provide a clean trace view.

There is a strong relationship between PW and averaging time. A short PW can result in a noisy trace, though the noise can be reduced with a longer test time and more averaging. The downside is that each test takes longer to run.

A long PW will provide clean traces with short test times, however dead zones will be increased which can be a problem with networks where connectors are in close proximity, an example being MPO breakout cassettes.







Pulse Width Examples

The two traces are taken with a 15 second averaging time. The first trace is a 5 ns pulse width, the second trace is a 30 ns pulse width. The 30 ns pulse inputs a high power level into the fiber (higher on the Y-axis) and is well above the noise floor. The result is a cleaner trace in the same amount of time.

Range vs. Pulse Width

Not all pulse widths can be selected on all ranges because a short pulse cannot reach the end of very long fibers, and long pulses can be too long for short fibers. The table below shows the allowable pulse widths depending on the selected range.

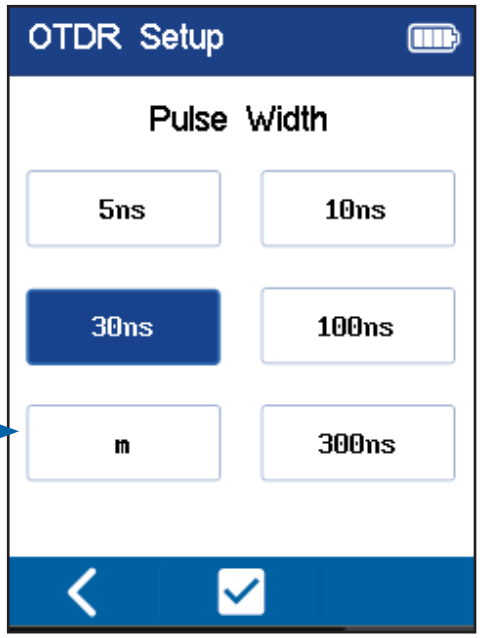
Range \ Pulse Width	5 ns	10 ns	30 ns	100 ns	300 ns	1 µs	3 µs	10 µs	20 µs
250 m	✓	✓	✓	✓	✓				
500 m	✓	✓	✓	✓	✓				
1 km	✓	✓	✓	✓	✓				
2 km		✓	✓	✓	✓	✓			
4 km		✓	✓	✓	✓	✓			
8 km			✓	✓	✓	✓	✓		
16 km			✓	✓	✓	✓	✓		
32 km					✓	✓	✓	✓	✓
64 km					✓	✓	✓	✓	✓
128 km					✓	✓	✓	✓	✓

The pulse width (PW) selection can be toggled between time by pressing the lower-left button. Initially, the PW is set to time and the toggle button displays 'm' to change the PM mode to meters. When the PW mode is in meters, the mode button will display ns for nanoseconds which will revert the setting to time mode.

The conversion is 10 ns = 1 m, i.e., a 100 ns pulse is 10 m long.

The pulse witdth should be shorter than the distance between any events on the fiber under test. For example, if there are patch panels that are 5 meters apart, the pulse width should not exceed 50 ns. Since the FiberMASTER offers 30 and 100 ns pulse width options, the maximum selection should be 30 ns. Shorter options are fine as long as the trace has acceptable clarity.

Pulse width mode toggle

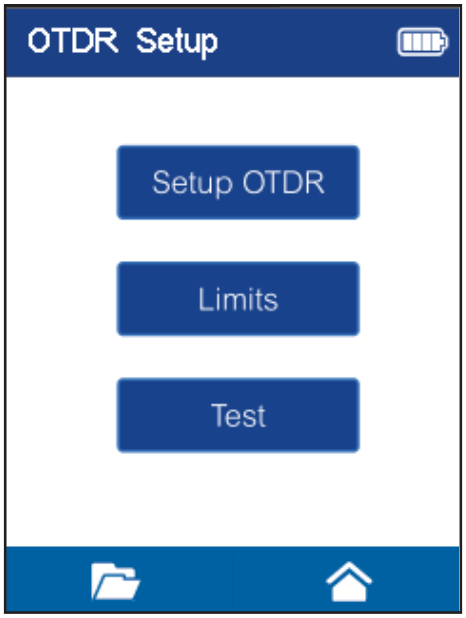


Chapter 7 Test Limit Selection

7.1 Limits Setup

The Limits setup section determines the pass/fail parameters of each test. These limits are divided into two primary groups.

There are four parameters that can be checked:
- Connector - loss of connectors (reflective events)
- Splices - loss of fusion splices (non-reflective events)
- Segment attenuation slope - loss of a section of cable vs. length
- Link - total loss of a link including all cable, connectors and splices.



7.2 Cabling Limits

Cabling limits are created by international standards organizations that determine the allowable loss for components of fiber cabling systems.

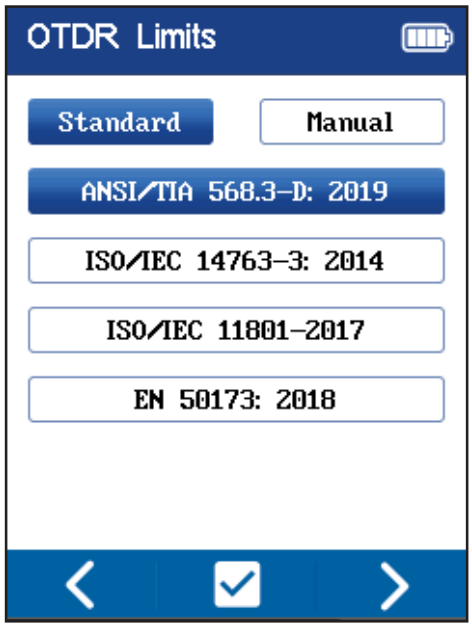
Select one off the standards and press ☑ to proceed.

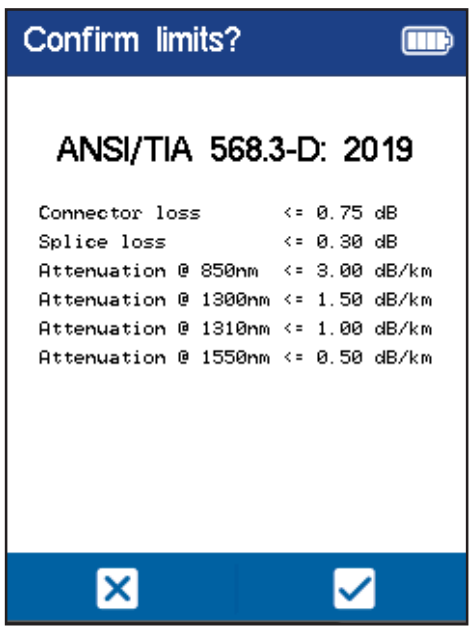
The confirmation screen appears and displays the limits for connector, splice, and cable loss for each wavelength.

Press ☑ to confirm or ☒ to cancel.

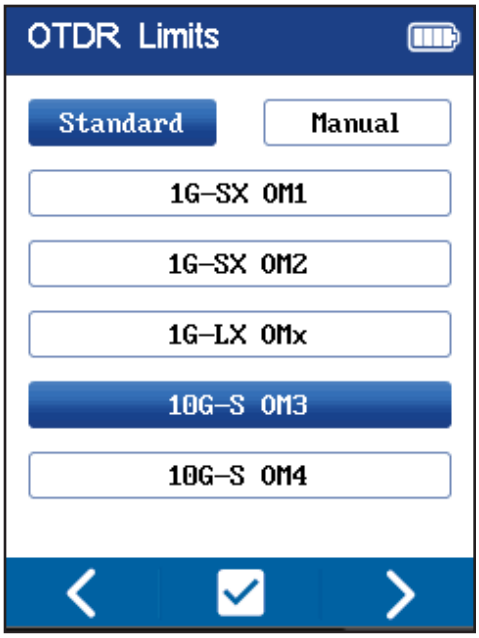
From the OTDR Limits screen,
Press the > button to view the first page of application limits.

Press Manual to enter custom pass/fail limits for each parameter.





7.3 Application Limits

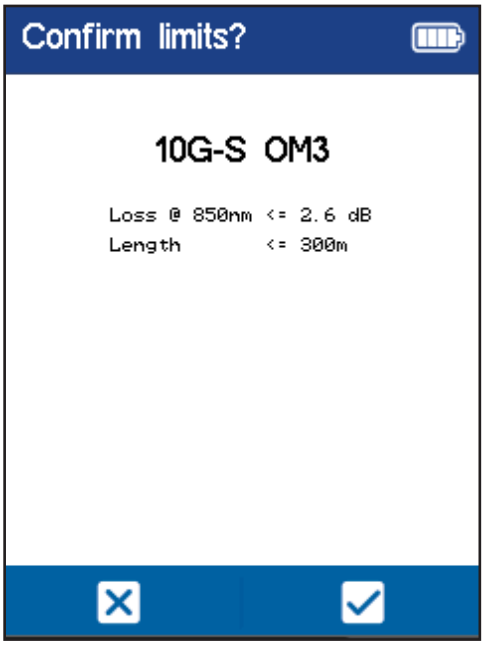


After the Cabling Limits page, there are several pages of application limits. Application limits are defined by the IEEE and provide the maximum loss and length for each Ethernet speed for a given fiber type and wavelength.

The application names can be decoded to determine the speed, wavelength, and fiber type.

- The first number is the Ethernet speed. Example, 1G = 1 Gbps, 10G = 10 Gbps and so on.
- The first set of letters defines the wavelength.
  - S or SX = 850 nm
  - LX = 1300/1310 nm
  - ZX= 1550 nm
- The last set of letters defines the fiber type.
  - OM1 = 62.5Qm MM fiber
  - OM2, OM3, OM4 = Grade 2, 3, or 4 of 50Qm MM fiber
  - OMx = any grade of MM fiber
  - OS1 and OS2 = SM fiber

Confirm Application Limit



After pressing ☑ with an application selected, the confirmation screen appears.

The confirmation screen displays the loss and length limits for the selected application. In this example, 10 Gbps, 850nm, OM3 MM Ethernet is selected.

The maximum loss allowed is 2.6 dB.
The maximum length allowed is 300m.

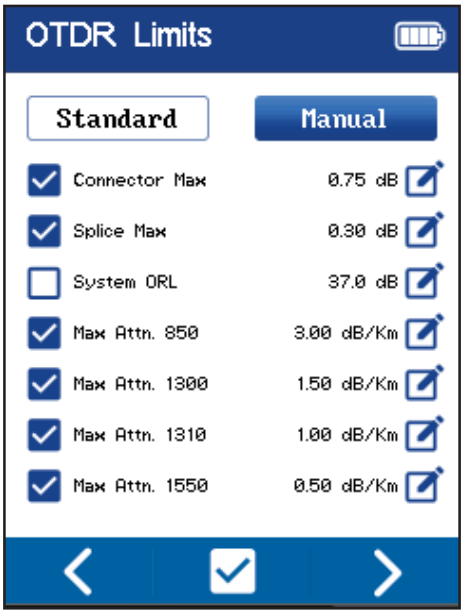
Press ☑ to confirm or the X box to cancel.

7.4 Manual Limit Selection

Press the Manual button to enter custom pass/fail limits.

Page 1 contains settings for the following limits:
- Connector - loss of connectors (reflective events)
- Splices - loss of fusion splices (non-reflective events)
- Segment attenuation slope - loss of a section of cable vs. length for 850, 1300, 1310, and 1550 nm wavelengths

Press > to continue to page 2.



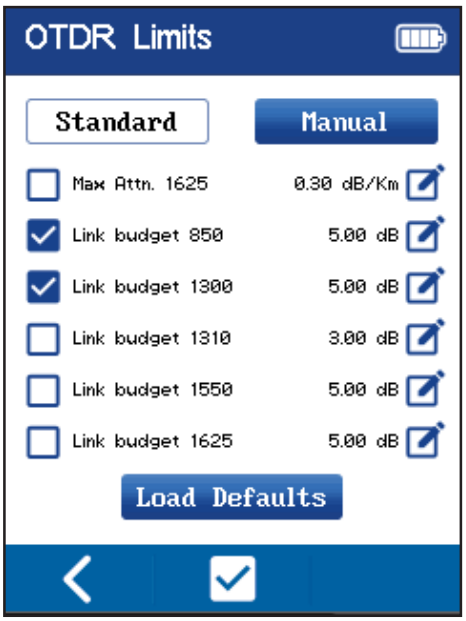
Page 2 contains settings for the following limits:
- Segment attenuation slope - loss of a section of cable vs. length for the 1625 nm wavelength
- Link budget (maximum total loss) for 850, 1300, 1310, 1550, and 1625 nm wavelengths.

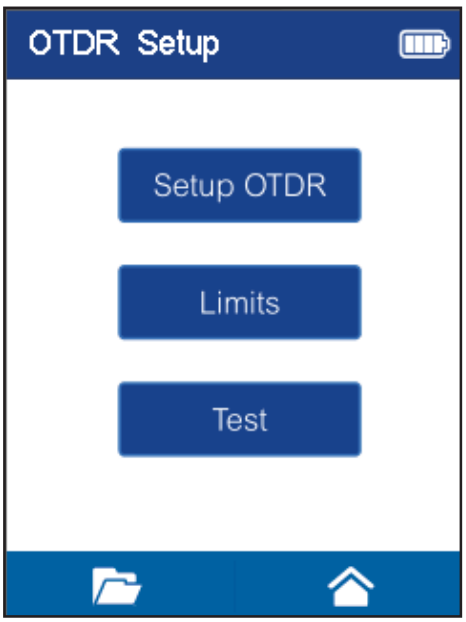
Press the ☑ to the left of each parameter that should be evaluated during the test. Unchecked parameters will not be tested.

Press the edit icon to the right of each value to change the limit for each parameter.

Press Load Defaults on page 2 to restore the factory default settings for each parameter.

Press ☑ to confirm the selections and return to the OTDR Setup page.





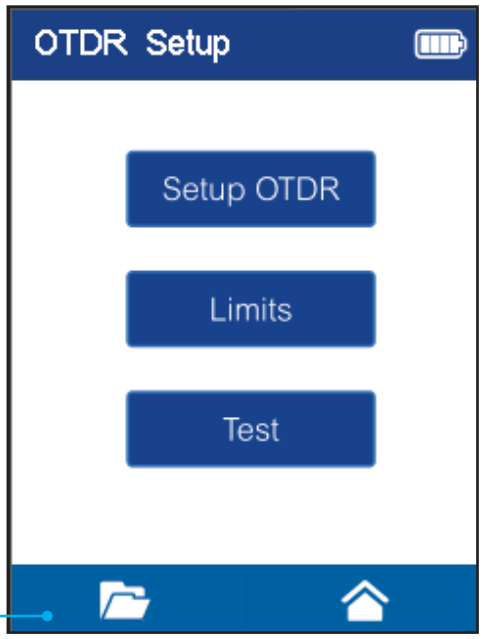
Chapter 8 Project Management

8.1 Project Manager

Press the folder icon in the OTDR Setup screen to open Projects. The Project folder is also available in other screens throughout the user interface. It operates the same regardless where the function is initiated.

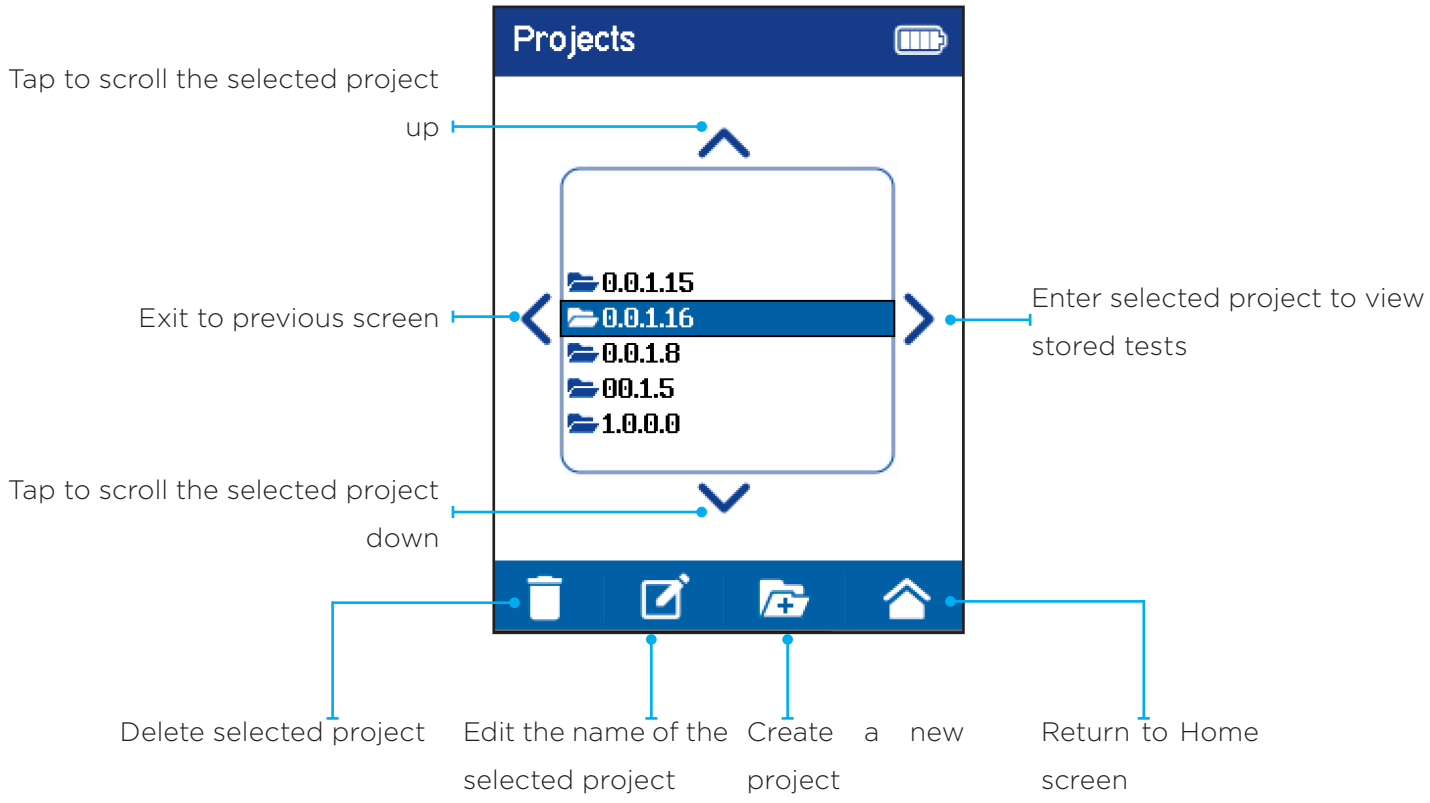
Projects contains a list of user created folders that can each store measurement results for OTDR tests, power meter tests and video inspection scope images.

Up to 40,000 total files can be stored, though the maximum depends on the mix of types and the number of data points in OTDR trace files.



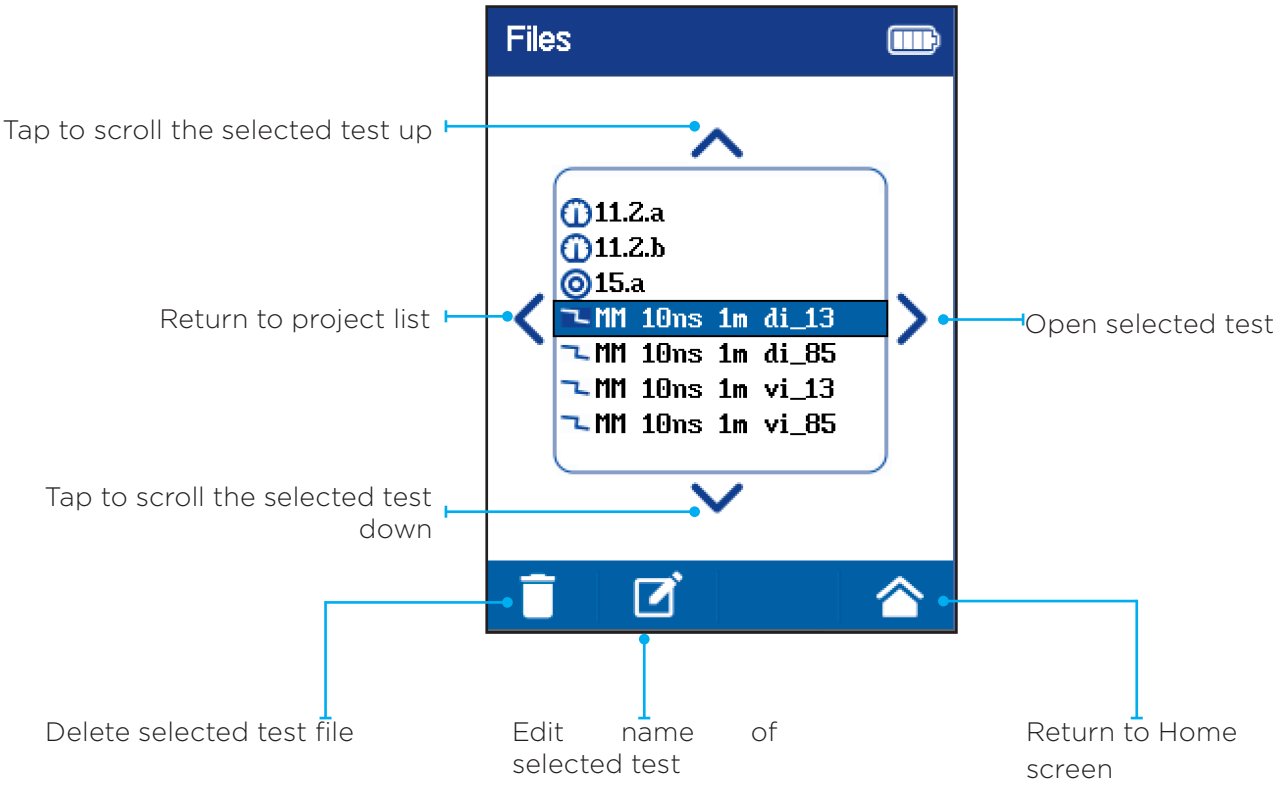
Project List

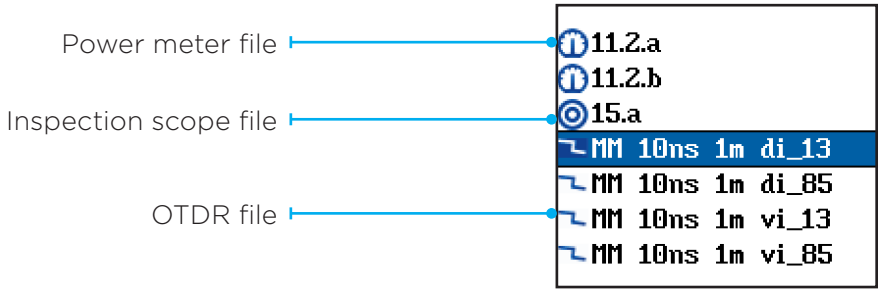
Press the folder icon in the OTDR Setup screen to open Projects.
Projects contains a list of user created folders that can each store measurement results for OTDR tests, power meter tests and video inspection scope images.



8.2 Files List

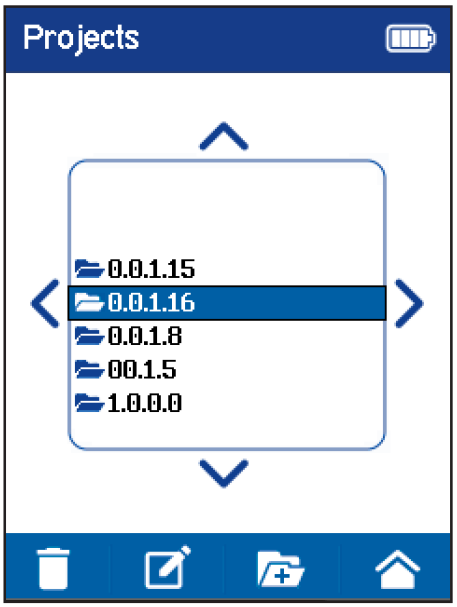
Displays a list of test files in the selected project. Preceding each file name is an icon that identifies the type of file. Test selection can be performed by scrolling within the list or using the arrow buttons above and below the list.





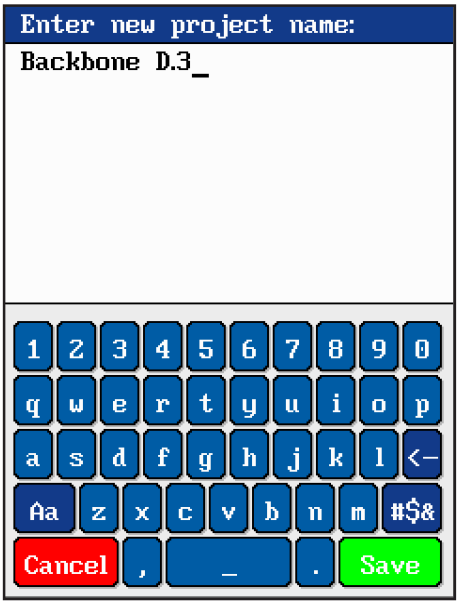
Create a new Project

Press the '+' folder button to create a new project.

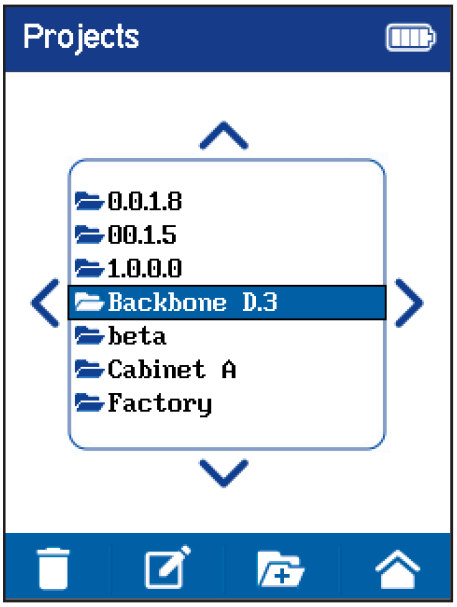


Enter a name for the new project using the keyboard. Letters, numbers and punctuation are allowed.

Press Save to create the new project.

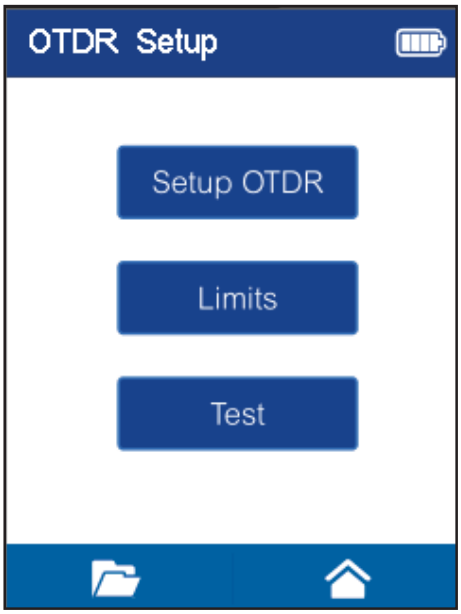


The new project will appear in the project list and any future tests can be saved to this or any existing project.

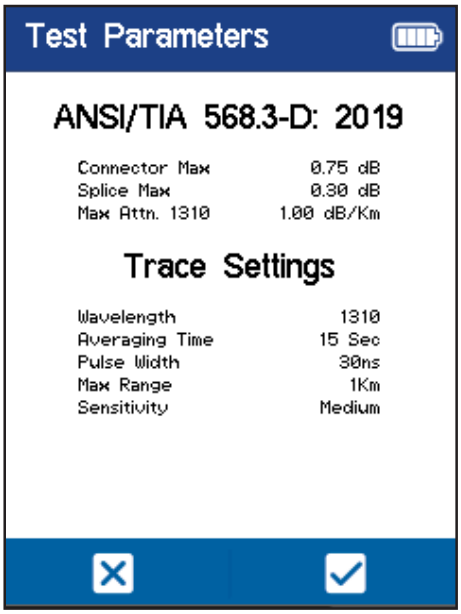


Continue with testing

Once a project has been selected, press Test to begin the testing process.



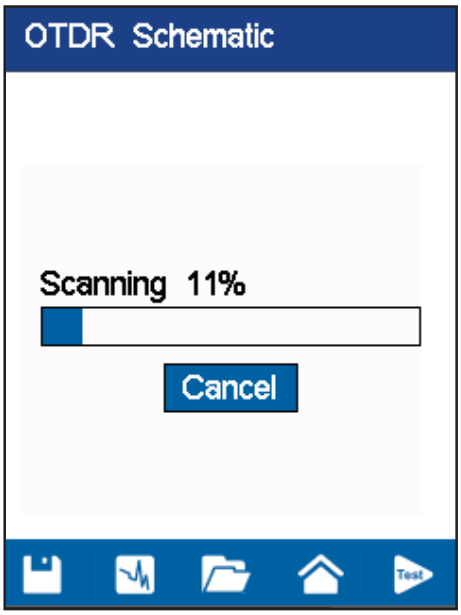
After pressing Test, the Test Parameters confirmation screen displays the selected settings for the limits and the OTDR configuration.



Press ☒ to return to the OTDR Setup screen.

Press ☑ to start the test.

The progress bar appears as the OTDR runs and acquires data for the selected test time.



Press Cancel to stop scanning. The test will not abort, instead the results will be displayed using the data that had been acquired at the time Cancel was pressed.

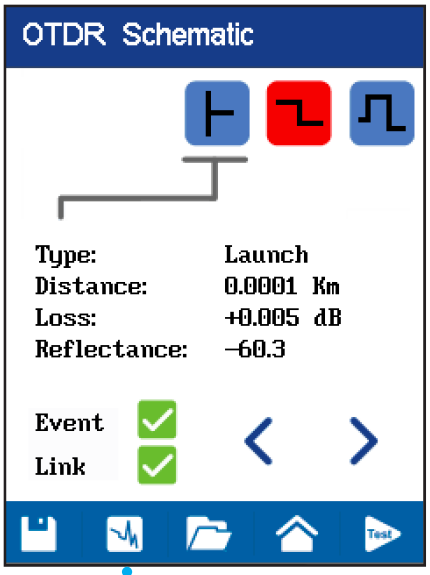
Chapter 9 OTDR Operation

9.1 OTDR Result Screens

There are three views for the OTDR results, they are; Schematic, Trace, and Event Table

The first view displayed after the test is run is the OTDR Schematic. The Schematic view is a linear map of the events detected by the FiberMASTER software which are classified as Launch, Splice, Connector, End, and Link.

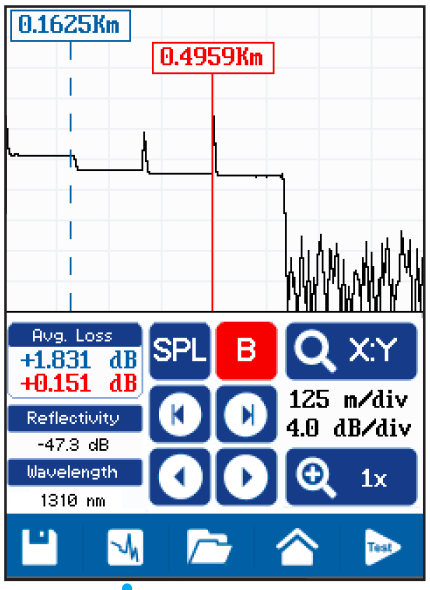
Pressing the View button on the menu bar cycles between the three OTDR views.



Cycle View

The second view is the trace screen which displays a detailed OTDR trace, loss information, zoom and cursor controls.

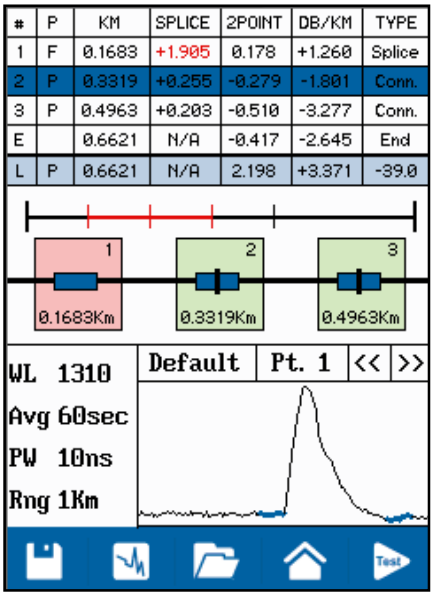
Detailed use of the controls are described later in the manual.



Cycle View

The third view is the event table, event diagram, detailed view of the active event and the trace parameters.

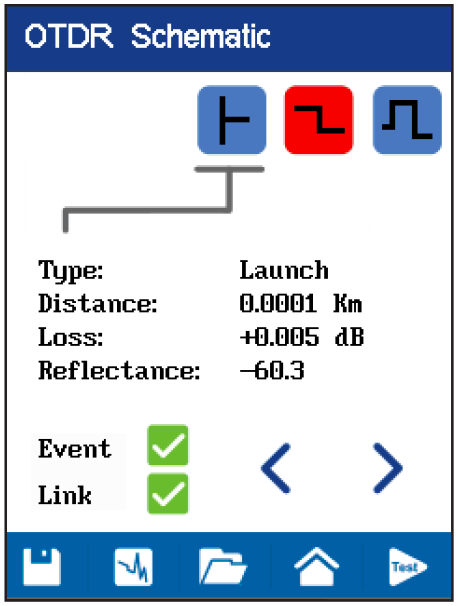
Pressing the Cycle view button again will return to the Schematic view.



9.2 OTDR Schematic Screen

The schematic screen appears when the OTDR test is finished running.
The schematic is a series of icons that represents events that the OTDR has analyzed from the raw trace data which are presented in an easy to understand format.
An event can be activated by either tapping on it directly, or by tapping the left/right arrows to cycle through the list of events on the link.

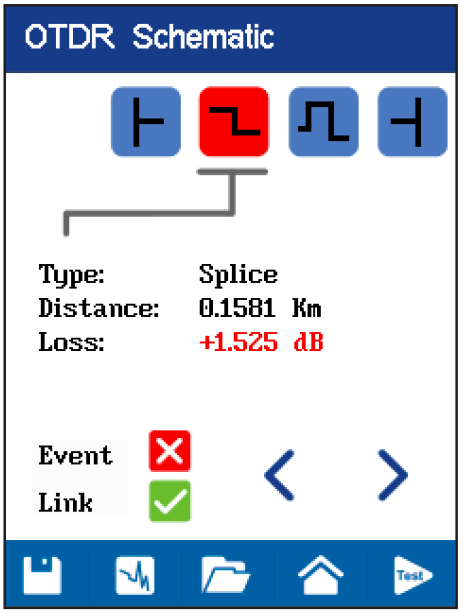
The first event is the launch. This is the first reflective event detected at the front of the OTDR. The quality of the rest of the link is dependant on the reflectance of the launch. It should be better than -50 dB for a UPC connector. In this example a reflectance of -60.3 dB is a good, low reflectance level.



Non-Reflective Events (splices)

In this example a failing non-reflective event symbol is shown. A non-reflective event is one where there is no air gap to create loss as there is with a connector. Instead there is a bend in the fiber, or there is a fusion splice.

The OTDR will identify a non-reflective event as a Splice regardless of the true nature of the event. In this example the loss is 1.525 dB which exceeds the limit setting of 0.3 dB as shown on the Trace Parameters page.

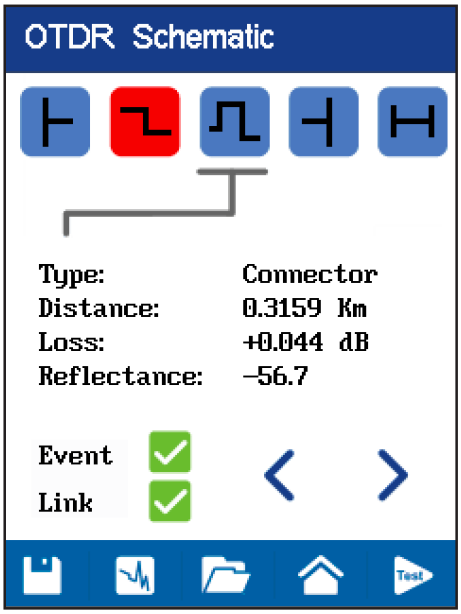


The Event status shows Fail for this event while the link shows Pass. This can happen because the total link loss is a function of the length of the fiber, and in this case the loss of the link is under the maximum allowed for it's length despite the failing splice.

Reflective Events (connectors)

In this example a passing connector symbol is shown. Reflective events occur when there is an optical discontinuity in the fiber and a reflection is sent back to the OTDR.

One of the side-effects of reflective events is that there is a dead zone after the event in which the OTDR cannot "see" anything. The size of the dead zone depends on the pulse width setting used to acquire the trace.



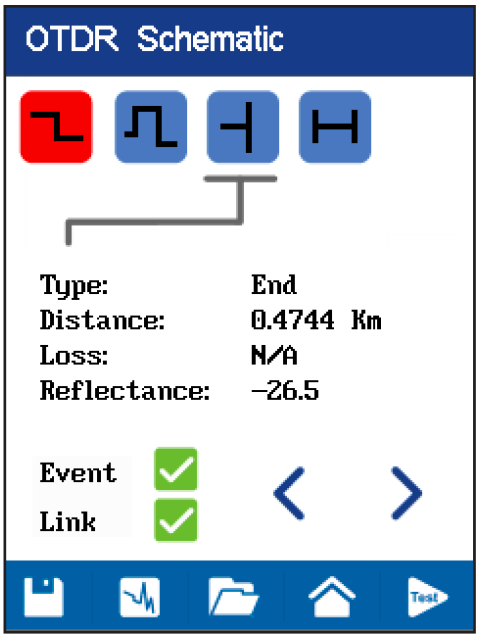
This connector is 315.9 meters from the start, has a loss of 0.044 dB, and a reflectance of -56.7 dB. The connector passes the test specifications as shown by the green Event ✓ mark.

OTDR Schematic End Event

The End event is where the OTDR detects the end of the fiber as set of the EOF setting the OTDR Setup configuration (described below).

The End event displays the total distance of the link which in this example is 474.4 meters, and the reflectance of the last connector which is -26.5 dB. Note that the high reflectance is the result of an open connector going into air, versus a mated pair of UPC connectors.

The Event and Link indicators also show pass for the End event.



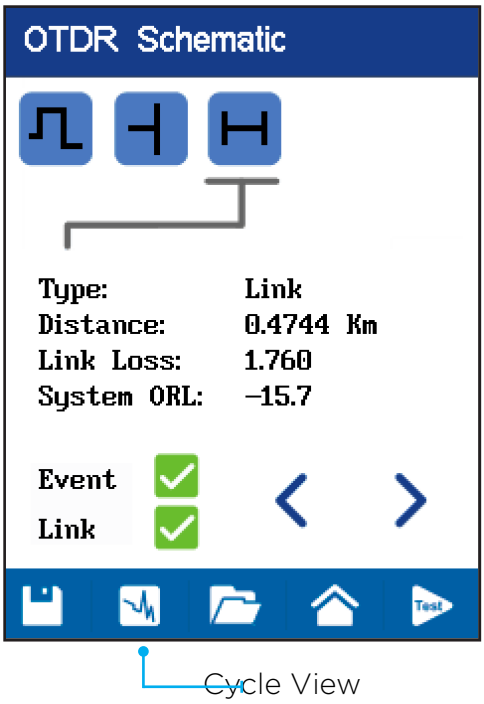
Link Summary

The Link summary gives the total length, loss and ORL (Optical Return Loss) of the link. In this example the length is 474.4 meters with a loss of 1.768 dB which includes all connectors, splices and fiber, and an ORL of -15.7 dB.

ORL is a measure of the total amount of light reflected back towards the launch. High ORL (low negative number) can create interference with network transmitters and ORL performance is important in high bandwidth networks. For example, 40 Gb/s networks require better than 30 dB ORL.

APC (Angled Physical Contact) connectors are used to achieve low reflectance connections/high ORL performance when required.

Press Cycle View to change to the OTDR Trace mode.



9.3 OTDR Trace Screen

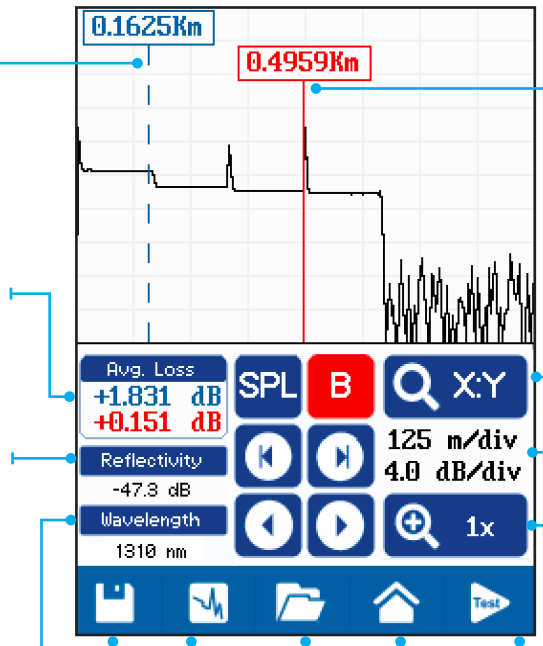
Trace mode provides a classical OTDR trace that the user must interpret to find events, section losses, faults and other conditions.

The appearance of the trace highly depends on the pulse width and averaging time of the test. If the trace is noisy, or there no events shown on the schematic when events are expected, try increasing the pulse width by one level.

Some events may not be visible on zoom level 1x due to the resolution sampling size. Zooming into 2x and scanning across the screen may be necessary to see certain types of reflective events.

The active cursor can be moved by tapping the desired position on the screen, by pressing the next/previous event buttons or by pressing the fine step buttons.

Cursor A is blue, cursor B is red. The active cursor is toggled by pressing the A/B button near the center of the screen.



"A" Cursor with Position Data
(Inactive)

Loss Window
Tap to cycle between average loss of events at the A and B cursors, LSA loss at the A and B cursors, 2-point loss between the A and B cursors, or the slope loss and ORL between the A and B cursors.

Reflectivity
Displays the reflectivity of the active cursor if placed at the *beginning* of a reflective event.

Wavelength
Displays the wavelength of the trace. Toggles between wavelengths on dual wavelength tests.

Save Trace
Save the active trace. A prompt will first appear to select a project.

Next View
Cycle to the Event Table view

Projects
Open the project manager to view saved tests

Home
Return to the OTDR Setup menu

"B" Cursor with Position Data
(Active)

Zoom Control
Toggles between zooming the X + Y, X only, or Y only axis when the Zoom level button is pressed.

Units per Division
Displays the number of meters per horizontal grid division, and dB per vertical grid division of the OTDR trace.

Zoom Level
Increases zoom level in steps from 1x to 2x, 4x, 8x, 16, 32. Displays X:Y levels individually when they differ.

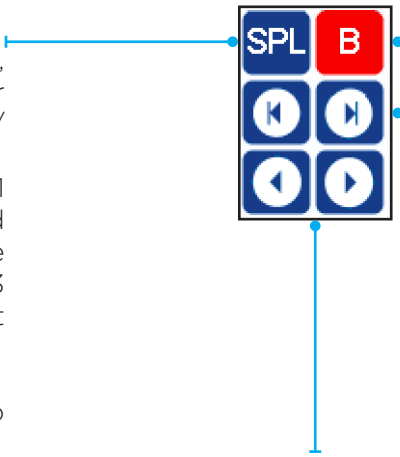
Run Test
Press to begin another test using the same settings.

Central control buttons

Splice Zone Setting
When pressed (red when active), sets the position of the four cursors that control the splice/connector measurement zones. Press to cycle from cursors 1 through 4. Position cursors 1 and 2 on the flat area to the left of the splice/connector, and cursors 3 and 4 on the flat area to the right of the splice/connector.

Press the SPL button again to turn the splice zone setting off.

See section 11.3 for additional details on setting splice zones.



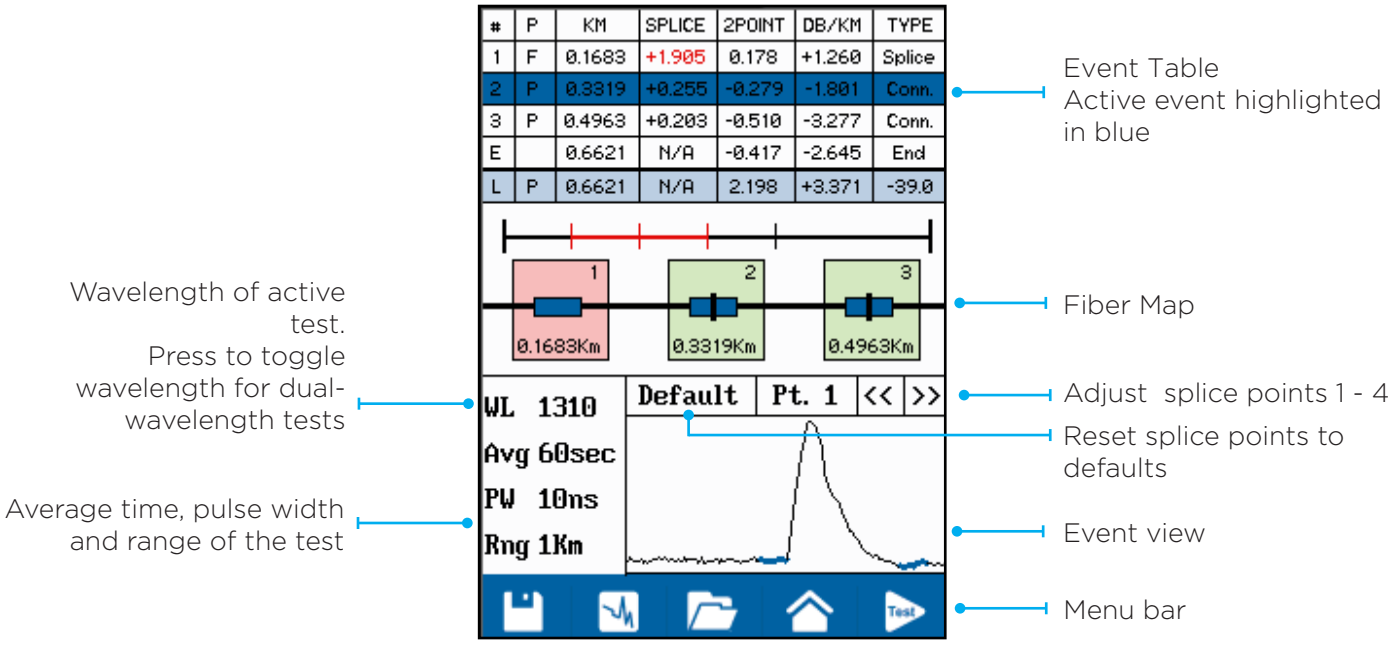
Toggle Active Cursor
Press to change which cursor is active. Cursor A is blue, cursor B is red. Touching the screen positions the active cursor to that position

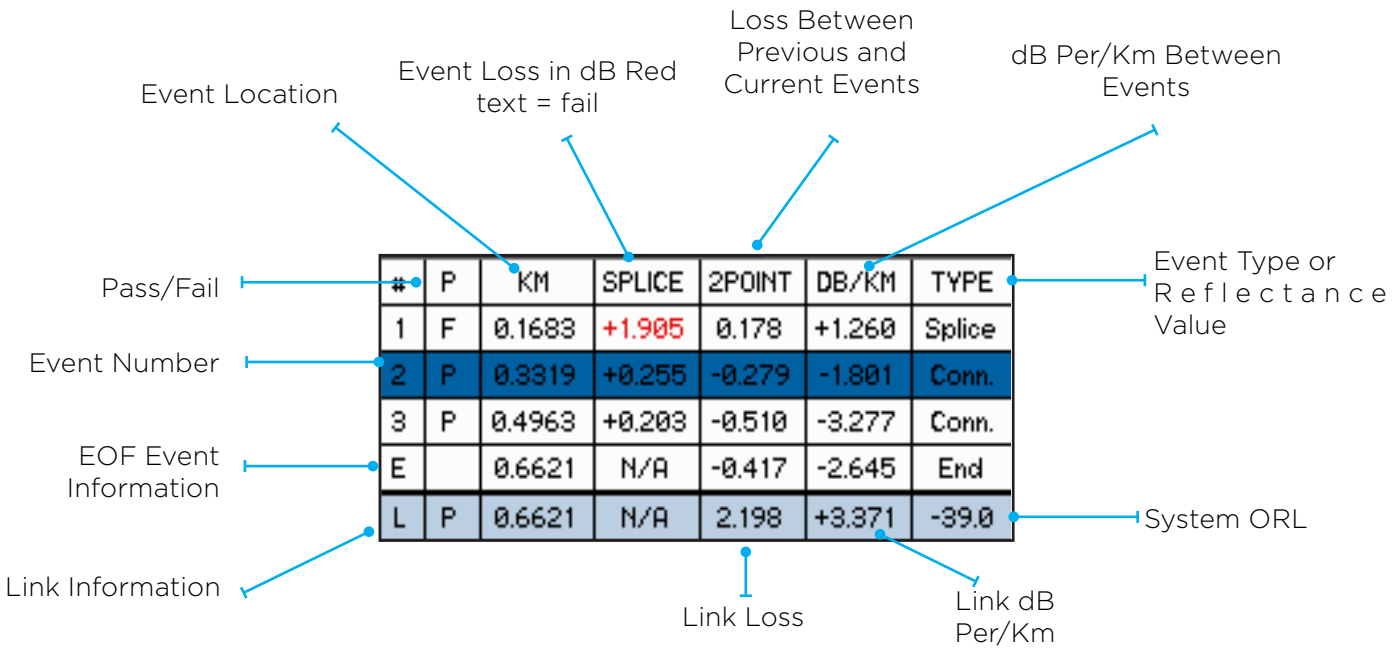
Previous/Next Event
Jumps the active cursor to the previous event when |< is pressed or the next event when >| is pressed.

Fine Cursor Step
Moves the active cursor in single steps each time < or > is pressed. The step size is determined by the range setting.

9.4 Event Table

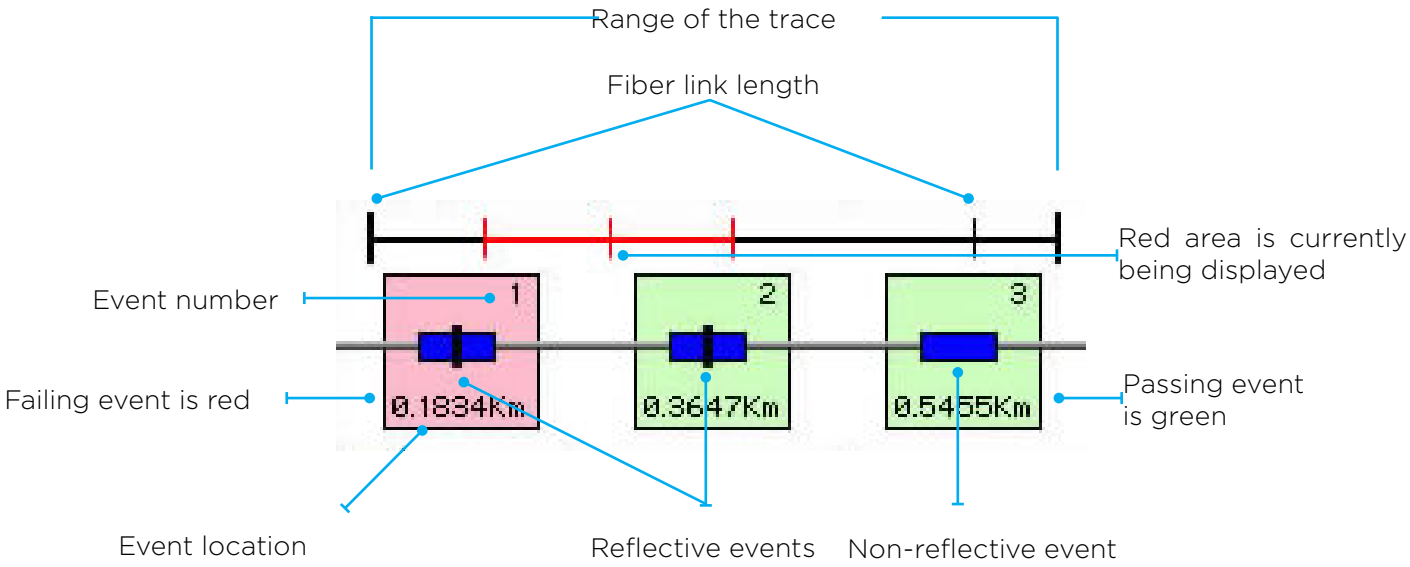
The Event Table is a view which displays the test results in event table with the schematic and a magnified view of the active event.





#	P	KM	SPLICE	2POINT	DB/KM	TYPE
1	F	0.1683	+1.905	0.178	+1.260	Splice
2	P	0.3319	+0.255	-0.279	-1.801	Conn.
3	P	0.4963	+0.203	-0.510	-3.277	Conn.
E		0.6621	N/A	-0.417	-2.645	End
L	P	0.6621	N/A	2.198	+3.371	-39.0

Fiber Map



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

9.5 Event Table Description

Event Table Field Description

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

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

KM:
Event Location (Distance from OTDR), labeled Km for Kilometer. This is the distance/location that the event occurs along the fiber link. This data should be the same for the End of Fiber and Link.

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

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

DB/KM:
dB per Kilometer. This is the calculated loss per Km from the end of the dead zone of the previous event to the beginning of the current event. The value in the "L" line of the table for this column is the dB Per/KM for the total link.

TYPE:
Event Type is the type of event or the return loss of and event. If the event has no reflection, “Splice” will be displayed and if the event is reflective, the reflectance value will be displayed. For the last event which is labeled "E", there is not value displayed, it simply shows "End" and in the "L" row, the Optical Return Loss for the link is displayed (System ORL).

Chapter 10 Advanced OTDR Operation

10.1 Average Splice Loss

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

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

10.2 Least Squares Approximation (LSA)

Least Squares Approximation (LSA) Splice loss method gives the user a visual aid in setting splice loss areas. This method can be more accurate by affording the ability to see the slope of the splice loss areas, however: it can also supply a reading with greater error if not used properly. The splice loss lines must be set to overlay the backscatter of a trace without over lapping any other events. Unlike basic splice lose, LSA measurement areas are drawn as straight lines without regard to the undulations of the back scatter. The idea of LSA loss is that the OTDR calculates a linear slope of the backscatter based on the selected splice markers. The slopes before and after the splice/connector are extended into the area of the connector and the difference in height is measured.

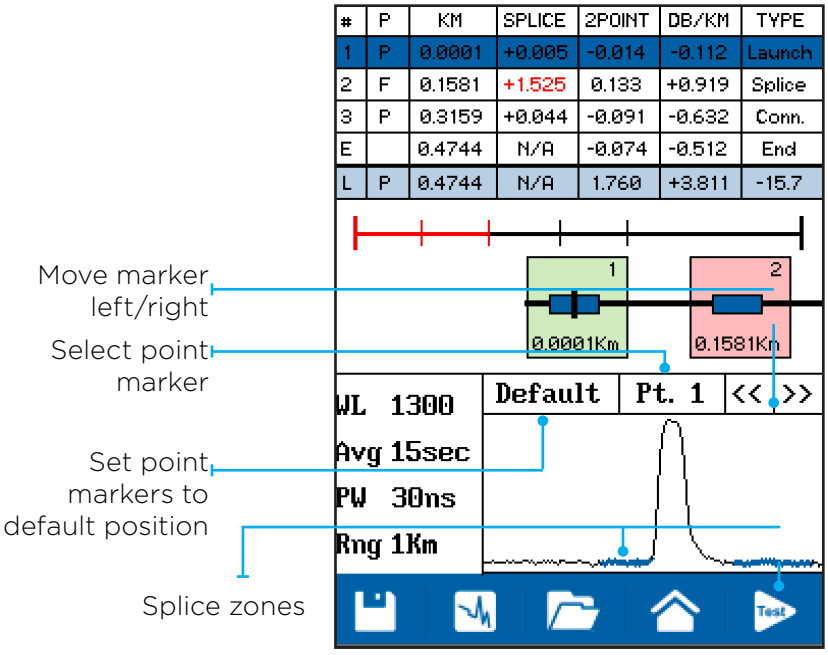
Excess error can be induced if the splice markers are incorrectly positioned in such a way that noise or undulations in on the trace affect the slope of the calculated line affecting the measured splice loss.

10.3 Loss Measurement Settings

Setting the Default Splice Loss Measurement zones

After a test the default splice zones should be set automatically. Should they need to be reset, or if they were not set properly for the trace they can be set to default from the Event Table screen.

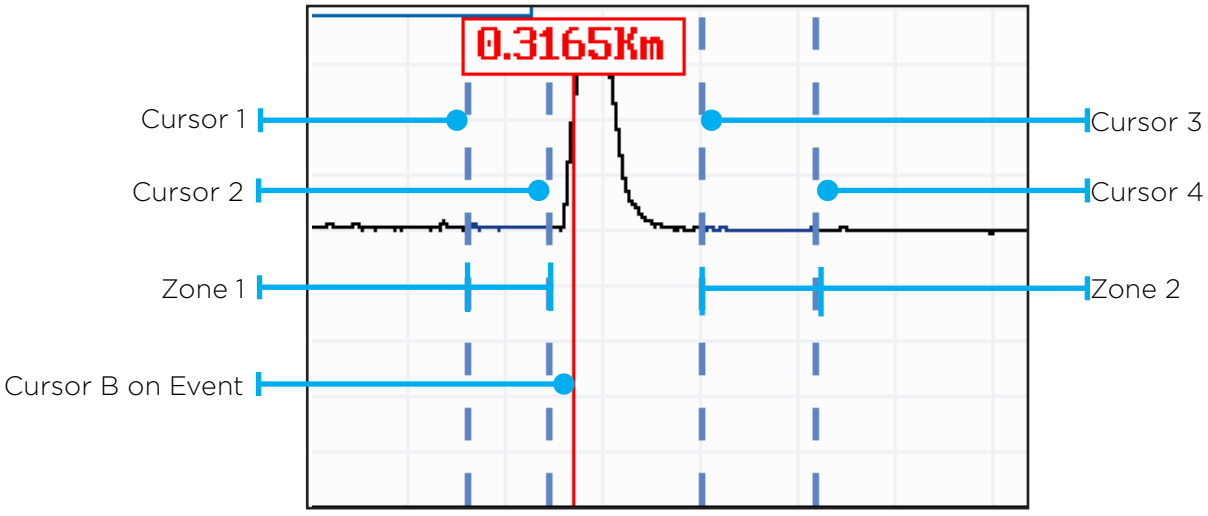
Press the Change View button until the Event Table is shown. The splice loss zones are the blue lines before and after the selected event. Press Default to reset the splice zones to the default positions.



Splice loss measurement zones

The splice zones for Average and LSA measurements can be manually set in the Trace and Event Table modes. The process of setting the splice measurement zones involves positioning four cursors that define two zones. Cursor 1 and 2 define the zone to the left of the splice/connector. Cursor 3 and 4 define the zone to the right of the splice/connector.

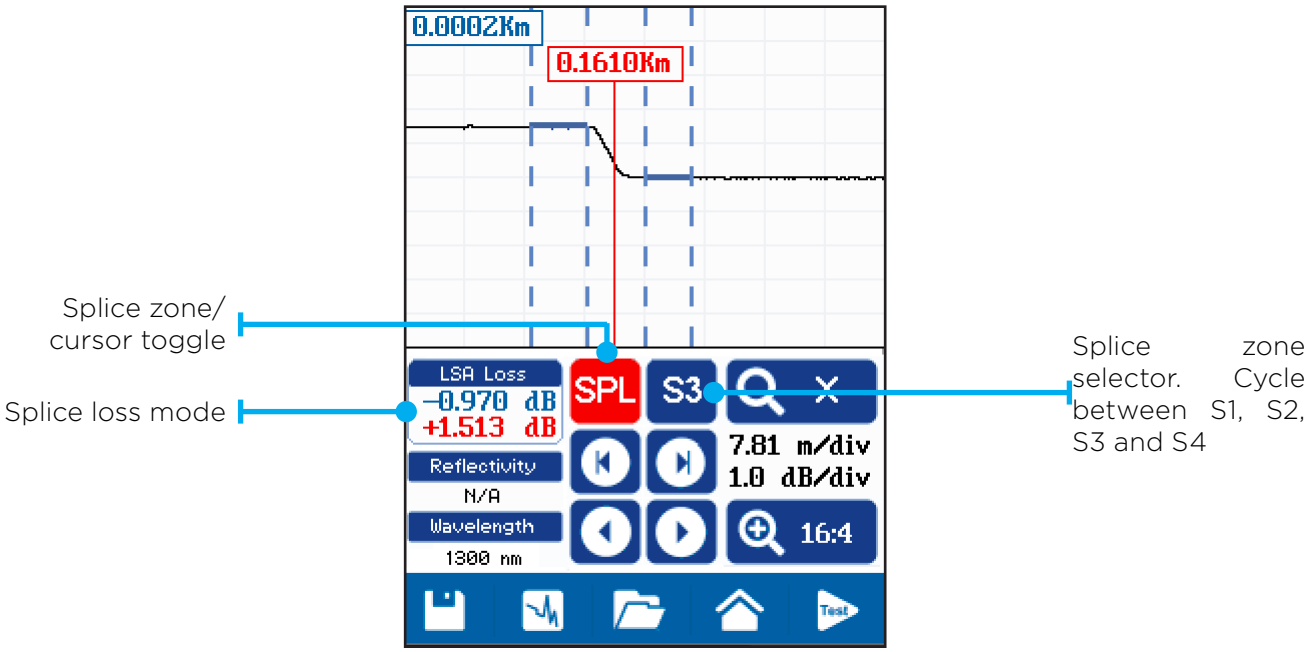
The zones should be set on the flat backscatter area immediately before and after the splice/connector, paying careful attention to not allow either zone to enter the sloped area of the event to be measured.



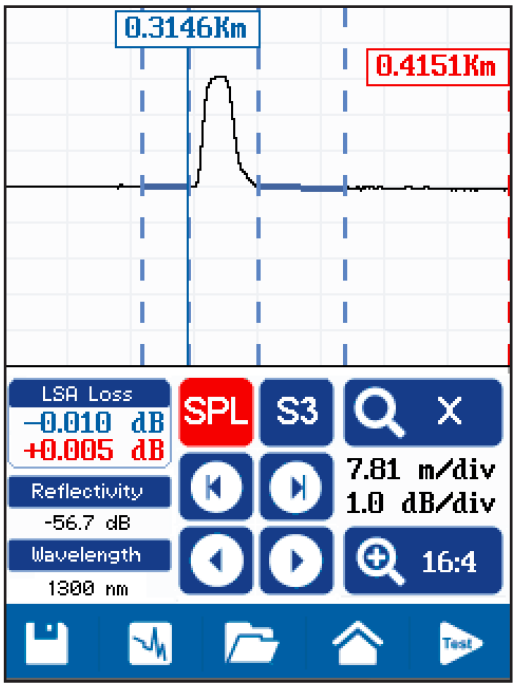
Splice loss measurement zone controls (Trace Mode)

Set the loss measurement mode to Avg. Loss or LSA Loss. In LSA mode the LSA slope lines will be visible between the splice zone cursors as shown below.

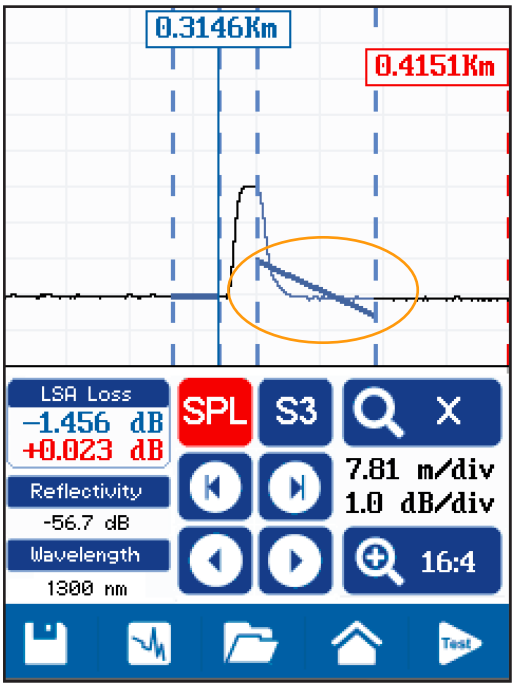
Zoom into an event and press the SPL button to change it from blue to red.
In adjustment mode the A/B cursor button will change to 'S1', representing Splice zone 1. With each press it will cycle from 1 to 4, then back to 1.



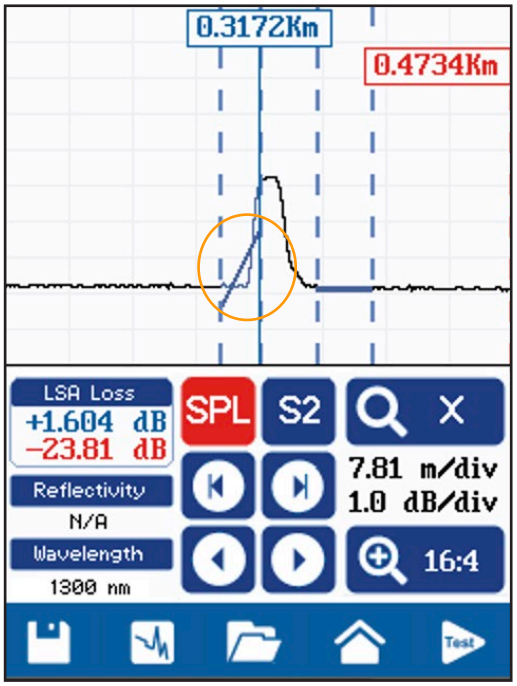
Correct vs. Incorrect Splice Zone Setup



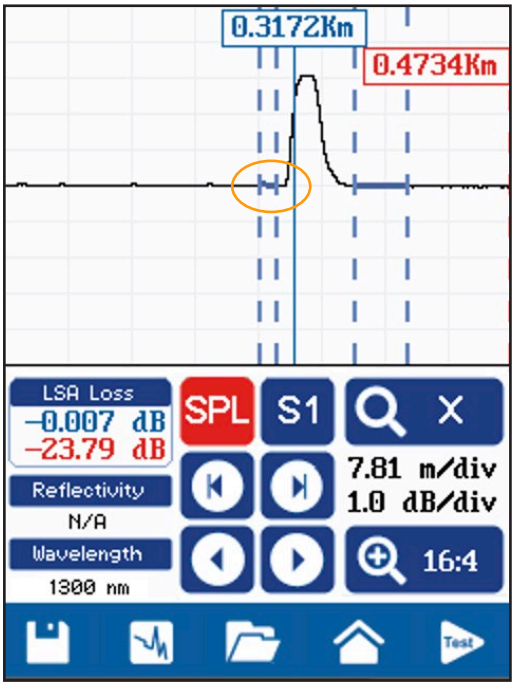
Splice zones properly setup on each side of the event. The LSA lines are flat on the back scatter before and after the reflection of the connector. Connector loss = 0.010 dB.



Splice cursor 3 is set on the reflection of the connector causing the LSA line on the right of the connector to not be flat. Calculated loss is 1.456 dB.



Splice cursor 2 is set on the reflection of the connector causing the LSA line on the left of the connector to not be flat. Calculated loss is 1.604 dB.



Splice cursor 1 is set on a slightly high noise spike that is causing the LSA line to dip from left down to the right. The result is an artificially low loss measurement of 0.007 dB.

10.4 2-Point Connector Measurements

The 2-point measurement mode measures the total loss between cursors A and B, including the loss of all fiber, splices and connectors. This is a quick method of measuring the link loss using the OTDR trace mode.

Care must be taken when using the 2-point mode to ensure the cursors are not placed on the slope of a reflective event or a noise dip/spike. The 2-point loss is a measure of a direct line drawn between the intersection of cursor A and B into the trace.

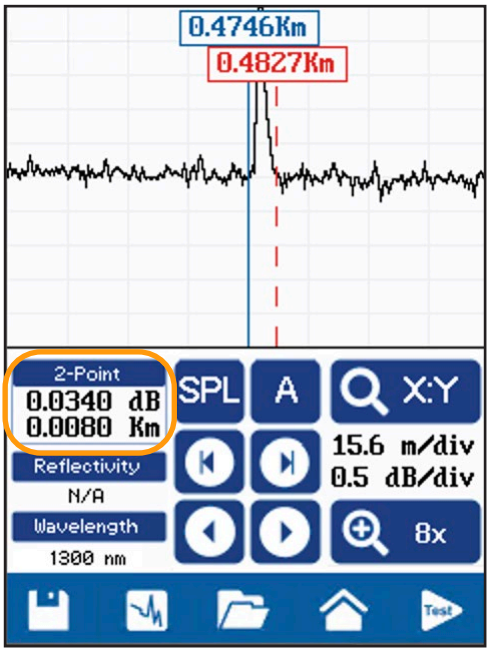
The 2-point mode can also be use to measure the dead zone of an event by placing the cursors at either side of a reflective event.

Short pulse width example

In this example the trace was taken with a 5 ns pulse width. The dynamic range is low, resulting in noise in the trace. Positioning of the cursors for a 2-point measurement has an impact on the measurement. Depending on whether the cursor is on a peak or a null, the resulting loss can be higher or lower than the LSA or Average loss measurement of the same event.

The 2-point loss of the connector in this example is 0.034 dB.

A benefit of the short pulse width is the is that the dead zone are also short. The 2-Point measurement box reads 0.0080 Km or 0.8 meters.



Long pulse width example

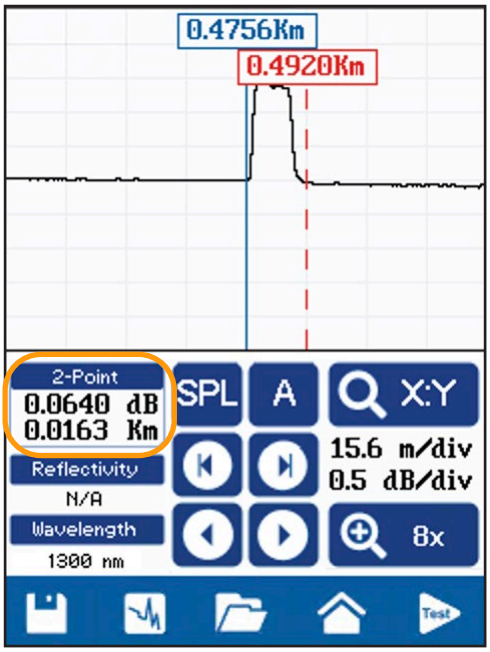
In this example the trace was taken with a 100 ns pulse width. The dynamic range is high, resulting in a clean trace. The high dynamic range is a result of the launch power being much higher than the back scatter reflection level.

Positioning the cursors is not critically important because the lack of noise will not affect the resulting loss measurement.

The 2-point loss of the connector in this example is 0.0640 dB.

A drawback of the long pulse width is that dead zones are long and can hide connectors or splices that are in close proximity.

The 2-point measurement box shows the distance between the A and B cursors (dead zone) is 0.0163 Km or 16.3 meters.



10.5 2-Point Link Measurements

A quick way to check the link loss is to change to 2-point mode and set cursor A at the beginning of the link, just after the dead zone, and cursor B just before the end-of-fiber event.

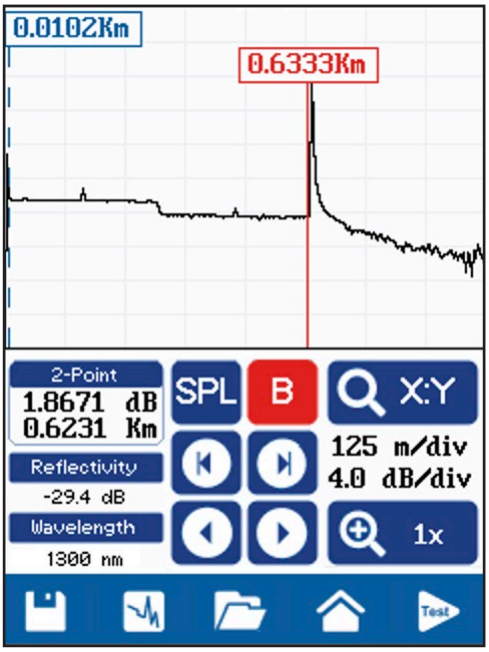
The 2-Point box will provide the loss of the total link (not including the first connector), including the two connectors and the splice in this example.

Short pulse width example

Because we are not trying to position the two cursors around a reflective event to measure it's loss the noise in the 5 ns trace is not as much of a factor in this example.

The main difference is the dead zone of the front-end event. Cursor A is able to be positioned at just 0.0102 km or 10.2 m from the front connector ensuring there are no "hidden" connectors or splices behind the first connector.

The 2-point link loss is 1.8761 dB and the distance between cursors A and B is 623.1 meters. The reflection of the end of fiber is -29.4 dB.



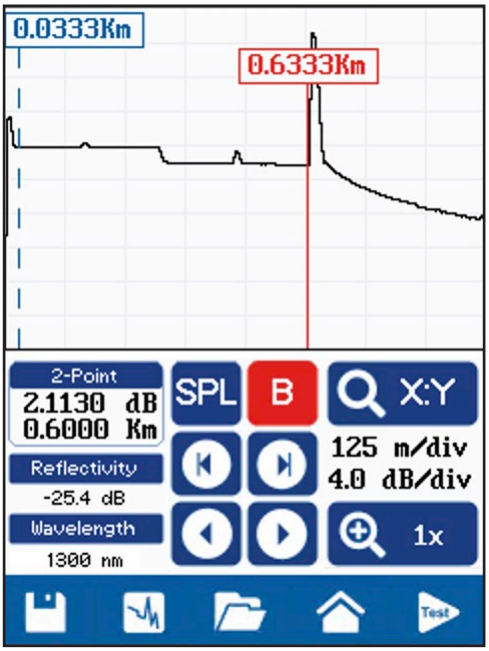
Long pulse width example

With the 100 ns pulse, cursor A must be positioned further into the fiber to get past the front-end dead zone. The distance of the dead zone here is 0.0333 km or 33.3 meters.

The 2-point loss is 2.1130 dB. The difference from the 5 ns example is due to the noise at the beginning of the 5 ns trace. The cursor is sitting in a dip that is causing the loss to be slightly lower.

The distance between the cursors is 0.6000 km or 600.0 meters vs 632.1 meters on the 5 ns trace. The difference is due to the position of cursor A being placed further into the fiber to account for the increased dead zone.

The reflection is slightly higher at -25.4 dB because the 100 ns pulse is launching more energy into the fiber and the OTDR is receiving a larger reflection from the end connector.



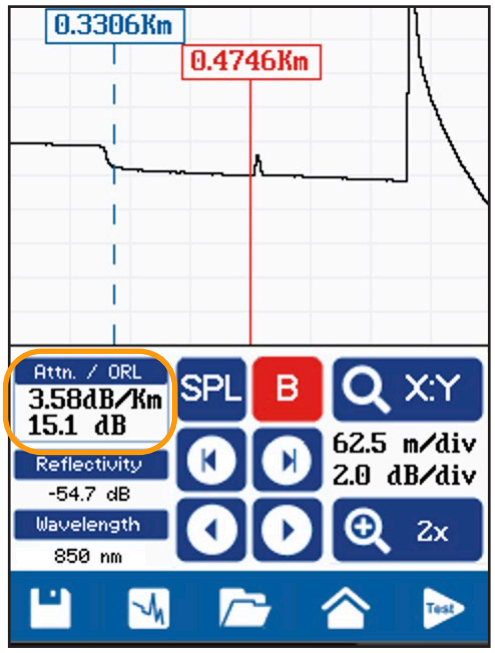
10.6 Slope / ORL Measurements

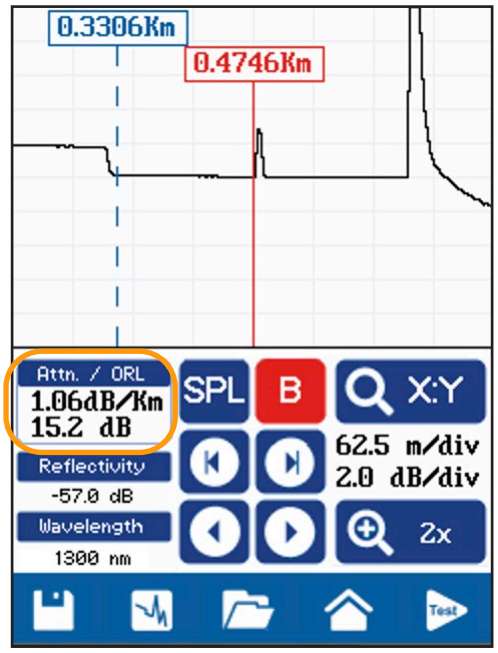
The 2-point cursor mode can be used to measure the attenuation slope of a section of fiber. Slope is defined as the attenuation per kilometer (dB/km) of fiber. This measurement can be directly compared to the specifications of the installed cabling to check for installation stress or damage that may be causing high loss along the entire length of the cable, not just in one spot.

To measure the slope, position the cursors on a section of fiber without any connectors or splices in between and touch the measurement box until it changes to Attn. / ORL.

The OTDR will measure the loss between the cursors and divide it by the distance between them, providing the calculated value in the measurement box.

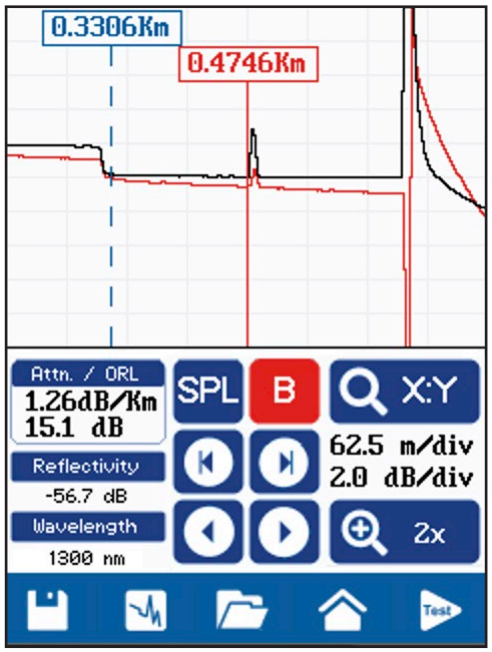
The slope (attenuation) of this section of fiber measures 3.58 dB/km at 850 nm and 0.94 dB/km at 1300 nm which are typical attenuation values for multi-mode fiber.





Running a dual wavelength test make is easy to visualize the difference in attenuation between 850 nm and 1300 nm of multi-mode fiber. At 850 nm, multi-mode fiber has more than 3x the attenuation compared to 1300 nm

The ORL (Optical Return Loss) value is a measure of the total power reflected from the link back to the OTDR port. The system ORL at 1300 nm is 15.1 dB which is typical of a link where the end connector is left in open air.



Chapter 11 Video Inspection Probe

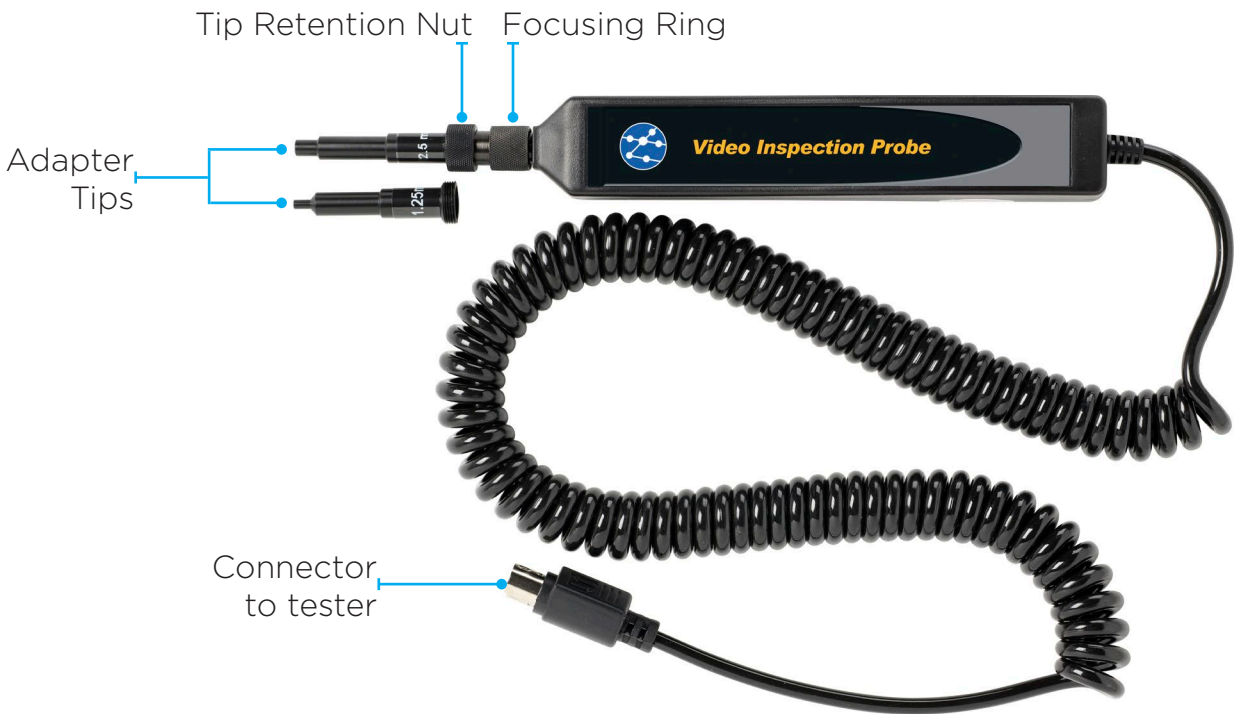
11.1 Video Inspection Probe Operation

The video inspection probe allows magnified end-face inspection of fiber optic connectors check for contaminates or damage. Proper cleaning and end-face inspection is a critical practice each time a connector is plugged into a mating connection or piece of fiber optic equipment.

Fiber optic connectors are physical contact, meaning the faces touch each other when mated. Contamination from one connector will be transferred to the other connector. The same is true for the OTDR port. Plugging a dirty connector into the OTDR will contaminate the OTDR port leading to high reflection/dead zones for every test until the OTDR port is properly cleaned.

Video Probe Tips

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



Viewing/Focusing a Connector

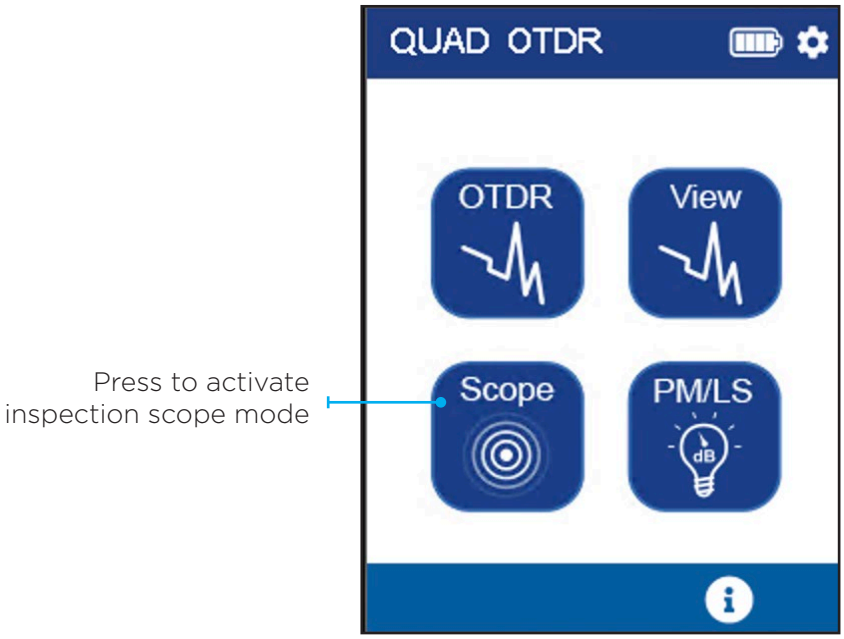
With the video scope turned on and the video probe plugged into the OTDR, insert a connector in to universal tip or insert the panel adapter tip into the appropriate port. The scope must be in the live scanning mode to make focus adjustments. Use the focus ring to get the connector image as sharp as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

NOTE:

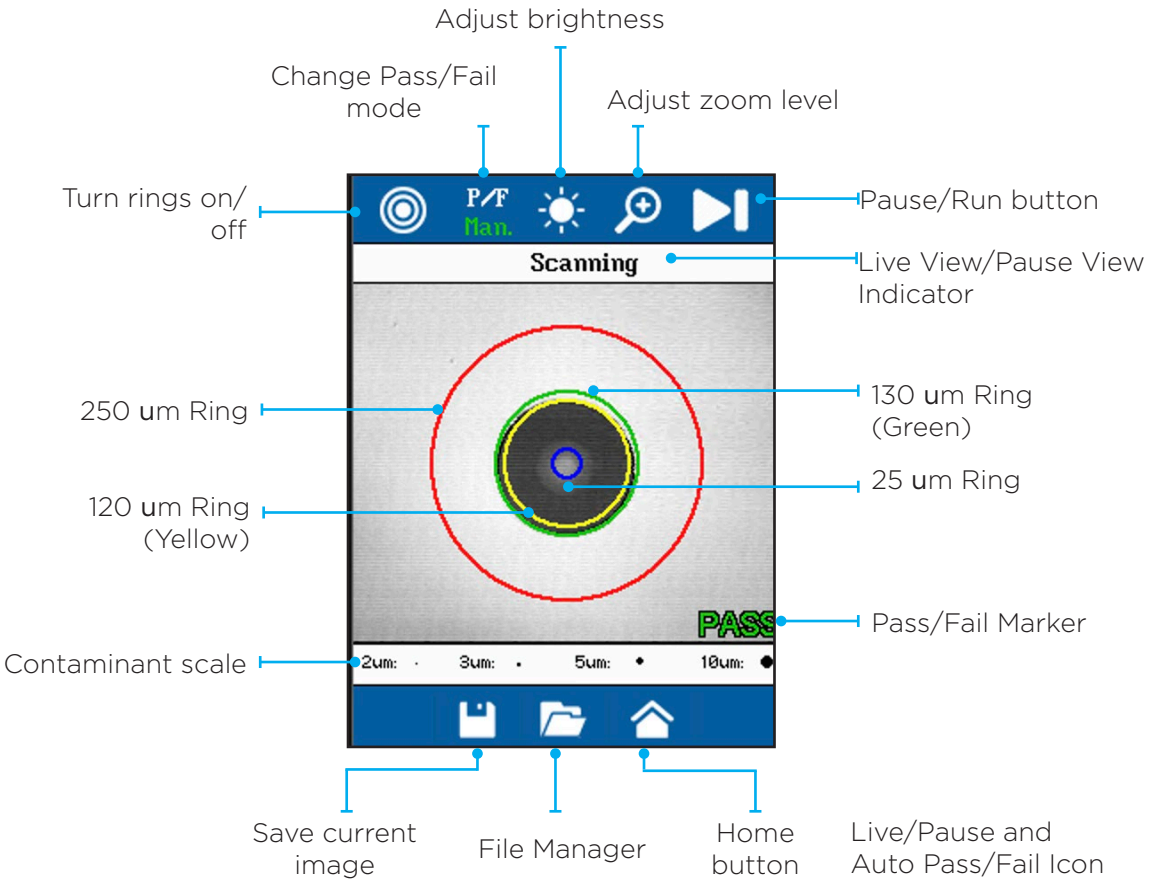
To autocenter the image, touch the center of the connector image and the connector will move as close as possible to the center of the display.

11.2 Video Inspection Probe Display

To operate the video scope, from the home screen, touch the Scope icon. If a probe is not connected already, connect the R-240-VIP video inspection probe to the video probe port on the top of the OTDR.



VIP Display



11.3 Video Inspection Probe Functions

Rings

Used to turn on and off the rings that indicate the IEC 61300-3-35 grading zones.
The rings do not need to be turned on for the automatic image grading test, they are for reference only.

Pass/Fail Modes

Off - No Pass/Fail indication will be marked on the image.
Man. PASS - All images will be marked PASS.
Man. FAIL - All images will be marked FAIL.
Auto - When scanning is paused, the image will be evaluated against the IEC 61300-3-35 standard and marked PASS or FAIL accordingly.

Adjust Brightness

Press to cycle through the brightness levels. Note that if the image is too dark, the automatic PASS/FAIL testing will tend to fail clean connectors.

Adjust Zoom

Toggles between low and high magnification.

Pause/Run Button

Pauses the image for automatic evaluation and PASS/FAIL testing. Press again to resume live scanning.

Home Button

Returns to OTDR Home main home screen

File Manager

Opens the file manager to create/delete projects and open saved files.

Save current image

Saves the current image to a selected project.

Containment scale

Reference for the size of contamination particles on the connector end-face.

11.4 Using the Video Inspection Probe

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

Pausing Image Scan
After centering the image, freeze it's position and focus level for inspection by touching the Pause/Run Icon. If the PASS/FAIL mode is set to Auto, pausing the image will start an automatic analysis of the connector and the result will be displayed in the bottom-right corner of the screen.

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

Pass/Fail
Use the pass/fail criteria tables on the next page to determine if the connector passes the IEC 61300-3-35 standard. There is a guide to contamination size located at the bottom of the image. To manually mark a connector as Pass or Fail, touch the Pass fail icon and cycle to the desired state. Once the pass fail status has be entered, the scan may be paused with the Live/Pause-Auto Pass/Fail icon to allow for marking the contamination points.

Marking Points of Contamination
To mark the points of contamination the unit must be in paused mode. Pick up the contamination marker by using the stylus and touching the contamination sample size that is required. Touch the image to place the marker. The marker may be fine-tuned with the stylus to cover the contamination point on the image to be marked. Once the marker is positioned properly, touch the contamination sample size again to set the marker. Repeat as many times as desired.

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

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

11.5 Connector Pass/Fail Criteria

Fiber End Face Criteria Table for Angled PC Polished Connectors

Zone	Description	Diameter	Allowable Scratches (Width)	Allowable Defects (Diameter)
A	Critical Zone	0 um to 25 um	≤ 4 um	None
B	Cladding Zone	25 um to 120 um	No limit	No Limit < 2 um 5 from 2 um to 5 um None > 5 um
C	Adhesive Zone	120 um to 130 um	No limit	No limit
D	Contact Zone	130 um to 250 um	No limit	None ≥ 10 um

Fiber End Face Criteria Table for Ultra PC Polished Connectors

Zone	Description	Diameter	Allowable Scratches (Width)	Allowable Defects (Diameter)
A	Critical Zone	0 um to 25 um	None	None
B	Cladding Zone	25 um to 120 um	No limit ≤ 3 um None > 3 um	No Limit < 2 um 5 from 2 um to 5 um None > 5 um
C	Adhesive Zone	120 um to 130 um	No limit	No limit
D	Contact Zone	130 um to 250 um	No limit	None ≥ 10 um

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

Zone	Description	Diameter	Allowable Scratches (Width)	Allowable Defects (Diameter)
A	Critical Zone	0 um to 25 um	2 ≤ 3 um None > 3 um	2 ≤ 3 um None > 3 um
B	Cladding Zone	25 um to 120 um	No limit ≤ 3 um None > 3 um	No Limit < 2 um 5 from 2 um to 5 um None > 5 um
C	Adhesive Zone	120 um to 130 um	No limit	No limit
D	Contact Zone	130 um to 250 um	No limit	None ≥ 10 um

Chapter 12 Loss Test Set

12.1 Loss Test Set Operation

The loss test set includes two components; an optical source and an optical power meter. On FiberMASTER, the OTDR port is also the optical source used for taking power loss measurements. It can be operated in continuous wave (CW) mode, or modulated at various frequencies for use with industry standard fiber identification devices and power meters that support modulation detection.

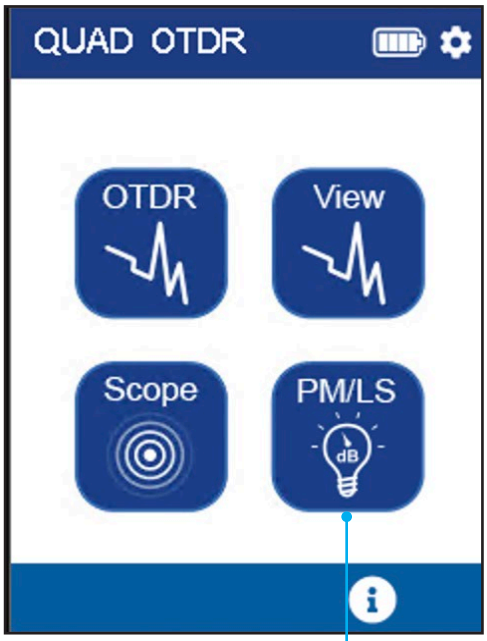
The power meter port uses a broadband detector on all OTDR models that can measure from 850 nm to 1625 nm. When used with the FiberMASTER source, the power meter automatically detects the wavelength being transmitted and sets itself to the same wavelength. The power meter can be used with any optical source, though the wavelength must be set manually.

The power meter includes LC, SC, ST, FC, 2.5 mm universal, and 1.25 mm universal adapters.

Power meter port

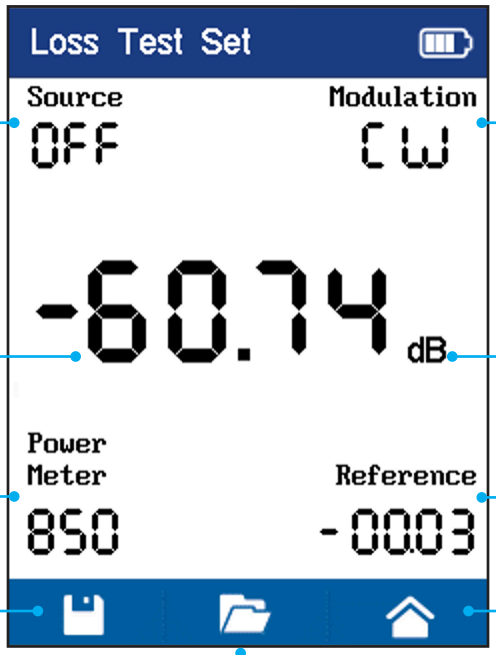
Single mode source port

Multi-mode source port



Press to activate Power meter/Light source Mode

12.2 Loss Test Set Display



Press to activate open light source wavelength selection

Press to open the source modulation options

Current measurement reading

Unit of measure

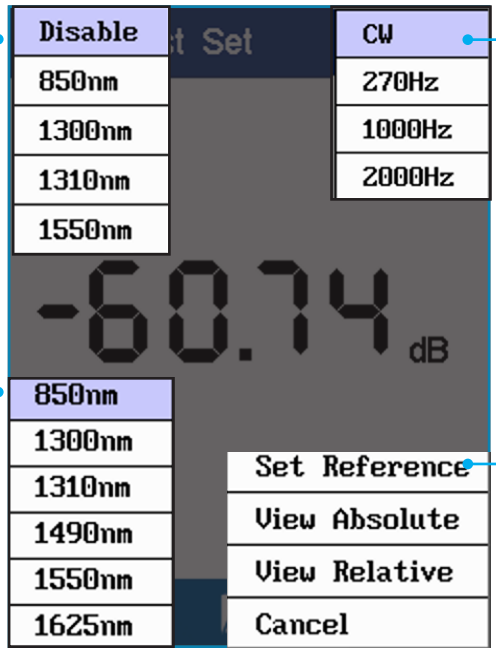
Press to open power meter wavelength selection

Press to open the power meter set reference options

Save current measurement

Open Project Manager

Return to the OTDR Home screen



Select the wavelength to be transmitted by the light source. Ensure the launch cable is connected to the correct connector for the selected wavelength.

Select the modulation of the light source. CW (continuous wave) is normally used when taking power measurements. 270, 1000, and 2000 Hz modulations are used to identify cables with fiber identifiers.

Select the wavelength to be measured by the power meter when not using the FiberMASTER light source. When the FiberMASTER source is used, the power meter will automatically detect the wavelength of the source.

Select whether the display is the absolute power value (dBm) or relative power (dB) after setting a reference value.

12.3 Power Meter Operation

The FiberMASTER power meter can be used with any light source to measure the amount of power entering the port. When used with the OTDR light source, the power meter's wavelength is automatically set to match the output of the OTDR source. When used with other light sources, the wavelength must be set manually.

Note: The wavelength information ID is transmitted during the initial 1-2 seconds of OTDR source activation. If the power meter is not connected to the OTDR source during this initial time, automatic wavelength detection cannot occur and the power meter wavelength will need to be set manually.

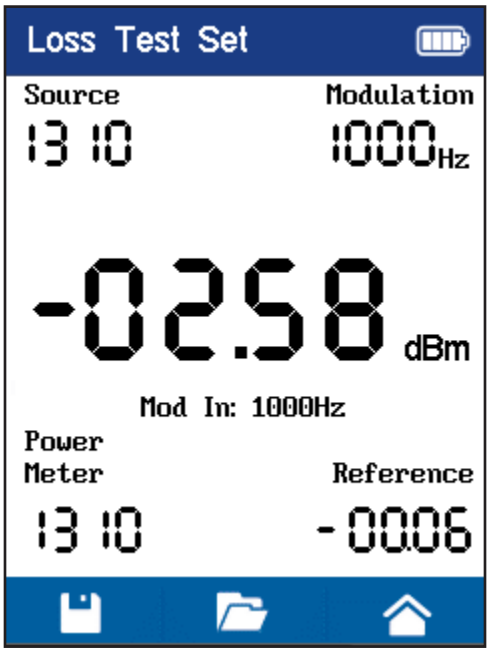
Power Meter Display Modes - View Absolute (dBm)
Displays power in dBm (decibel-miliwatt), meaning 0 dBm = 1 mW of power. This is an absolute reading of the amount of power arriving at the detector. Absolute power readings are useful when troubleshooting optical equipment to compare power arriving at the receive port to the specifications of the equipment.
Example, if the specification of an optical receiver states that the input power range is from -40 to 0 dBm. Use the power meter to measure the incoming power from the source fiber. If the incoming power is -50 dBm, it is below the minimum sensitivity of the receiver and it will not operate.

Power Meter Display Modes - View Relative (dB)
Displays changes in power from a reference point in dB (decibel). Measuring relative power is useful when testing the loss of a cable from one end to the other. To obtain an accurate measurement, a reference must first be made. The reference value is the absolute power (dBm 1) directly between the light source and the power meter, which is stored in the tester's memory. Then when making the relative measurement, a second absolute power measurement (dBm 2) and the difference between the two absolute measurements dBm 2 - dBm 1.

The power meter is set to absolute mode (dBm) with the source and meter both at 1310 nm.

When the meter is in absolute mode the Reference value can be ignored. It is only applicable when the meter is in relative (dB) mode.

Below the power reading is the modulation detection. It will display 270Hz, 1000Hz, or 2000Hz when an the incoming signal is modulated. This function is used to ensure the intended fiber is being measured while in the presence of other live fibers.



12.4 Light Source Operation

The light source is located in the top left portion of the display. The current status is displayed, example, 1310 is displayed when the 1310 nm SM source is active, OFF is displayed when no source is active.

Press the desired wavelength to activate the source. The power meter will auto-detect the FiberMASTER source wavelength only when connected during the initial turn-on sequence.

In the top right portion of the display, select the modulation of the light source. CW (continuous wave) is the normal operating mode for use with any power meter. 270, 1000, or 2000 Hz modulations can be enabled for use with power meters or fiber identifiers that detect any of these three frequencies.

Menu Bar

Save
Saves the current reading to internal memory. Files can be opened by themselves or attached to an OTDR trace for reporting.

Note: For safety, the source will turn off when a file is saved and must be enabled to test again.

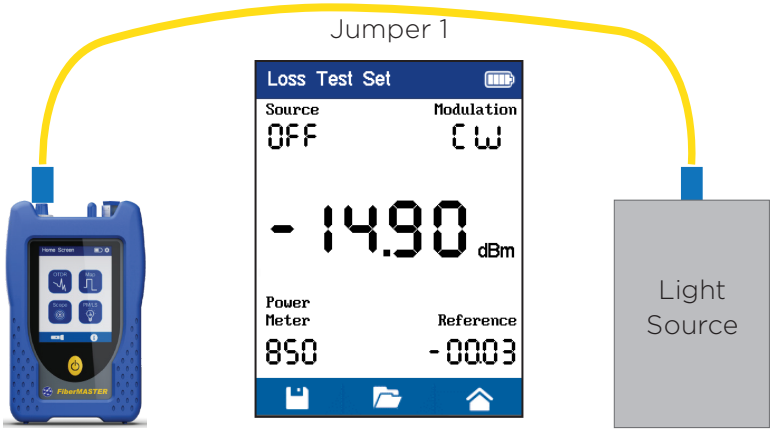
Project Manager
Open the project manager to view stored test files.

Home
Returns to the main OTDR home screen.

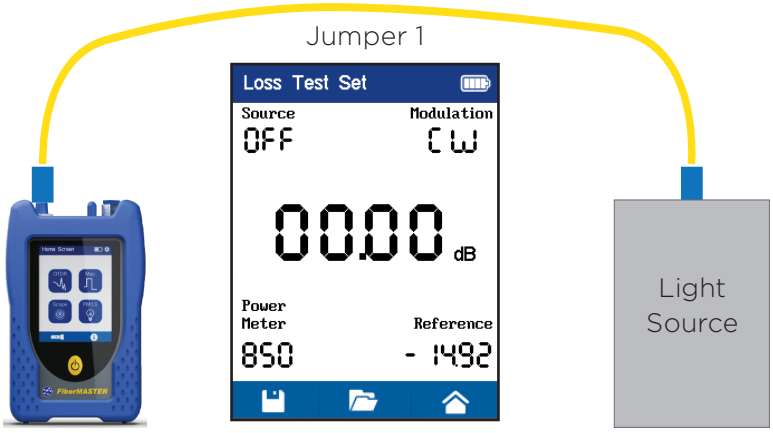
12.5 Setting a Reference Value and Testing a Cable

When testing a cabling link for dB loss, the starting power level going into the cable under test must be known, excluding the loss of any test jumpers. This process is known as setting a reference. Failure to set the reference will result in inaccurate loss readings.

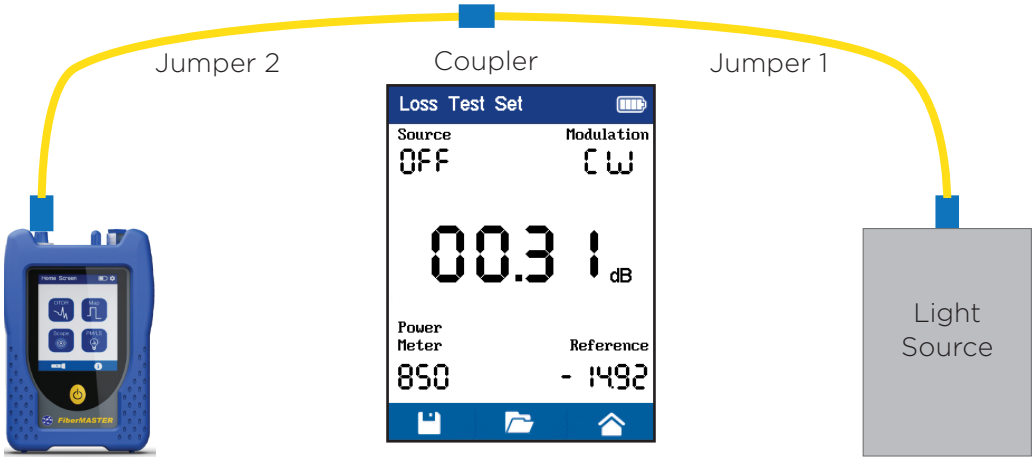
1. Connect test jumper 1 between the light source and power meter with the meter set in Absolute mode. Any light source can be used.



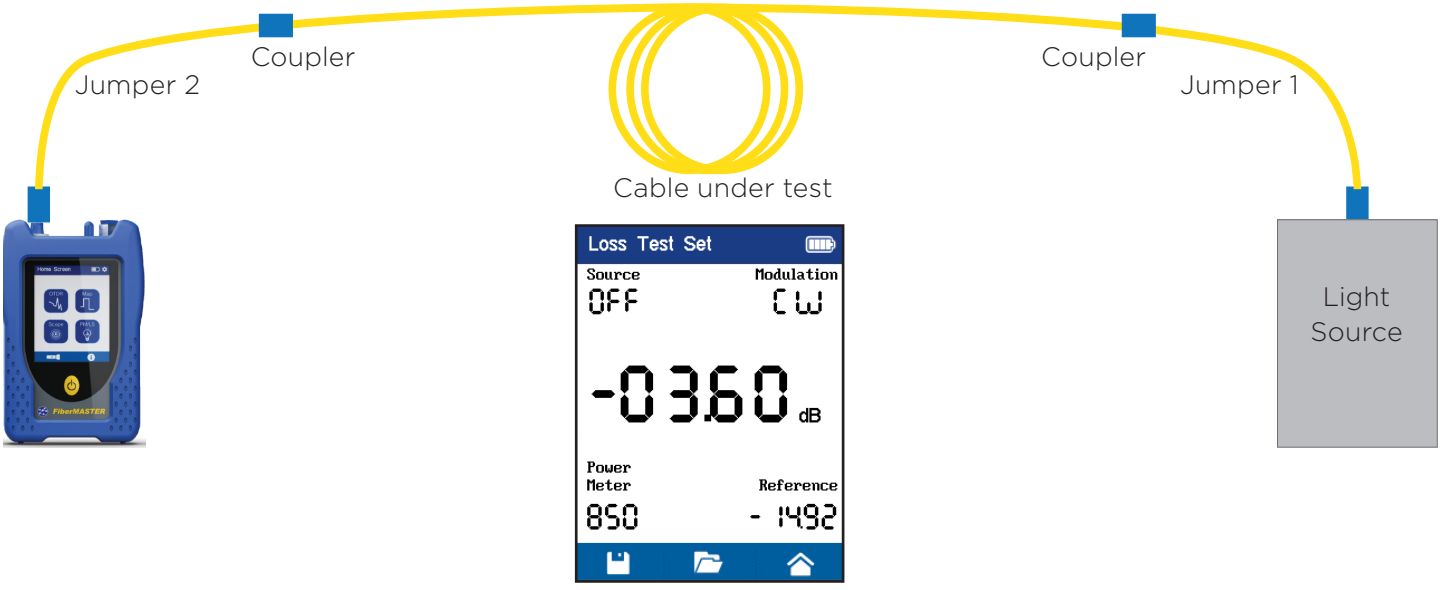
2. Press Set Reference on the bottom right menu to store the reference value in the meter. The display will change to 0.00 dB which is now in the relative mode.



3. Disconnect jumper 1 from the power meter.
   Do not disconnect the jumper from the light source once the reference has been set.
4. Connect jumper 2 between the power meter and jumper 1 using a coupler. The loss value shown here is the loss of jumper 2 and coupler. Ensure that the value is less than 0.75 dB. If the value exceeds 0.75 dB clean the connections or use a new set of jumpers and return to step 1.



5. Connect the cable to be tested between the two jumpers. Read the loss of the cable and store the reading if desired.



Chapter 13 Visual Fault Locator

13.1 VFL Safety

Caution

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

13.2 VFL Description

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

13.3 VFL Operation

The Visual Fault Locator is access from the Home screen.

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

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

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

Chapter 14 Specifications

14.1 OTDR Specifications

Wavelength	850, 1300, 1310,1550 and 1625 ±20 nm
Dynamic Range	Multi-mode: 29 dB @ 850 nm, 30, dB @ 1300 nm SInglemode: 37 dB @ 1310 nm, 38 dB @ 1550 nm PON: 36 dB @ 1625 nm
Pulse Width	5 - 20,000 ns
Units of Measurement	km
Event Dead zone	1 meter
Attenuation Dead Zone	5 meter
Resolution	.125 - 32m
Distance Uncertainty	±(0.75m + 0.005% x distance + sampling resolution)
Full Scale Distance Range	0.25-128 km
Typical Real-time Refresh Rate	2 Hz
Group Index of Refraction (GIR)	1.024 - 2.048
Linearity	± .05 dB/dB
Memory Capacity	~40,000
Memory Type	Internal
Power Supply / Charger	5V, 2.1A USB Charger
Battery	Li-Poly, 3.7V, 8,000 mAh, 10 hour operation typical
Storage Temperature	-20 to 60 C
Operating Temperature Range	0 to 40 C
Dimensions (w/out rubber boot)	6.25” L x 4.125” W x 1.875” H (159mm L x 105mm W x 48mm H)
Weight	1.5 lbs (0.7 kg)
Communications ports	USB and Bluetooth
Connector Styles	SC UPC MM/SM, SC APC PON

TREND reserves the right to change specifications without notice.

14.2 Power Meter Specifications

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

14.3 Light Source Specifications

Fiber Type	Single mode, Multimode
Wavelengths	850, 1300, 1310, 1550, 1625 nm ±20 nm *
Output Power	0 dBm ±0.5 dB (-3 dBm ± 0.5 dB @ 1625 nm)
Laser safety classification	Class I Safety Per FDA/CDRH and IEC-825-1 Regulation
Modulation Modes	CW, 270 Hz, 1000 Hz, 2000 Hz

* Light source wavelengths present are determined by the OTDR configuration

14.4 Visible Fault Locator Specifications

Emitter Type	Laser Photo Diode
Wavelength	650 nm ±5nm
Output Power	1 mW Max.
Connector Type	2.5 mm Universal
Laser safety classification	Class 2 Per FDA/CDRH and IEC-825-1 Regulation
Modulation Modes	CW, 1 Hz

Chapter 15 CertSoft 2 PC Software

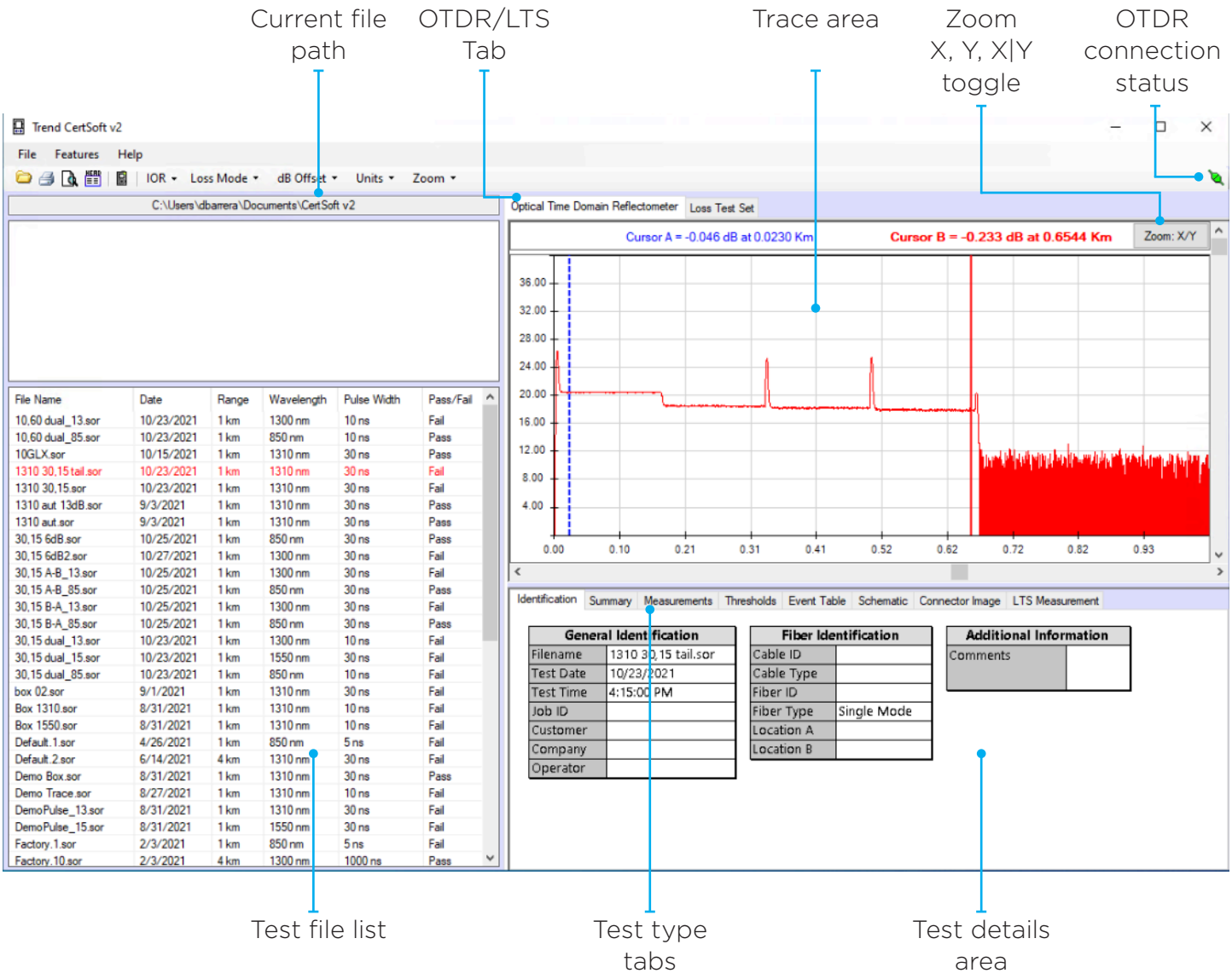
15.1 Description

CertSoft2 is a Windows PC software application used to transfer test files from the FiberMASTER OTDR to the PC for archival and generation of test reports. Download and install the software from /support

Requirements:

- Windows 7 or newer running on an Intel or AMD x86 PC.
- 8 GB RAM, 500 MB disk space
- USB Type A port

User Interface

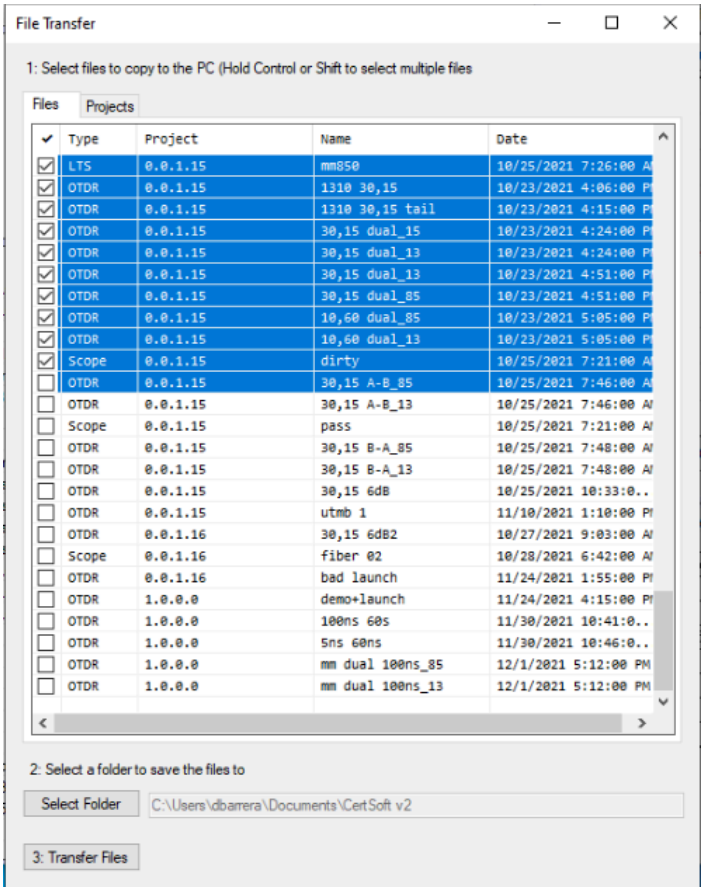


16.2 Transferring Files

Connect the OTDR to the PC using a USB cable. Verify that the OTDR connection status icon turns green. If the icon does not turn green check the following:

- Cable plugged securely into OTDR, the LED light should be on.
- Ensure the cable is plugged directly into the PC, not into a USB hub.
- Reinstall the CertSoft2 software and ensure the USB drivers are installed.

The first column identifies the type of file. Click Features on the menu, then select File Transfer.



Type	Project	Name	Date
LTS	0.0.1.15	mm850	10/25/2021 7:26:00 A
OTDR	0.0.1.15	1310 30,15	10/23/2021 4:06:00 P
OTDR	0.0.1.15	1310 30,15 tail	10/23/2021 4:15:00 P
OTDR	0.0.1.15	30,15 dual_15	10/23/2021 4:24:00 P
OTDR	0.0.1.15	30,15 dual_13	10/23/2021 4:24:00 P
OTDR	0.0.1.15	30,15 dual_13	10/23/2021 4:51:00 P
OTDR	0.0.1.15	30,15 dual_85	10/23/2021 4:51:00 P
OTDR	0.0.1.15	10,60 dual_85	10/23/2021 5:05:00 P
OTDR	0.0.1.15	10,60 dual_13	10/23/2021 5:05:00 P
Scope	0.0.1.15	dirty	10/25/2021 7:21:00 A
OTDR	0.0.1.15	30,15 A-B_85	10/25/2021 7:46:00 A
OTDR	0.0.1.15	30,15 A-B_13	10/25/2021 7:46:00 A
Scope	0.0.1.15	pass	10/25/2021 7:21:00 A
OTDR	0.0.1.15	30,15 B-A_85	10/25/2021 7:48:00 A
OTDR	0.0.1.15	30,15 B-A_13	10/25/2021 7:48:00 A
OTDR	0.0.1.15	30,15 6dB	10/25/2021 10:33:0..
OTDR	0.0.1.15	utmb 1	11/10/2021 1:10:00 P
OTDR	0.0.1.16	30,15 6dB2	10/27/2021 9:03:00 A
Scope	0.0.1.16	fiber 02	10/28/2021 6:42:00 A
OTDR	0.0.1.16	bad launch	11/24/2021 1:55:00 P
OTDR	1.0.0.0	demo+launch	11/24/2021 4:15:00 P
OTDR	1.0.0.0	100ns 60s	11/30/2021 10:41:0..
OTDR	1.0.0.0	5ns 60ns	11/30/2021 10:46:0..
OTDR	1.0.0.0	mm dual 100ns_85	12/1/2021 5:12:00 PM
OTDR	1.0.0.0	mm dual 100ns_13	12/1/2021 5:12:00 PM

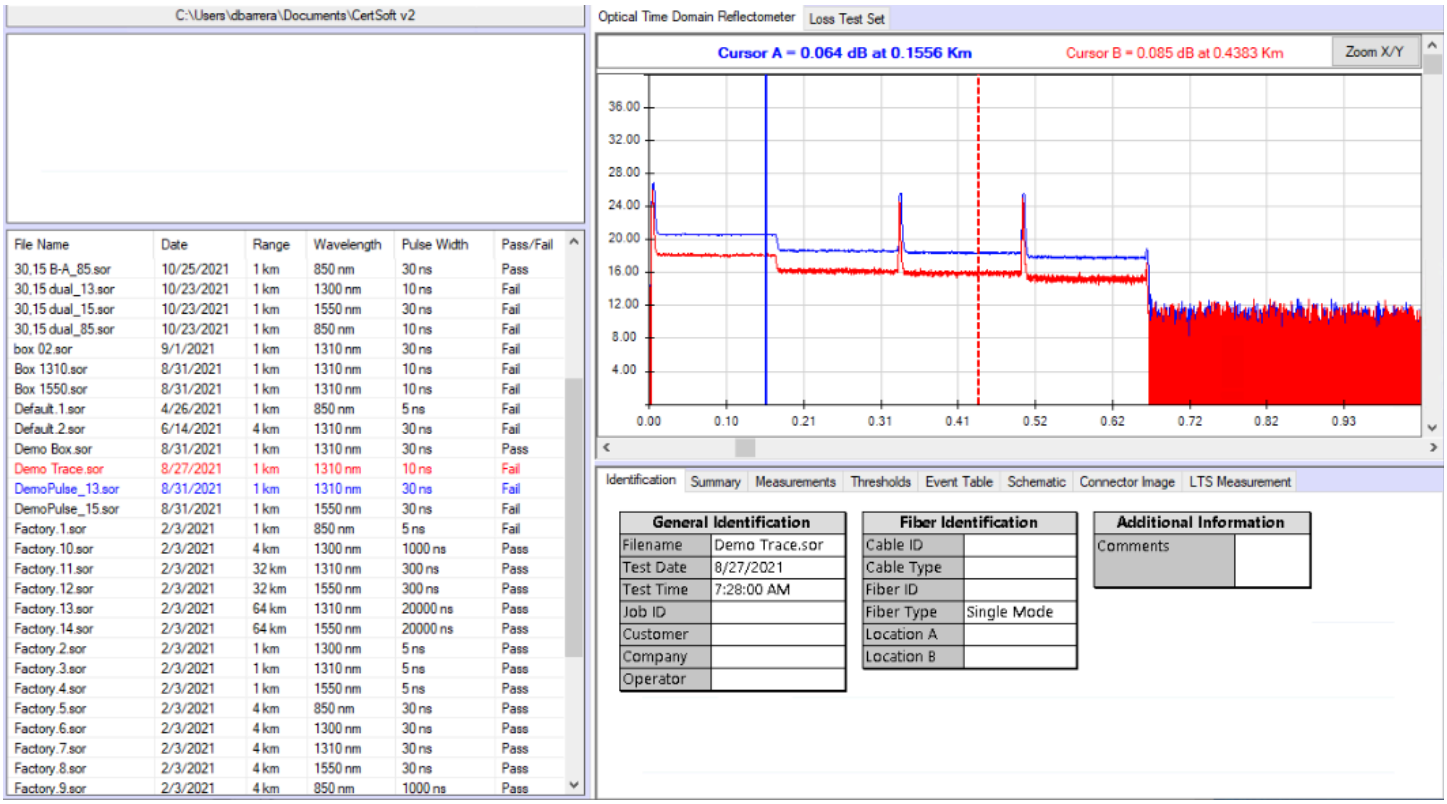
- Select the files to import by either choosing the box beside the file or select multiple file by selecting the first file name, holding Shift, then selecting the last file name to choose all of the files in between.
- Select the Projects tab to import all files within a selected project.
- Click Select Folder to choose the target folder to copy the files to.

Click Transfer Files to start copying files from the OTDR to the PC.

15.3 Opening a Trace

Double-click a file in the list to open a trace.

- Double-click the same file to close the trace.
- A second trace can be opened to compare two traces in the window.
- The trace color matches the color of the file name in the test list.



File Name	Date	Range	Wavelength	Pulse Width	Pass/Fail
30,15 B-A_85.sor	10/25/2021	1 km	850 nm	30 ns	Pass
30,15 dual_13.sor	10/23/2021	1 km	1300 nm	10 ns	Fail
30,15 dual_15.sor	10/23/2021	1 km	1550 nm	30 ns	Fail
30,15 dual_85.sor	10/23/2021	1 km	850 nm	10 ns	Fail
box 02.sor	9/1/2021	1 km	1310 nm	30 ns	Fail
Box 1310.sor	8/31/2021	1 km	1310 nm	10 ns	Fail
Box 1550.sor	8/31/2021	1 km	1310 nm	10 ns	Fail
Default.1.sor	4/26/2021	1 km	850 nm	5 ns	Fail
Default.2.sor	6/14/2021	4 km	1310 nm	30 ns	Fail
Demo Box.sor	8/31/2021	1 km	1310 nm	30 ns	Pass
Demo Trace.sor	8/27/2021	1 km	1310 nm	10 ns	Fail
DemoPulse_13.sor	8/31/2021	1 km	1310 nm	30 ns	Fail
DemoPulse_15.sor	8/31/2021	1 km	1550 nm	30 ns	Fail
Factory.1.sor	2/3/2021	1 km	850 nm	5 ns	Fail
Factory.10.sor	2/3/2021	4 km	1300 nm	1000 ns	Pass
Factory.11.sor	2/3/2021	32 km	1310 nm	300 ns	Pass
Factory.12.sor	2/3/2021	32 km	1550 nm	300 ns	Pass
Factory.13.sor	2/3/2021	64 km	1310 nm	20000 ns	Pass
Factory.14.sor	2/3/2021	64 km	1550 nm	20000 ns	Pass
Factory.2.sor	2/3/2021	1 km	1300 nm	5 ns	Pass
Factory.3.sor	2/3/2021	1 km	1310 nm	5 ns	Pass
Factory.4.sor	2/3/2021	1 km	1550 nm	5 ns	Pass
Factory.5.sor	2/3/2021	4 km	850 nm	30 ns	Pass
Factory.6.sor	2/3/2021	4 km	1300 nm	30 ns	Pass
Factory.7.sor	2/3/2021	4 km	1310 nm	30 ns	Pass
Factory.8.sor	2/3/2021	4 km	1550 nm	30 ns	Pass
Factory.9.sor	2/3/2021	4 km	850 nm	1000 ns	Pass

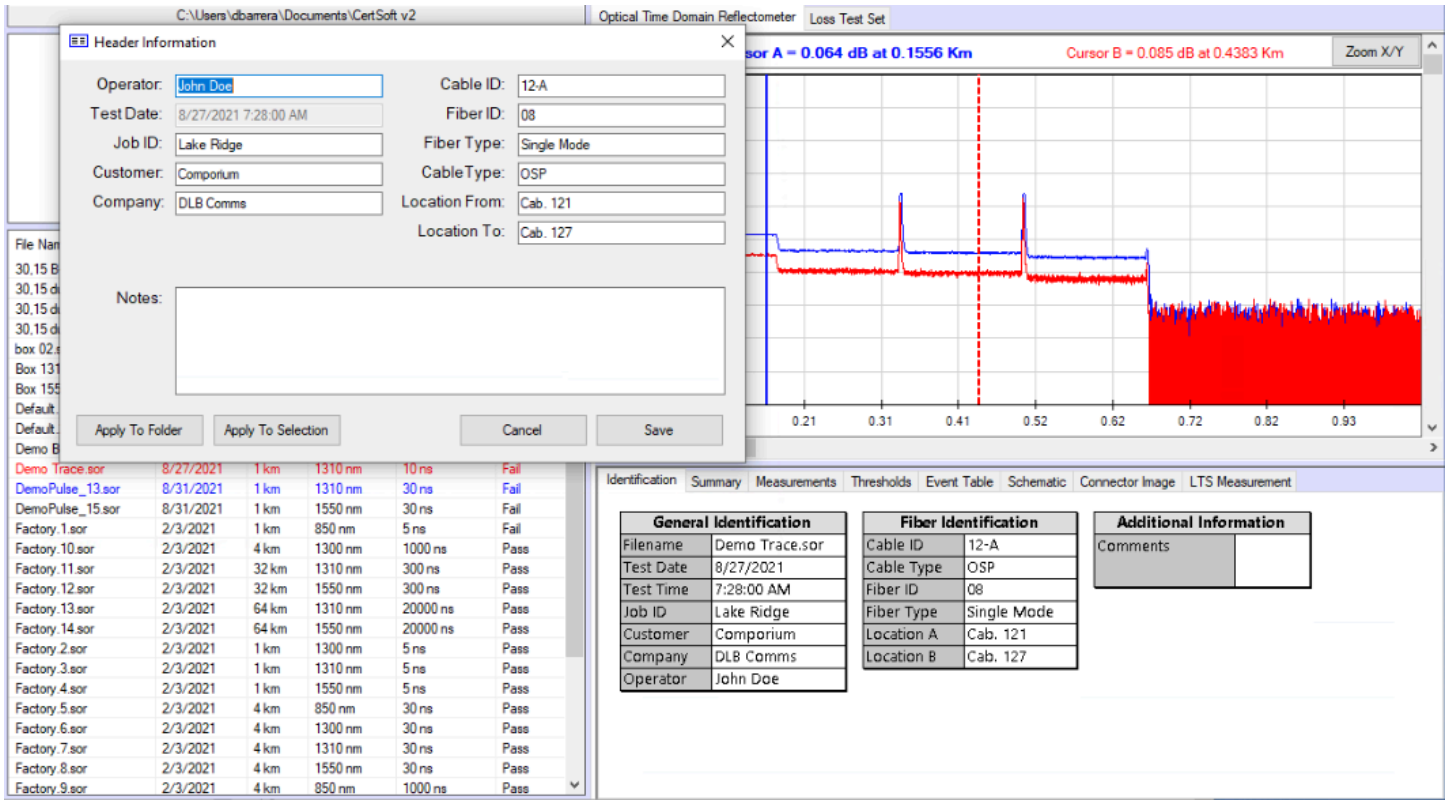
- Left-click on the trace to position the selected cursor.
- Right-click to toggle between cursor A (blue) and cursor B (red).

Click Transfer Files to start copying files from the OTDR to the PC.

15.4 Editing Trace Information

Information can be applied to the header for fiber(s) in the active folder. This information will appear on the printed/PDF reports.

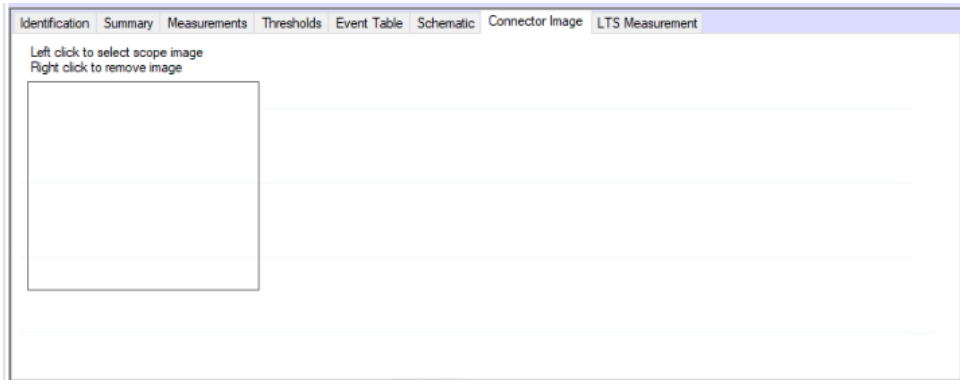
- Click the General Information box to edit the Header Information.
- Update the desired information.
- Press Apply to Folder to save this information to all tests in the active folder. Press Apply to Selection to save this information to the current test.

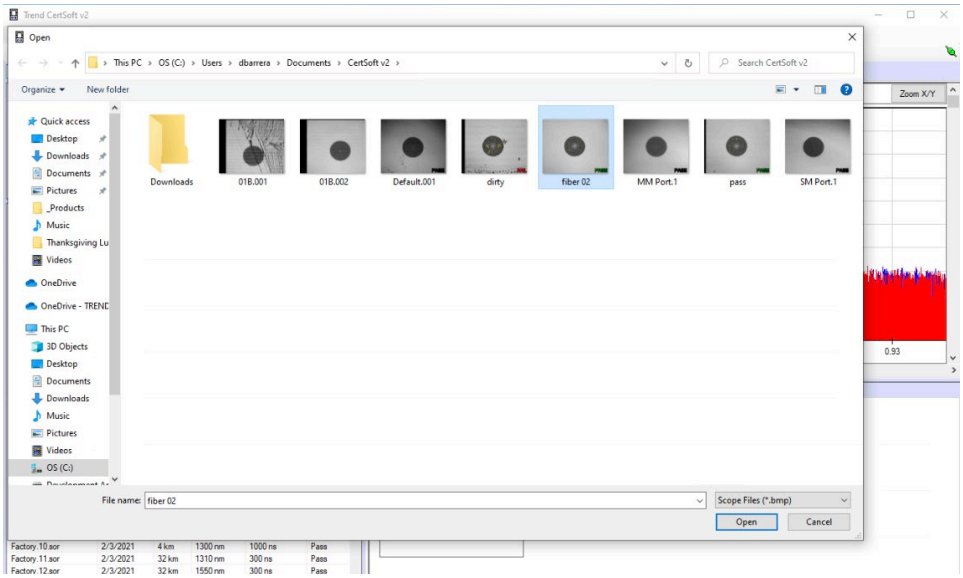


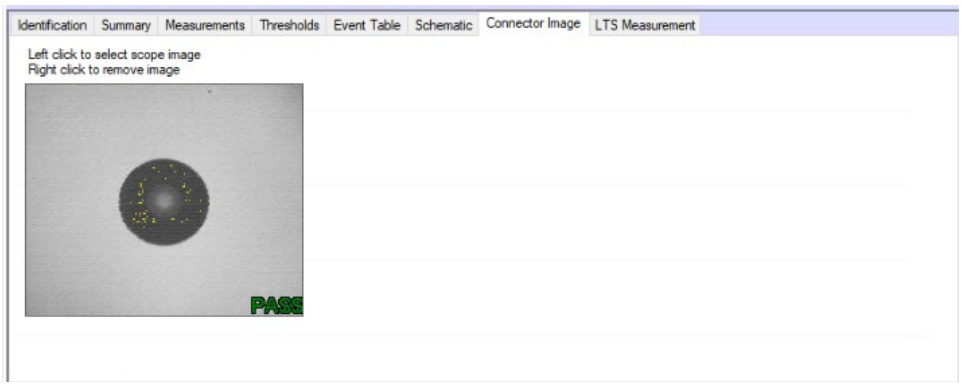
15.5 Adding Connector Images

A connector image from the video inspection probe can be attached to each trace file. The image will appear on the printed/PDF reports.

- Click on the Connector Image tab.
- Click in the box to add an image.
- Select an image from the active directory. The image files are transferred the in the same manner as the OTDR trace files.
- The selected image will appear in the Connector Image tab. Right-click the image to remove it and left-click in the box to add another.



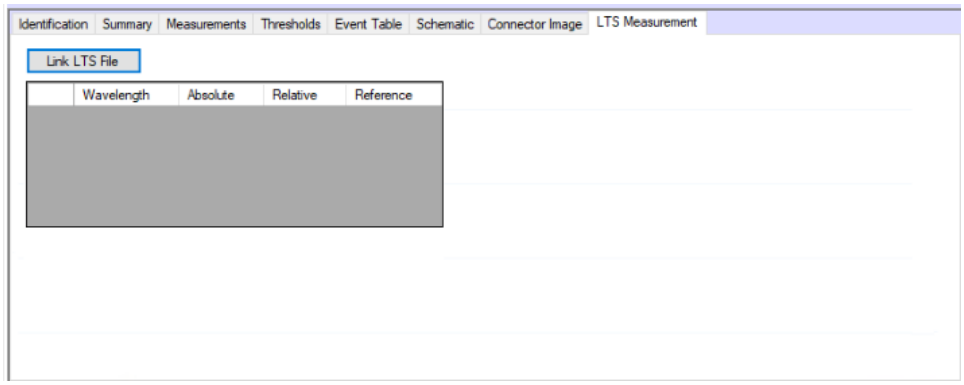


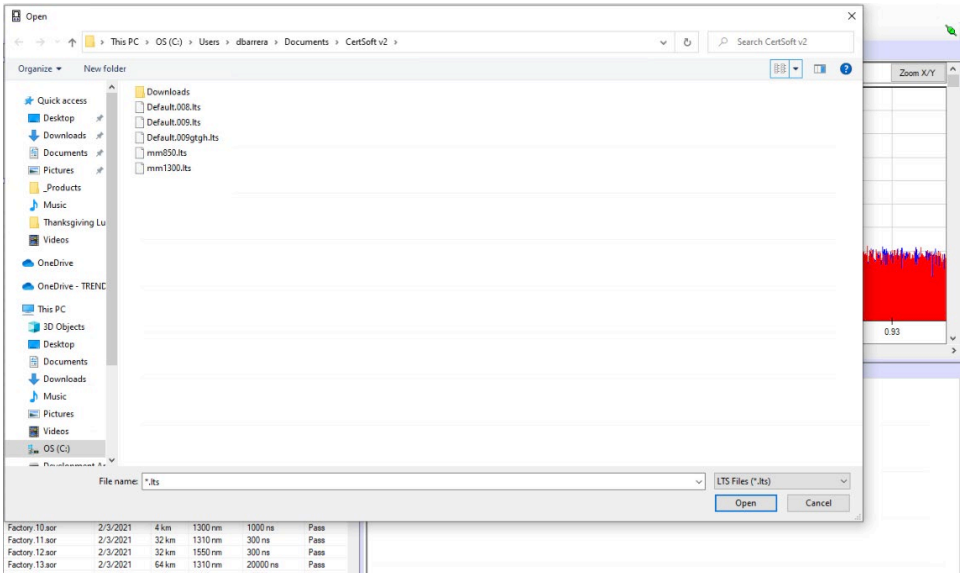


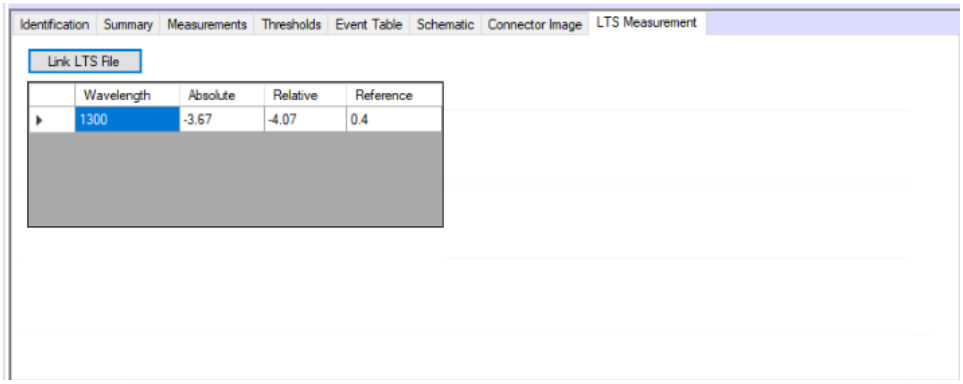
15.6 Adding Loss Test Set Measurements

Loss test sets measurements are light source/power meter measurements made with the OTDR that can be attached to a trace.

- Click on the LTS Measurement tab.
- Click the Link LTS File button.
- Select an LTS file from the active directory. The LTS files are transferred the in the same manner as the OTDR trace files.
- The selected result will appear in the the window with the wavelength, absolute power level, relative loss, and reference level displayed.



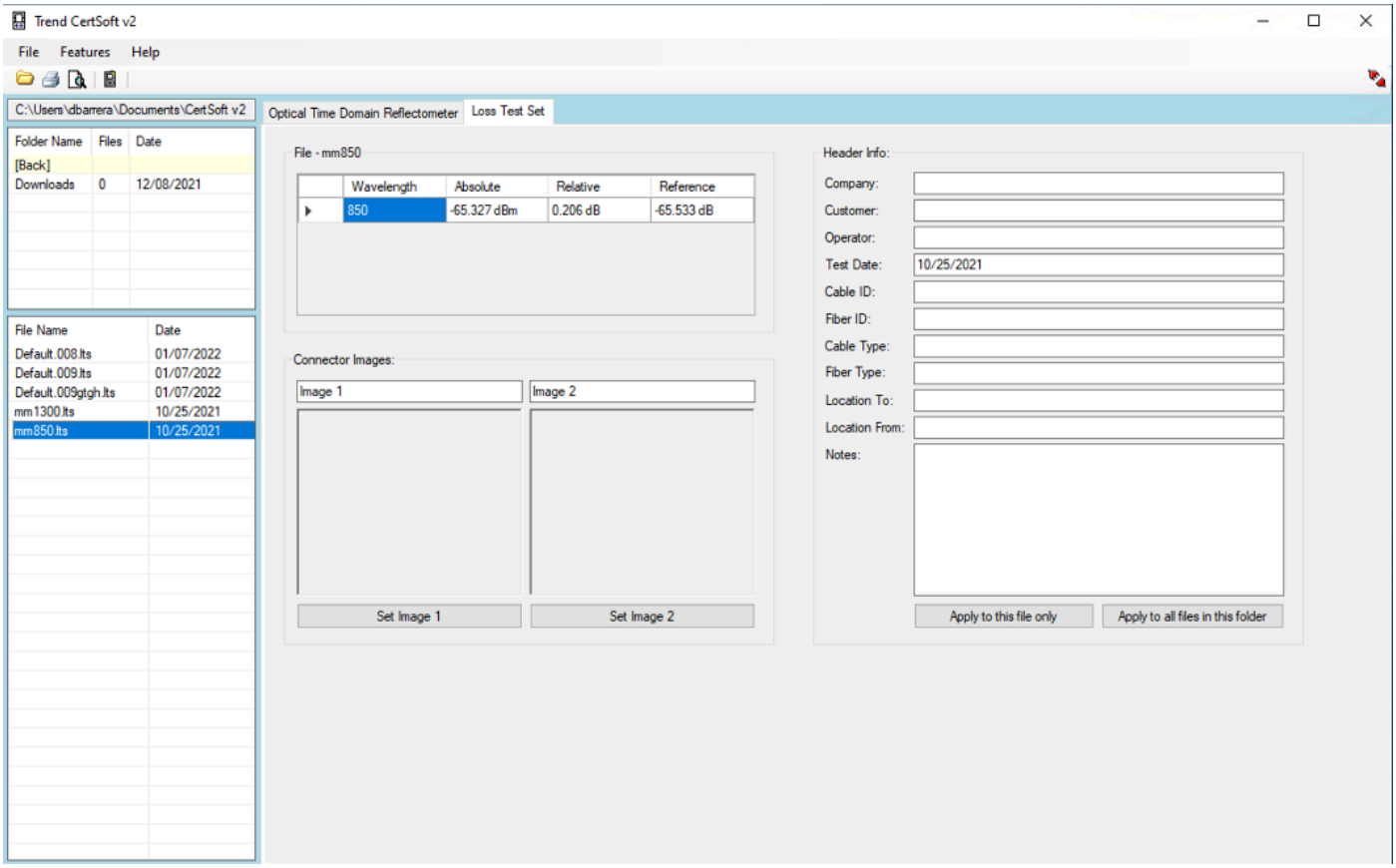




15.7 Loss Test Set Mode

The Loss Test Set tab is used to open LTS files that are not associated with an OTDR trace. This mode is compatible with the FiberMASTER OTDR and the FiberMASTER Power Meter/Light Source test kit.

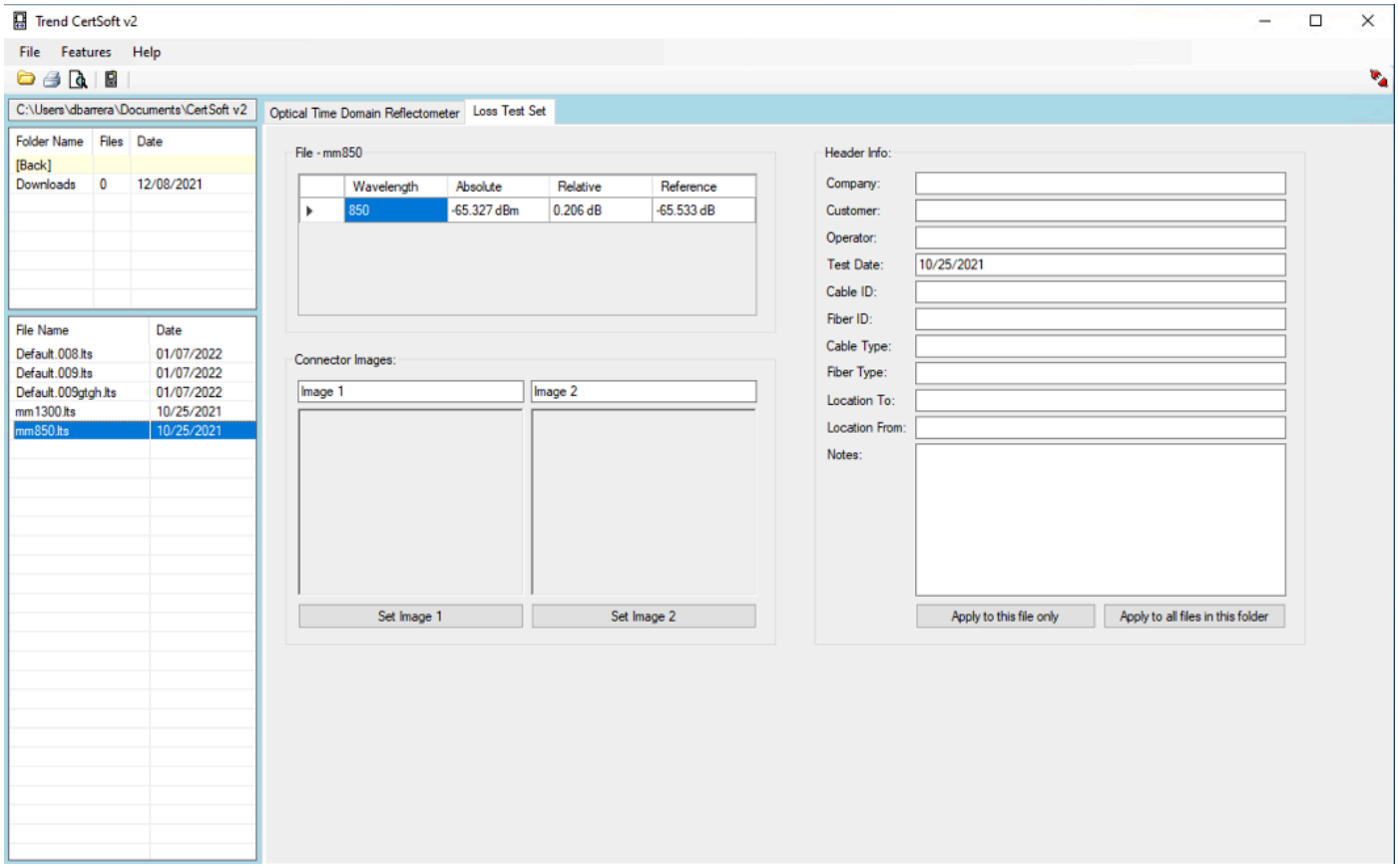
- Click on the Loss Test Set tab.
- Select an LTS file from the active directory. The LTS files are transferred the in the same manner as the OTDR trace files.
- The selected result will appear in the the window with the wavelength, absolute power level, relative loss, and reference level displayed.
- Select up to two connector images that will be displayed on the report.
- Enter information for the Header Info that summarizes the test identification. Apply the information to only the active test or to all tests in the current folder.



15.8 Generating Test Reports

The Loss Test Set tab is used to open LTS files that are not associated with an OTDR trace. This mode is compatible with the FiberMASTER OTDR and the FiberMASTER Power Meter/Light Source test kit.

- Click on the Loss Test Set tab.
- Select an LTS file from the active directory. The LTS files are transferred the in the same manner as the OTDR trace files.
- The selected result will appear in the the window with the wavelength, absolute power level, relative loss, and reference level displayed.
- Select up to two connector images that will be displayed on the report.
- Enter information for the Header Info that summarizes the test identification. Apply the information to only the active test or to all tests in the current folder.



15.9 Updating Instrument Firmware

The FiberMASTER firmware is routinely updated to add or improve functionality. Updating the firmware requires a Windows PC with an available USB port and the CertSoft2 PC software.

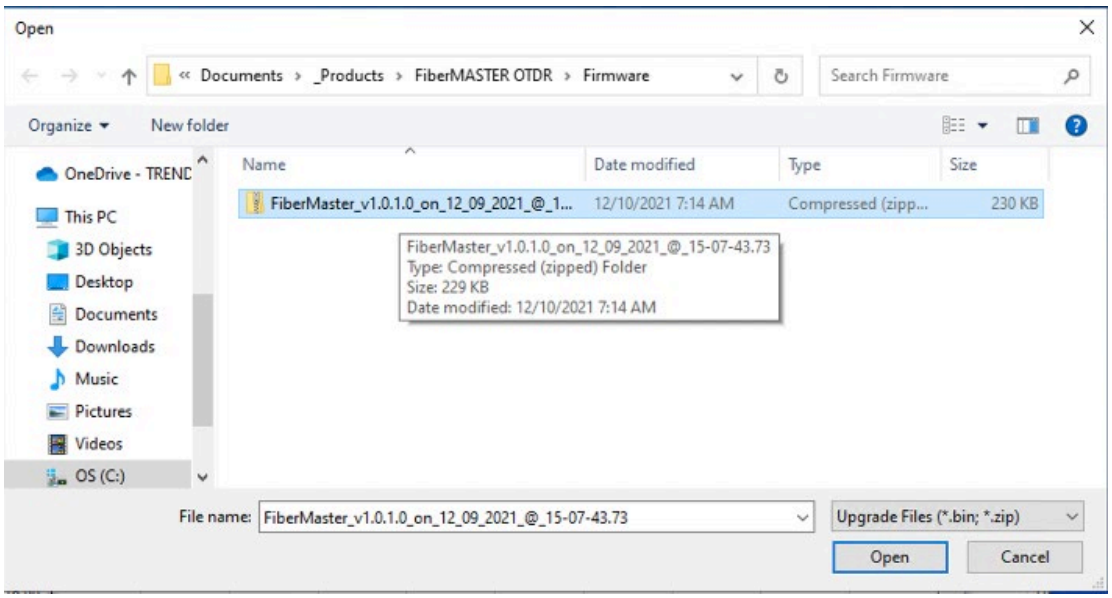
Updating the firmware does not delete any files or settings from the OTDR. However, in the event a problem occors during the update it is recommended that all test files be uploaded to CertSoft2 before updating the firmware.

ENSURE THE BATTERY IS FULLY CHARGED BEFORE PROCEEDING.

Download the latest firmware from /support
Take note of the directory to which the firmware zip file is downloaded. Do not unzip the firmware file.

Open CertSoft2 and connect the FiberMASTER to the PC with the USB cable. Confirm the connection status by checking that the icon in the upper-right corner of the screen is green. If the OTDR does not connect, try disconnecting/reconnecting the USB cable, cycling the OTDR power and restarting the software to reset the USB connection.

1. Click on Help
2. Click Firmware Upgrade
3. Click Select Upgrade File
4. Navigate to the firmware zip image file. Note, do not unzip the file. Simply select the zip file as shown.



5. Click Open to choose the update image.
6. The update will begin. Follow the prompts to complete the update process.

DO NOT DISCONNECT THE USB CABLE OR POWER OFF THE OTDR DURING THE UPDATE PROCESS.

If the update process stops responding during the update:

1. Wait 5 minutes
2. Power OFF the OTDR
3. Disconnect the USB cable
4. Clear any warnings on CertSoft2
5. Close CertSoft2
6. Open CertSoft2
7. Power ON the OTDR
8. Connect the USB cable
9. Confirm the connection status is green
10. Restart the firmware update process