AFL Telecommunications
A Fujikura Business

Test & Inspection

M200
Handheld OTDR
User's Guide

NOYES
Test & Inspection

Limited Warranty

One Year Limited Warranty

All Noyes products are warranted against defective material and workmanship for a period of one year from the date of shipment to the original customer.

Any product found to be defective within the warranty period will be repaired or replaced by Noyes.

In no case will Noyes liabilities exceed the original purchase price of the product.

Exclusions

The warranty on your equipment shall not apply to defects resulting from the following:

- Unauthorized repair or modification
- Misuse, negligence, or accident

CE Information

CE

These instruments have been designed and tested to comply with the relevant sections of any applicable specifications including full compliance with all essential requirements of all applicable EU Directives.

Returning Equipment

To return equipment, please contact Noyes to obtain additional information and a Service Request (S.R.) number. To allow us to serve you more efficiently, please include a brief description specifying the reasons for the return of the equipment.

AFL Telecommunications

Noyes Test & Inspection

16 Eastgate Park Road

Belmont, NH 03220

Tel: 800-321-5298

603-528-7780

Fax: 603-528-2025

This is a quick reference user's guide for the M200 OTDR. It assumes basic knowledge in the use of an OTDR and a PC.

Table of Contents

Safety Information

WARNING! Use of procedures or adjustments other than those specified herein may result in hazardous radiation exposure.

850/1300 nm multimode OTDR port	**This is a CLASS I LASER output** 
1310/1550 nm single-mode OTDR port	**This is a CLASS I LASER output** 
VFL port	**This is a CLASS II LASER output. Do not stare into beam** 

WARNING! Do not connect the OTDR to any fiber that is not dark, or that is terminated by a device with reflectivity > -13 dB.

CAUTION! To avoid serious eye injury, never look directly into the optical outputs of fiber optic network equipment, test equipment, patch cords, or test jumpers. Refer to your company's safety procedures when working with optical systems.

WARNING! Use only the specified AC adapter. Use of another type of AC adapter can damage the instrument and create the danger of fire and electrical shock.

WARNING! To avoid the danger of fire and electrical shock:

- Never use a voltage that is different from that for which the AC adapter is rated.
- Do not plug the unit into a power outlet that is shared by other devices.
- Never modify the power cord or excessively bend, twist, or pull it.
- Do not allow the power cord to become damaged. Do not place heavy objects on the power cord or expose it to heat.
- Never touch the AC adapter while your hands are wet.
- Should the power cord become seriously damaged (internal wiring exposed or shorted), contact the manufacturer to request servicing.

CAUTION! Do not run any tests or perform functions that activate an M200 laser unless fiber is attached to the corresponding OTDR port.

NOTICE! An M200 OTDR contains no user serviceable parts. Except for changing batteries and cleaning optical ports, this instrument must be returned to Noyes or authorized agents for repair and calibration.

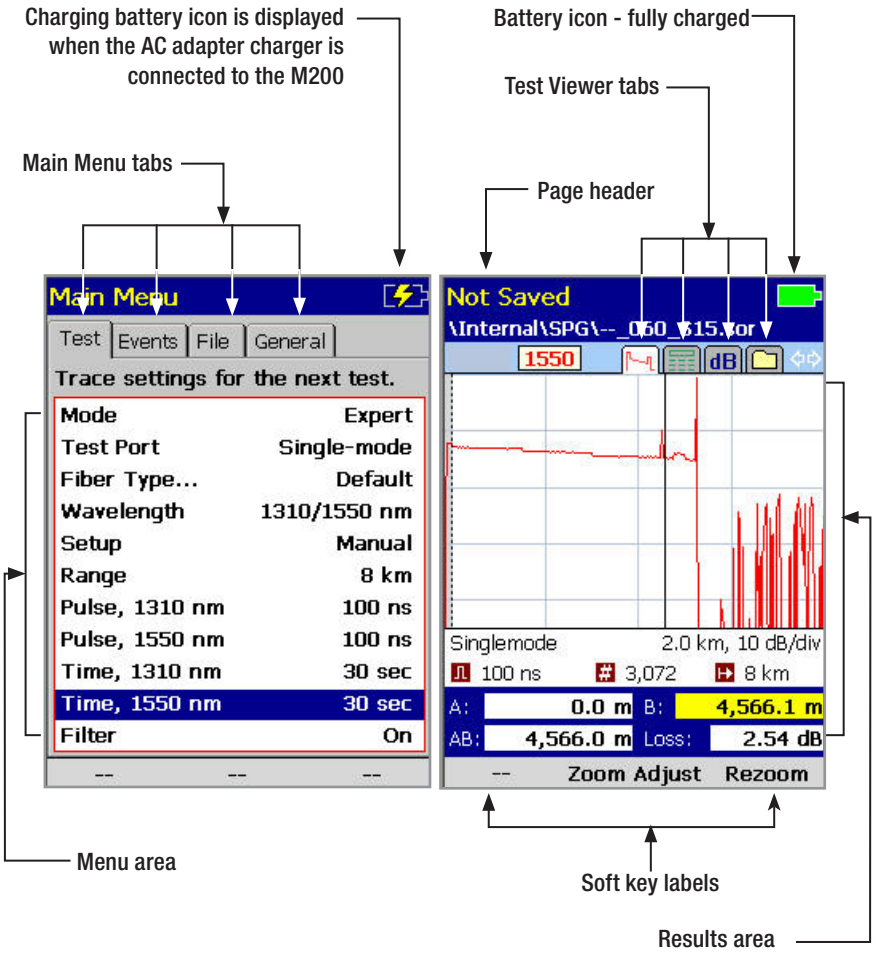
IMPORTANT! Proper care in handling should be taken when using any precision optical test equipment. Scratched or contaminated optical connectors can impact the performance of the instrument. It is important to keep the dust caps in place when the unit is not being used.

Getting Started: M200 Keys

The use of each key is summarized in the table below.

Key Symbol	Key Name	Key Function
	Power	Press and hold (approx. 1 sec.) to turn the M200 on or off.
	VFL laser	**ON 2Hz** - Press and hold (approx. 2 sec.) LED will flash **ON CW** - Press and hold (approx. 4 sec.) LED will be solid **OFF** - Press and hold (approx. 1 sec.) LED should be OFF
	Menu	Press to access the Main Menu.
	Left and Right Tab keys	Press to display the next/previous available Menu Tab or View Tab.
	Arrow keys (Navigation Keys)	The arrow keys provide several functions as follows: • In the Main Menu, these keys are used to navigate menus and change setup parameters. • In the Trace Page, the Left and Right arrow keys are used to move cursors. • In the Zoom Adjust Page, these keys are used to change horizontal and vertical zoom levels.
	Select	This key provides several functions as follows: • In the Main Menu, press this key to display a submenu (if available). • In the Trace Page, press this key to toggle between [A] and [B] cursor.
	Back	Press once to return to the previous menu. Press one or more times, depending on which menu or editor submenu is displayed, to return to the Home page.
	Test	Press to start or stop a test.
	Save	Press to save the currently displayed test results.
	Soft keys	The label shown on the display above each key indicates the current use of each function key.

Getting Started: Display Features



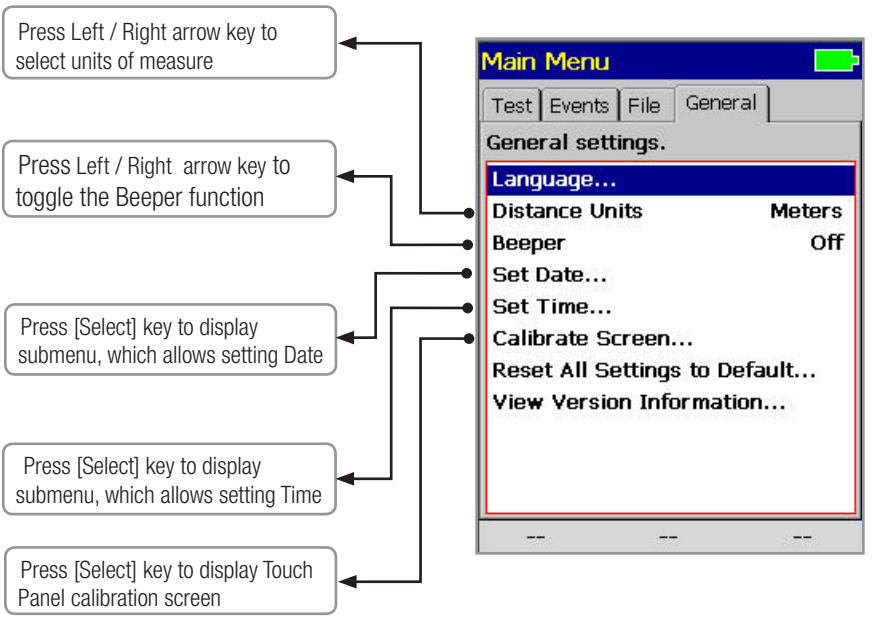
Menu View

Trace View

Set-up: General Settings

Keys used

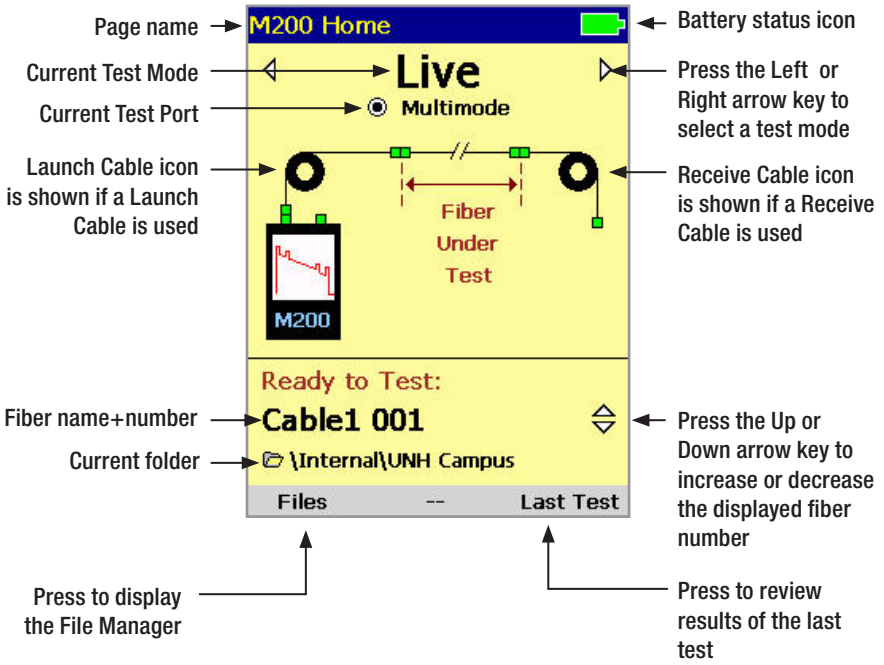
Key Symbol	Key Name	Key Function
	Left & Right Tab	Scroll through menu tabs to display [General]
	Up & Down Arrows	Navigate up/down the list of parameters
	Left & Right Arrows	Display available options
	Select	Display a submenu or editor
	Back	Return the previous menu



Home Page: Changing the Mode

Keys used

Key Symbol	Key Name	Key Function
	Left & Right Arrows	Scroll through modes



Mode	Description
Full Auto	This is the recommended mode for users who are not familiar with OTDR operation. In the Full Auto mode, OTDR parameters such as Range, Pulse Width, and Averaging Time are set automatically. In addition, Full Auto tests always include an Event Table and Summary Page.
Live	This is the best mode for real-time troubleshooting. Note that the Wavelength setting can only be set to individual wavelengths.
Expert	This mode is available for experienced users. It provides the most set up flexibility. You can set Range, Pulse Width, and Averaging Time manually (Setup = Manual) or automatically (Setup = Auto). And you can either enable the event table (Events = Auto) or disable the event table (Events = Off). Note that in the Expert mode, the Events menu contains settings related to the event table and all launch and receive cable settings.

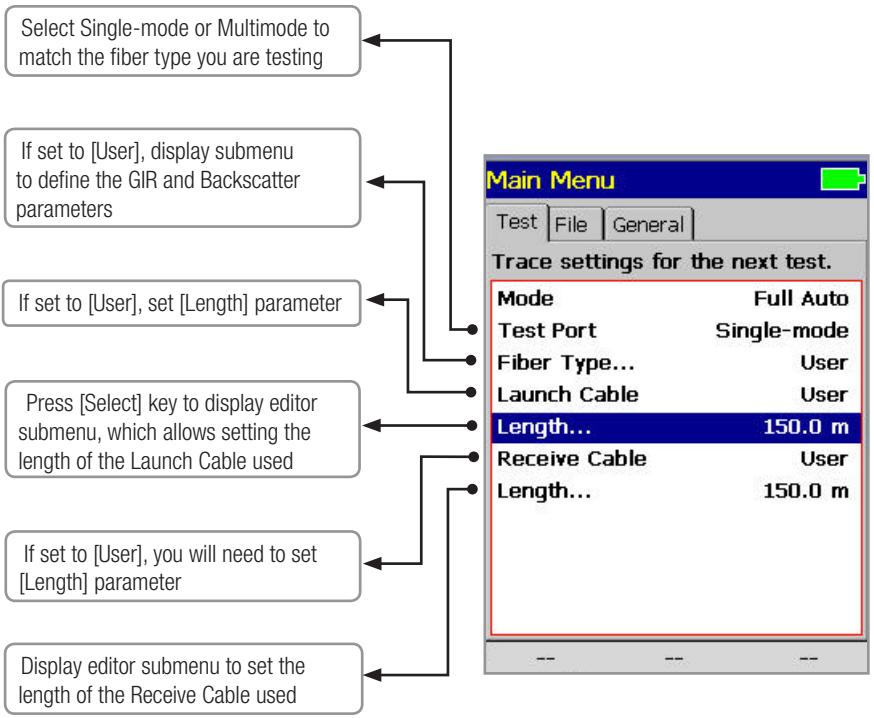
Set-Up: Full Auto Mode Settings

Definitions

Core Settings	Full Auto Mode settings are common for all OTDR Test Modes and will be referred to as Core Settings.
Launch Cable (Launch Cord)	A test cable used to connect the OTDR to the near end of the link under test that is long enough to allow the OTDR to measure the loss of the first connection.
Receive Cable (Tail Cord)	A test cable used to terminate the far end of the link under test that is long enough for the OTDR to measure the loss of the last connection.

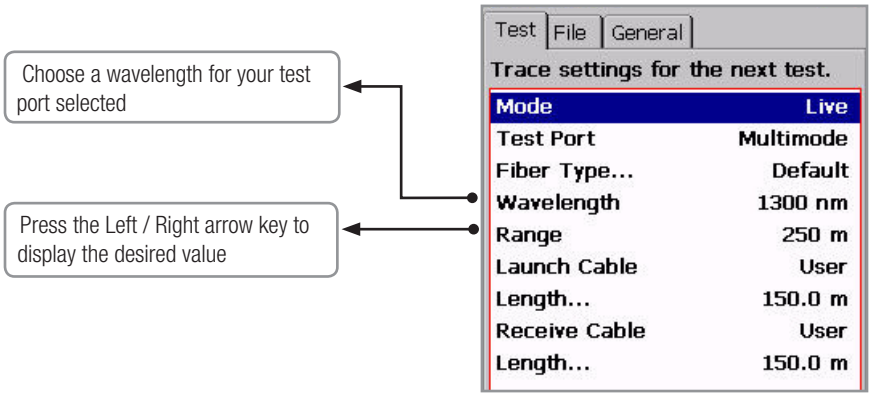
Default Threshold Chart

Threshold	Default Value
Event Loss	0.20 dB
Event Reflection	-65.0dB
Event End	6.0dB



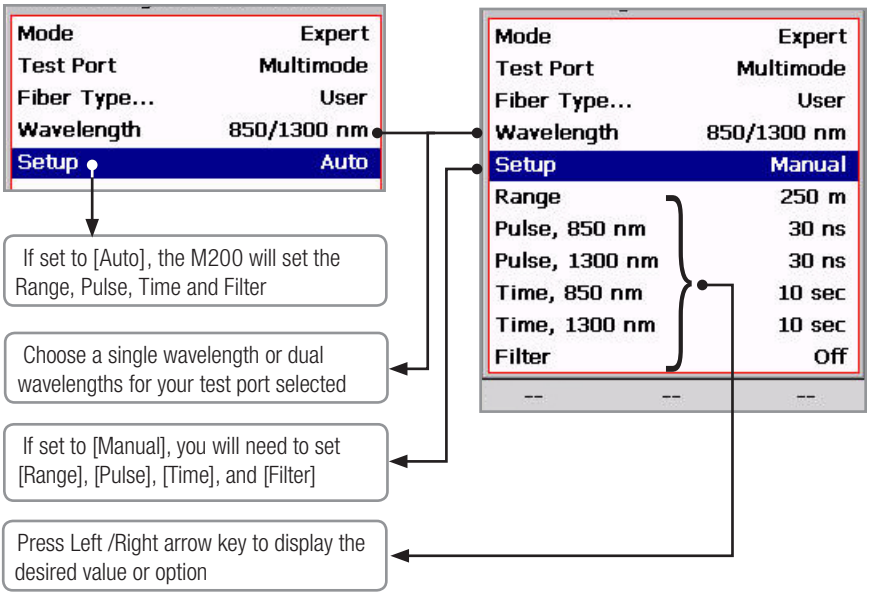
Set-Up: Live Mode Settings

In addition to Core Settings, the Live mode allows you to set the Wavelength and Range parameters.



Set-up: Expert Mode Settings

In addition to Core Settings (Full Auto Mode settings), the Expert test mode allows you to set the Wavelength, Range, Pulse Width, Averaging Time, Filter parameters.



Set-up: Expert - Manual Setup

Note: The Range, Pulse Width, and Averaging Time parameters are user-selectable if the [Setup] parameter is set to [Manual].

<table>
<tr><td>Range</td><td>The [Range] parameter determines the distance range of the full (unzoomed) trace. It also determines [Resolution] - the distance between data points in the trace: the longer the range, the wider the data point spacing. We recommend selecting the shortest distance range that is longer than the fiber under test. For example, to test a fiber that is 1.5 km long, select the 2.5 km range. Available [Range] values:
<table>
<tr><th>Wavelength (nm)</th><th>Distance Range</th><th>Resolution (set by M200)</th></tr>
<tr><td rowspan="4">MM 850
MM 1300
MM 850/1300</td><td>< 4 km (13123 ft)</td><td>0.25 m (0.82 ft)</td></tr>
<tr><td>8 km (26246 ft)</td><td>0.5 m (1.64 ft)</td></tr>
<tr><td>16 km (52493 ft)</td><td>1 m (3.28 ft)</td></tr>
<tr><td>⩾ 32 km (104986 ft)</td><td>range/ 1600 m (range/ 5249 ft)</td></tr>
<tr><td rowspan="4">SM 1310
SM 1550
SM 1310 /1550</td><td>< 4 km (13123 ft)</td><td>0.25 m (0.82 ft)</td></tr>
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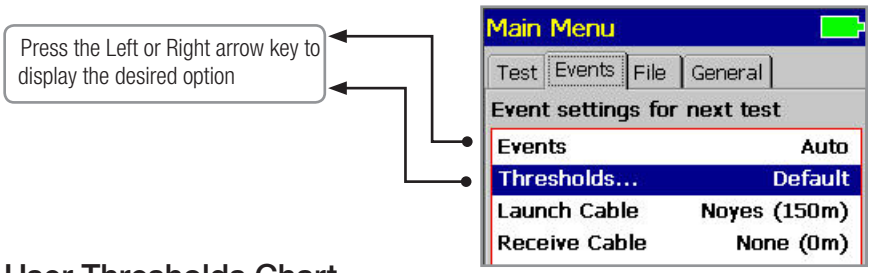
<tr><td>⩾ 32 km (104986 ft)</td><td>range/ 1600 m (range/ 5249 ft)</td></tr>
</table>
</td></tr>
<tr><td>Pulse Width</td><td>The M200 can operate using different pulse widths. Short pulse widths provide the shortest event and attenuation dead zones. Long pulse widths provide the best event detection on long fibers.</td></tr>
<tr><td>Averaging Time</td><td>The [Time] parameter determines the duration of a timed test. Available time settings: 5 • 10 • 30 • 60 • 90 • 180 sec</td></tr>
</table>

Set-up: Events Menu Settings



User Thresholds Chart

Threshold	Min Value	Default Value	Max Value
Event Loss	0.05 dB	0.20 dB	1.0 dB
Event Reflection	-65.0 dB	-65.0dB	-45.0 dB
Event End	1.0 dB	6.0dB	6.0 dB

File Manager

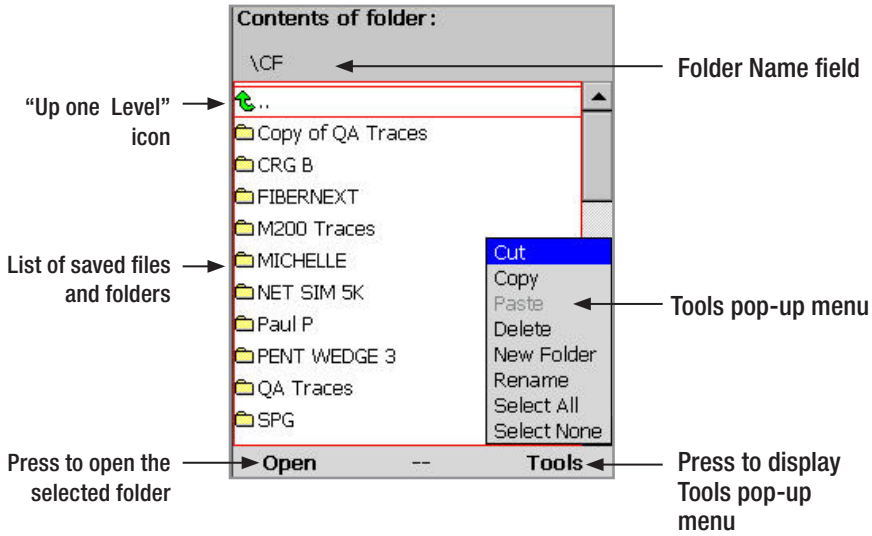
File Manager is accessed from the File tab > [Folder...] parameter in Main Menu settings, or from the Home page by using the [Files] soft key.

Use to change folders and go between CF, USB, and Internal storage.

Use Tools within the File Manager to create, delete, copy and move files and folders.

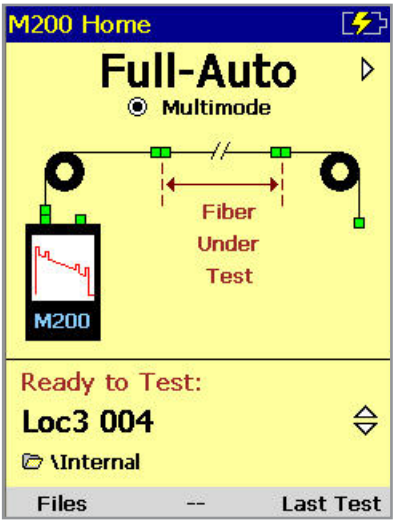
Keys used

Key Symbol	Key Name	Key Function
	Up & Down Arrows	Navigate up/down the list of folders and files
	Left & Right Arrows	Left: move to the top of the folder / file list Right: move to the bottom of the folder/ file list
	Open Soft key	Make the selected folder current
	Back	Return the previous menu
	Select	Select folders or files. Navigate up the folder tree (when the "Up one Level" icon - .. is indicated)

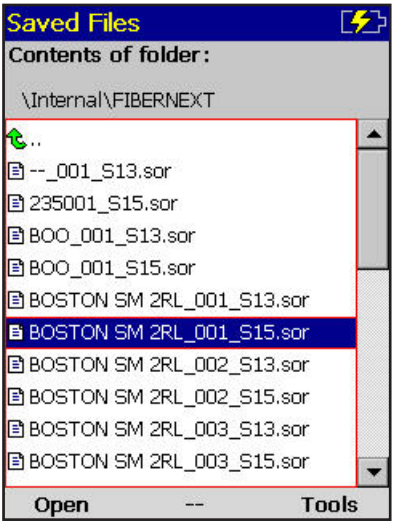


Opening a Trace File for Review

Access File Manager from the Home Page by pressing the [Files] soft key



[Files] soft key



Press to open a trace for review

Saving a File

Save

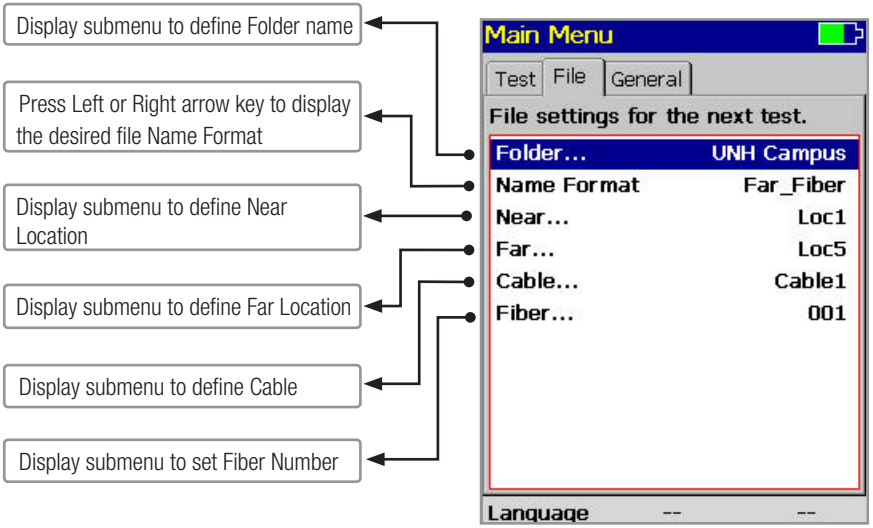
After completing a test press Save key to save file in current folder with name established in the set up process.

Save-As

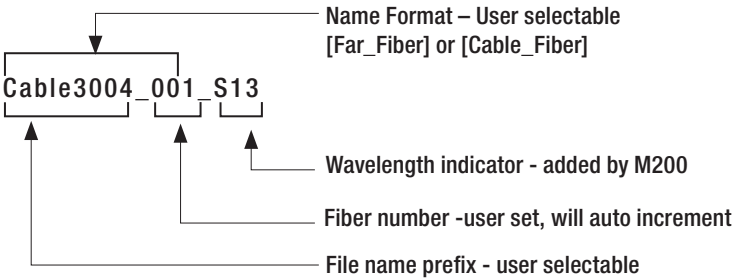
To change the folder or file name after a test has been completed, go to the File tab and make changes. Once satisfied press the save key.

Set-up: File Menu Settings

Set Folder/ File name and Folder location where the next trace file will be saved.



Name Format



The file name prefix is user selectable, may be set either to [Far...] name or [Cable...] name.

The fiber number is added automatically by the M200, but may be changed.

The wavelength indicator is added automatically by the M200 depending on the selected test wavelength as follows:

Selected SM Wavelength	Wavelength Indicator
1310 nm, single-mode	.S13
1550 nm, single-mode	.S15

Selected MM Wavelength	Wavelength Indicator
850 nm, multimode	.M85
1300 nm, multimode	.M13

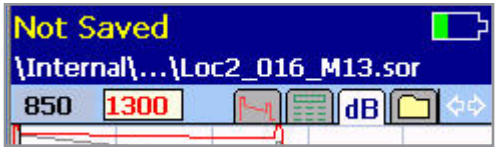
Running Tests & Viewing Results

Test Press to start Test

M200 header will be **[Testing]**

Test Press to stop Test

M200 header will be **[Stopped]**



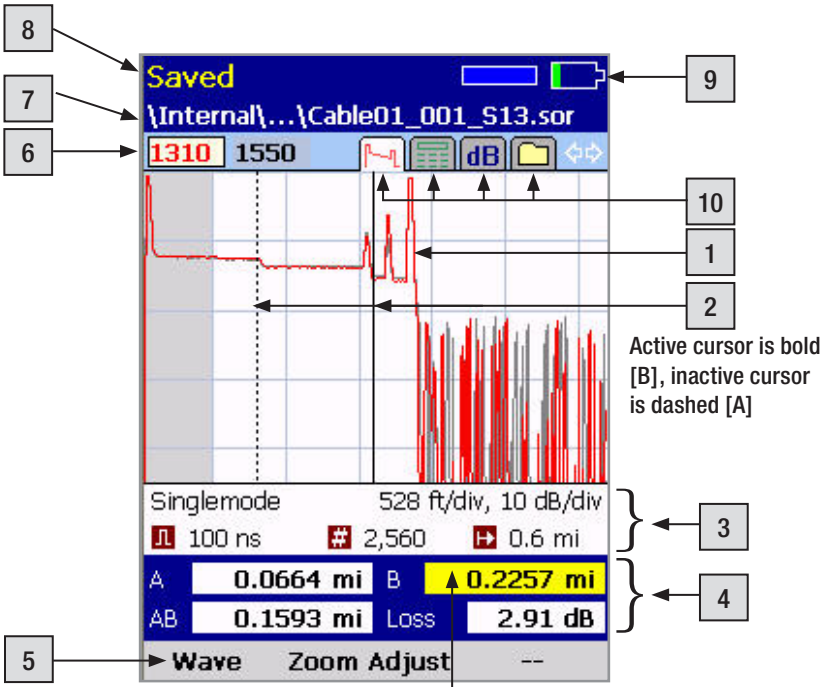
When test is done, **[Not Saved]** is the M200 header

After test is saved, **[Saved]** is the M200 header

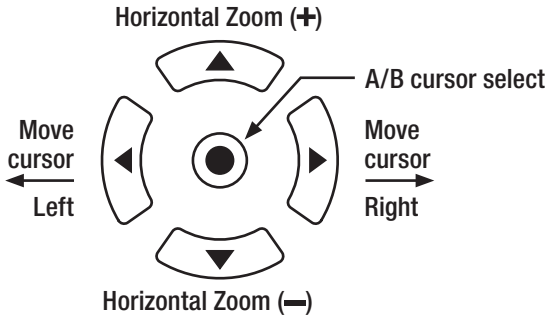
Page Tabs (keys used ⇦ ⇨)

Page icon	Page name	Description
	Trace Page	Displays OTDR trace, setup, A/B cursors, Loss and Distance between A & B cursors
	Event Page	Displays OTDR trace, Event location, type, reflectance and insertion loss
dB	Summary Page	Displays OTDR trace, Link Length, ORL and insertion loss
	File Information Page	Displays file and fiber setup parameters of the currently displayed trace

Trace Page Features



Key definitions

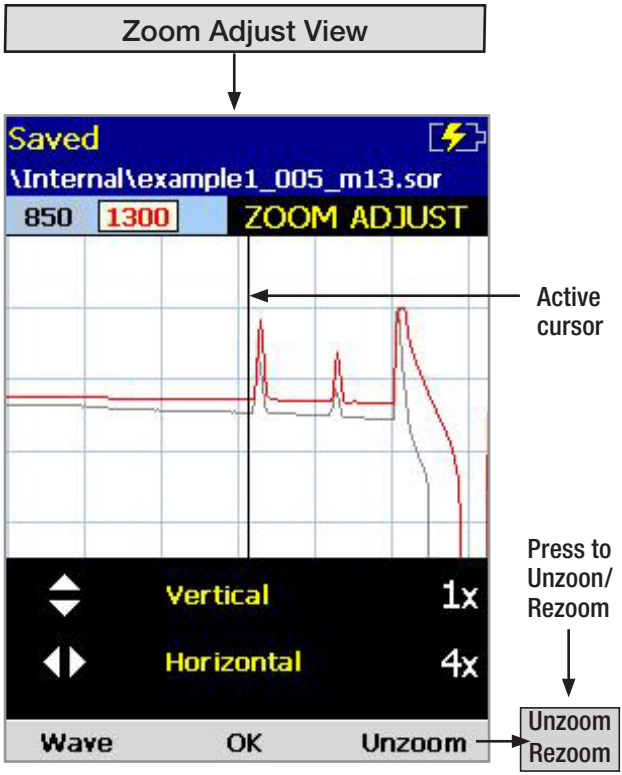


Trace Page Features

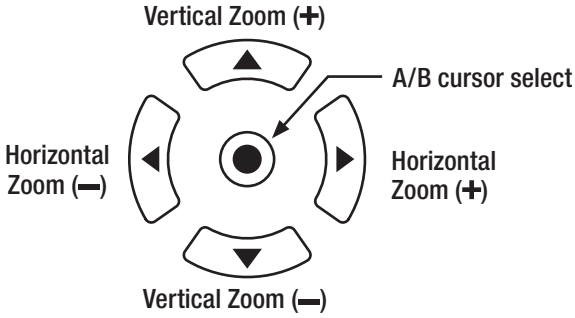
Trace Page Features

Ref	Feature	Description
1	Trace	This is a graph of insertion loss vs. distance. The vertical axis shows loss in dB. The horizontal axis shows distance in user-selected Distance units.
2	Cursors	Used to measure loss, and distance. The active cursor can be moved by pressing either Left [◀] or Right [▶] arrow key. Press the ◉ -[Select] key to toggle between the A and B cursors.
3	Test data field	This field displays various test data as follows: Fiber type • units of measure per division • dB per division • ⎍ pulse width setting • # number of averages • ↦ Range value
4	Cursor data field	This field displays A cursor location, B cursor location, distance from A to B in user-selected Distance units, and measured loss between A and B in dB.
5	Soft function key labels	Soft function keys are located on the Front panel. The label shown on the display above each key indicates the current use of each function key.
6	Wavelength field	Displays test wavelengths of the currently displayed trace. For the dual-wavelength test (850/1300 nm or 1310/1550 nm), press the [Wave] soft key to toggle between the 850 nm and 1300 nm test results or between the 1310 nm and 1550 nm test results respectively. **Note**: the Highlight box around the wavelength value indicates the currently displayed wavelength.
7	File name field	Displays file name of the currently displayed trace.
8	Test status	Displays test status labels as follows: Testing - indicates test in progress Stopped - test is interrupted Not Saved - the displayed test results are not saved Saved - the displayed test results are saved
9	Battery indicator	Displays estimated battery status as follows: Green battery icon - battery is full Charging battery icon - battery is charging Red battery icon - battery requires recharging
10	Page icons	The Highlight box around an icon indicates the active view.

Zoom Adjust View



Keys definitions

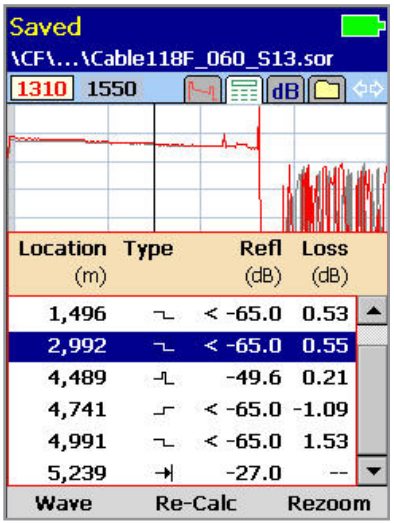


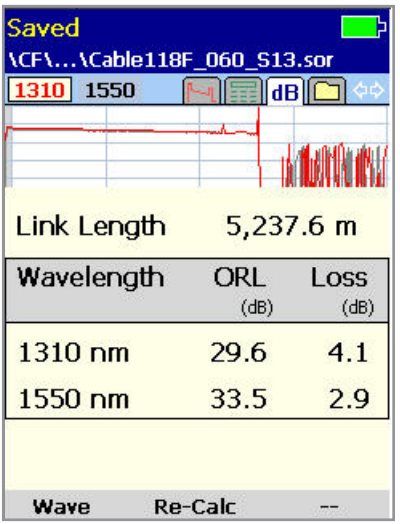
Event Table & Summary Results

Event Table & Summary Results are generated together

1 Set Mode to Full Auto or set Mode to Expert and Events (Events menu) to Auto.

2 In the Event Table or Summary Page, press the [Calc] soft key if no Event Table or Summary Page was created. Or press the [Re-Calc] soft key to generate a new Event Table or Summary Page if you changed the GIR or BC.





Event Icons and Types

Event Icon	Event Type
	Start of Fiber Under Test
	End of Fiber Under Test
	Reflective Event
	Non-Reflective Event
	Gainer
	Multiple Event

Fault Locating: Full Auto

Set Mode to Full Auto

Clean and Connect launch cable

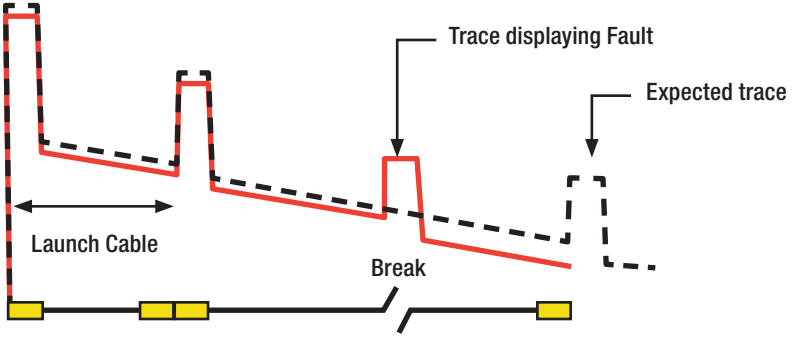
Select Test Port: MM or SM

Select Fiber Type

Select Launch Cable: Noyes (150m), None, User

In General Tab Set Distance Units: m, ft, kft, km, mi

Press Test key ✓



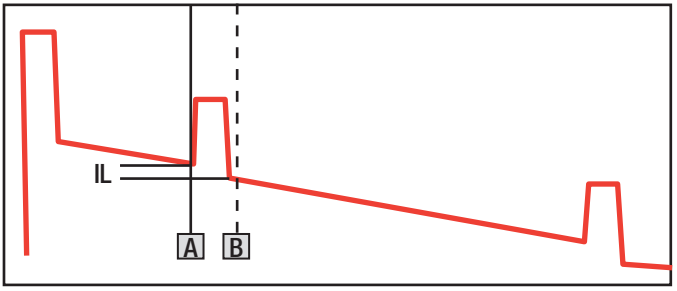
Two Point A/B Measurement

Measuring Loss on an OTDR Trace

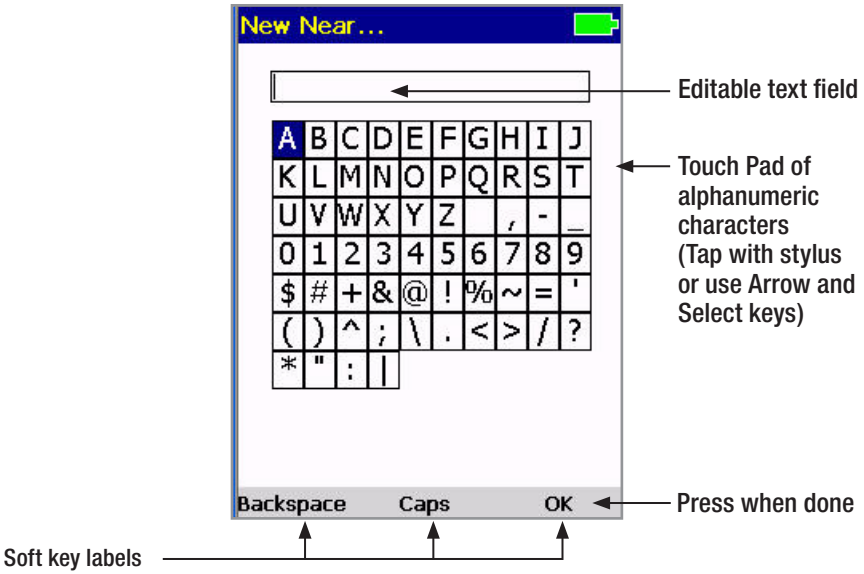
An OTDR trace shows relative power vs. distance. The insertion loss (IL) between any two points (A to B) on the optical fiber link under test equals the trace level at A minus the trace level at B.

To measure the end-to-end loss of a link, use a launch and receive cable and put the [A] cursor before the first event in the link and the [B] cursor just after the tail of the last event.

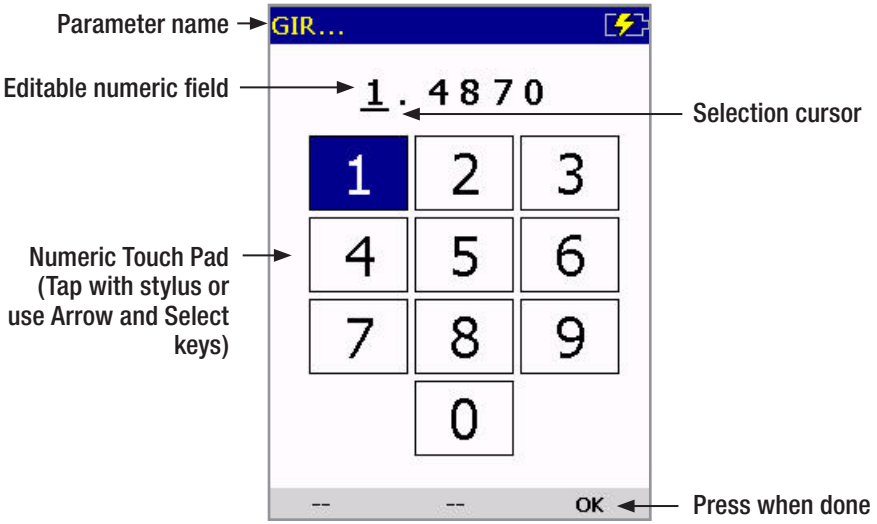
- Position the left cursor [A] at the start of the event
- Position the right cursor [B] beyond the event where the trace returns to a constant slope
- Read the insertion loss (Loss: in dB) measurement



Text Editor



Numerical Editor



Transferring Files

From M200 via USB Function port to PC

To transfer files from your M200 to a PC using a USB cable, perform the following:

1 Connect your M200 to a PC using a type A to Mini USB B cable.

If your PC requests new USB drivers, install the CD-ROM that comes with your M200, which should contain the needed drivers. This step only needs to be performed the first time you connect your M200 and PC together.

2 If your PC pops up a dialog box asking if you want to set up a new Partnership, select No (the M200 should always be a 'guest.').

- Open My Computer > Mobile Device >File Storage > Internal folder.

or

- Open My Computer > Mobile Device > CF folder.

From CompactFlash card or USB Flash drive to PC

To transfer files from your M200 to a PC using your CF card or USB drive, perform the following:

1 Copy any files stored on the M200 Internal Drive to the CF drive or USB drive.

2 Remove the CF card or USB drive from your M200 and read it with your PC.

From Internal memory to CompactFlash card or USB Flash drive

Please refer to Application Note titled "Transferring M200 files from Internal memory to a CompactFlash card or USB Flash drive" on our web site at www.AfItele.com (select User Guides, M200 Application Note, M200-00-2001.pdf).

Installing the M200 USB Drivers and Using ActiveSync

For information on installing the M200 USB Drivers and using ActiveSync, please refer to our web site at www.AfItele.com (select Noyes Test & Inspection, OTDRs, M200 OTDR) for drivers, software, and instructions.

Specifications

OTDR Specifications		
	Multimode	**Single-mode**
Emitter Type	Laser	
Safety Class	Class 1 FDA 21 CFR 1040.0 & 1040.11	
Center Wavelengths	850/1300 nm	1310/1550 nm
Wavelength Tolerance	± 20 / ± 30 nm	± 20 / ± 30 nm
Dynamic Range (SNR = 1)	22 dB	26 dB
Event Dead Zone [1]	1.5 m	1.5 m
Attenuation Dead Zone [2]	9 m	9 m
Pulse Widths [3]	10, 30, 100, 300 ns, 1, 3 µs	10, 30, 100, 300 ns, 1, 3, 10 µs
Range Settings	250 m to 32 km	250 m to 208 km
Data Points	Up to 16,000	Up to 16,000
Data Point Spacing	0.25 m (range ≤ 4 km); Range/16000 (range ≥ 8 km)	
Group Index of Refraction (GIR)	1.4000 to 1.6000	
Distance Uncertainty (m)	± (1 + 0.005% x distance + data point spacing)	
Trace File Format	Bellcore GR-196 Version 1.1	
Trace File Storage Medium	Internal, non-volatile memory and removable Compact Flash Card	
Trace File Storage Capacity	> 100 internal; thousands on Compact Flash	
Trace File Transfer to PC	USB Flash drive type 1 CompactFlash or Mini USB Cable w ActiveSync	
Visual Fault Locator Specifications		
Emitter Type	Laser	
Safety Class	Class II FDA 21 CFR 1040.10 & 1040.11; IEC 825-1:1993, EN60825-1:1994	
Wavelength	650 nm	
Output Power (nominal)	0.8 mw	
General Specifications		
Size (in boot)	23 x 11 x 7 cm (8.8 x 4.3 x 2.8 inches)	
Weight	0.9 kg (2 lb)	
Operating Temperature	-10 to +50 °C	
Storage Temperature	-20 to +60 °C	
Relative Humidity	0 to 95% RH (non-condensing)	
Power	Removable Lilon or 110/220 VAC power adapter	
Battery Life[4]	6 hours	
Recharge Time [4 & 5]	3 hours	

All specifications valid at 23°C ± 2°C (73.4°F ± 3.6°F) unless otherwise specified.

1. Typical distance between the two points 1.5 dB down each side of a reflective spike caused by a -40 dB (Multimode) or -45 dB (single-mode) event using 10 ns pulse width.
2. Typical distance from event location to point where trace is within 0.5 dB of backscatter.
3. 3 µs pulse width not available at 850 nm.
4. New battery.
5. Typical, from fully discharged to fully charged state, unit may be operating.

Recommended Accessories

You will need fiber optic test jumpers to connect your M200 to the fiber under test. Test jumpers must have the same core and cladding size as the fiber under test. The connector at one end of the test cable must mate with the appropriate optical port on the M200. The connector on the other end must mate with the fiber optic link under test.

Launch and Receive cables are required to measure the insertion loss and reflectance of the near-end and far-end connectors respectively, on the fiber link being tested. Noyes Fiber Rings may be used as Launch and Receive cables. Fiber Rings with a variety of lengths and connector styles are available from AFL Telecommunications. The table below will help you to select the right test jumpers or cables for your test.

To do the following test	**You will need the following accessories**	
	To connect your OTDR to the fiber link under test	To terminate far-end of the fiber link under test
• Fault locate - find a break • Measure link length	Test Jumper (1-2 m typical)	None
• Measure near-end connector loss • Measure near-end connector reflectance	Launch cable (such as a Noyes 150 m Fiber Ring)	None
• Measure near-end connector loss and reflectance • Measure far-end connector loss and reflectance • Measure end to end link loss and optical return loss	Launch cable (such as a Noyes 150 m Fiber Ring)	Receive cable (such as a Noyes 150 m Fiber Ring)

Cleaning Tips

Clean Test Cables and FUT

Connector end faces must be kept free from dirt or other contaminates to ensure accurate measurements and operation. It is important to keep connectors on the launch and receive cables and those on the Fiber Under Test (FUT) clean. Follow your company's approved cleaning procedures.

Cleaning the Optical Ports

CAUTION! Before conducting the following procedures be sure to have the M200 turned OFF.

To access the SM or MM OTDR Port

Rotate the adapter base counterclockwise approximately four times.

Pull the adapter directly out away from the universal adapter mount.

To access the VFL Port

Unscrew the adapter counterclockwise and pull the adapter straight out to expose the ferrule.

Cleaning the Exposed Ferrule (two methods)

I. Noyes Cleaning Procedure

Lean a can of FCC2 back (30°), press the button on FCC2 to fill the well.

Dip a CCTP stick into the well of the FCC2 to dampen the tip with optical cleaning fluid.

Place the damp tip over the ferrule to be cleaned.

Rotate the tip clockwise 10 revolutions while applying varying pressure to create a gentle pumping action where the tip contacts the ferrule.

Discard the CCTP stick after using both tips.

II. If using lint-free optical cleaning pads and isopropyl alcohol

Be sure to use 99% IPA that has not been contaminated.

Dampen the wipe with the alcohol and gently wipe the exposed ferrule. Then dry the ferrule using a new optical wipe.

Cleaning the adapters

Use a can of filtered compressed air (held vertically), blow out any contaminants from the adapter.

Once completed, replace the adapter over the ferrule, centering it onto the alignment pin.

Tighten the adapter base.

FAQs

Can I save traces for viewing later?

Yes. There is a dedicated **Save** key. In the Main Menu “File Tab”, set up the location/ folder (Internal, CF, or USB) to save the file, the file naming format and fiber number. The fiber number will increment after each trace is saved.

What is the advantage of the Expert Auto Mode?

User is able to select a single λ and have the OTDR set the other test parameters.

What is the purpose of the Live Mode?

With a launch cable, the Live or “real-time” mode may be used to quickly view many short fiber links. It can also be used to quickly “trace” short fiber link fibers.

Why do I need to use a launch and receive cable?

A launch cable allows the OTDR to settle down after the initial pulse and provides a reference cable for testing the first connector on the fiber under test. A receive cable provides a reference cable for testing the last connector of the fiber under test.

Tips

Expert OTDR Setup

RANGE: Length

- Too Short: you will not capture the entire fiber length
- Too Long: trace will be squashed to left side of Screen
- Good Range: 1.5 to 2 times length of actual fiber

PULSE WIDTH:

- Too Narrow: trace disappears into noise floor before end of fiber is reached
- Too Wide: events can not be resolved
- Good Pulse Width: Events can be seen and trace is smooth

AVERAGES:

- Too Few: Trace is noisy, trace floor is too high
- Too Many: Trace is smooth but wastes time
- Good Number of Averages: smooth trace

Test in feet or meters?

If you know your fiber distances in feet, it may be beneficial to measure distances to events/faults in feet.

Fiber loss specifications are given in dB/km. Therefore it is often beneficial to measure fibers in meters/kilometers when loss results are required.

Recharging Batteries

You may charge the batteries while the M200 is switched on or off by attaching an AC power adapter.

- Plug the AC adapter/charger into a standard wall outlet.
- Connect the AC adapter/charger to the Power port located on the M200 side panel.
- The [AC/Charger] indicator on the side panel will turn on- Red
- Charge batteries until the [AC/Charger] indicator turns Green.

Repair and Calibration

Unauthorized repair of the Noyes test equipment will void the warranty.

Calibration is recommended every 12 months. Noyes' Calibration department is in compliance with ANSI/NCSL Z540-1, ISO 10012-1, MIL STD 45662A, ISO Guide 25 and traceability to the National Institute of Standards and Technology. Call Customer Service to obtain a Service Request (SR) Number before sending units in for calibration.

View Version Information

- From the General Menu, use the UP/Down arrow keys to highlight the [View Version Information…] parameter.
- Press the [Select] key to enter the Version Information Screen.

  Note: It is helpful to have the M200 version number if you need to contact Noyes Customer Service or Technical Support.

Contact us

You may call Noyes Customer Service between 8 AM and 5PM, United States Eastern Time.

Phone 800-321-5298
603-528-7780

Fax 603-528-2025

Web **www.Afltele.com**
(select Noyes Test & Inspection, and then click on Tech Support)

Thank you for choosing Noyes Test & Inspection

16 Eastgate Park Road
Belmont, NH 03220
Phone: 800-321-5298
603-528-7780
Fax: 603-528-2025
www.AFLtele.com (select Noyes Test & Inspection)

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