

# RXT-4113+

xWDM OTDR Series Modules

CWDM, DWDM or DWDM with 1310/1550/1625 Live



for RXT-1200  
Modular Test Platform



The new RXT-4113+ is our latest generation xWDM OTDR module. Users can now select CWDM, DWDM, combo CWDM+DWDM or DWDM+Legacy optical configurations. Advanced hardware and powerful software supports the testing of both xWDM, Grey optics and single stage PON network architectures. Precise wavelength tuning, 3 cm resolution and up to 500,000 data points offers unprecedented network characterization.



## Platform Highlights

### Software

- Advanced software architecture supports multiple test applications
- VeExpress™ Cloud or Enterprise versions to maintain instrument firmware and manage test options or inventory
- EZ Remote software for flexible remote control and software upgrade
- Fiberizer® Desktop+ PC software for advanced trace analysis and report generation
- Fiberizer Cloud trace analysis and data management
- VeSion® R-server compatibility for centralized work force management and test results repository
- Optional fiber inspection scope (USB) with single or multi-fiber (MPO/MTP®) support

### Hardware

- High resolution, 7" full color TFT touch-screen viewable in any lighting condition
- Connectivity via 10/100Base-T Management interface, WiFi™, Bluetooth®, or 3G/LTE for back office applications
- Intelligent fan operation with built-in temperature sensor
- Interchangeable Li-ion battery pack for extended test time
- USB-A Interface for USB flash drives, USB wireless dongles and fiber inspection probe connection
- Optional built-in GPS module for Geotagging OTDR traces

## Key Features

### Optical

- CWDM wavelengths per ITU-T G.694.2 (8, 10, or 18 channels)
- DWDM wavelengths per ITU-T G.694.1 (C-band, 1529.16 to 1563.86 nm, Channel #s 17-60) in 50, 100 or 200 GHz steps
  - Optional extended channel 14-62 available
  - TEC laser stabilization for hot and cold weather conditions
  - Built-in DWDM wavelength locker with  $\pm 2.5$  GHz stability
- Legacy wavelengths include 1310, 1550 and 1625 live testing
- PON up to 1:32 splitter
- Sampling resolution up to 500,000 points
- Event dead zone <0.85 m, attenuation dead zone <3.5 m
- High dynamic range for long haul fibers and testing through xWDM Mux/demux
- Telcordia GR-196 and SR-4731.sor file formats
- Optional V-Scout mode – Smart Link Mapping using intuitive icons derived from multiple test acquisitions
- Optional CWDM/DWDM/Legacy Light Source via OTDR port
- Optional broadband Optical Power Meter
- Optional VFL 650 nm light source
- Built-in G.657A2 launch fiber to characterize OTDR connections and short fiber spans
- Fixed connector or universal 2.5 mm optical interface with inter-changeable optical adaptors (SC/FC/LC)



Value added data post processing

**Fiberizer Cloud**

cloud.fiberizer.com

## Wavelength-Division Multiplexing Primer

### Overview

Wavelength-Division Multiplexing (WDM) has quickly become the technology of choice for high-capacity optical communication systems. WDM allows Service Providers to expand the capacity of their networks without having to install additional fiber. In simple terms, WDM combines multiple signals simultaneously at different wavelengths onto the same fiber. A multiplexer combines the optical signals at the transmitter side while a de-multiplexer separates them at the receiver end.

### ITU Frequency Bands in WDM Systems

“Grids” are used for the location of nominal central frequencies in WDM systems. The International Telecommunication Union (ITU) has divided the wavelengths into a frequency grid for CWDM and DWDM.

### CWDM

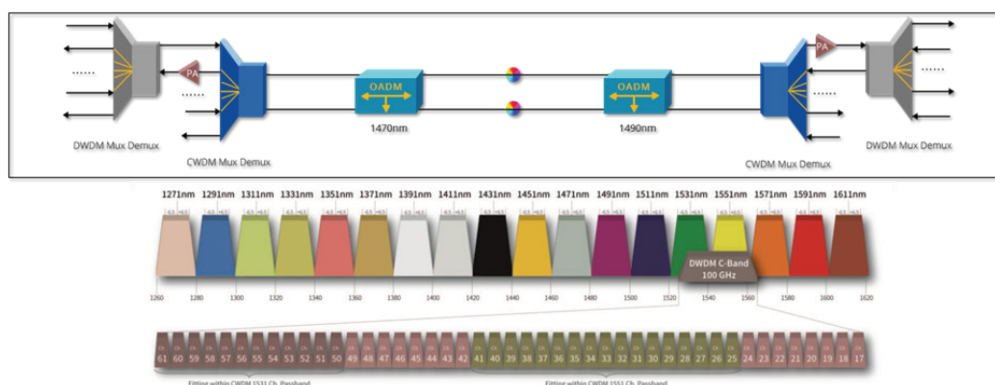
Coarse WDM can deploy up to 18 wavelengths with 20 nm channel spacing ranging from 1270 nm to 1610 nm. Although the ITU-T G.694.2 grid was amended in 2003 to shift the wavelength by 1nm, for simplicity the RXT4113+ will continue to use center wavelengths labels 1270 to 1610 nm. The wide channel spacing allows for the use of cheaper network components, including uncooled lasers and lower-quality multiplexers and de-multiplexers.

By today’s standards, several CWDM wavelengths below 1470 nm are considered “unusable” on older G.652 fibers, due to the increased attenuation in the 1270-1470 nm bands. Newer fibers conforming to the G.652.C and G.652.D standards reduce the “water peak” attenuation considerably and can support operation for all 18 CWDM channels.

The CWDM spectrum prevents the use of erbium-doped fiber amplifiers which are generally optimized for 1550 nm transmission. As a result, CWDM deployments are often limited to 80 km and equipment is designed for short-range access and metro operation only.

### DWDM

Dense WDM uses up to 49 channels at 100 GHz spacing or up to 98 channels with 50 GHz spacing. Dense channel spacing demands tight wavelength stability and thus requires cooled lasers. The ITU initially chose the Conventional band or C-band spectrum for DWDM operation since it offers the lowest fiber attenuation and it occupies the spectrum in which erbium doped optical amplifiers operate. Development of new fiber amplifiers promise to extend DWDM operation into the L-band.



## CWDM/DWDM Network Testing

Service providers utilizing WDM technology, need to install and troubleshoot using new OTDR test methods. Applications include:

- Verify network performance at the discrete ITU-T grid wavelengths (CWDM or DWDM)
- Verify end-to-end loss through multiplexers, OADM and de-multiplexers
- Verify attenuation and macro-bending across the transmission band or channel
- Continuity testing end-to-end using Source and Optical Spectrum Analyzer (OSA) prior to service turn up
- Wavelength provisioning to check new wavelength service and routing without disrupting traffic on live channels

The new RXT-4113+ xWDM OTDR module series supersedes the popular RXT-4111 DWDM, RXT-4112 CWDM OTDR and RXT-4113 modules. Whether the test application involves CWDM, DWDM or hybrid CWDM/DWDM, the RXT-4113+ OTDR module simplifies testing. A unified, intuitive user interface merges both test CWDM and DWDM applications - user can simply connect the fiber to the CWDM or DWDM OTDR port and move between MUX ports as required.

## xWDM/PON Network Testing

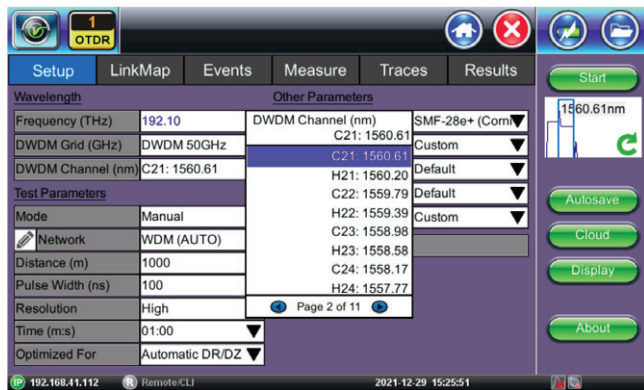
Technicians and engineers are recently being confronted by hybrid PON and xWDM networks. The new RXT-4113+ module’s optical hardware and firmware has been designed to test both point-to-point and point-to-multipoint network architectures. Users can now enjoy the unique ability to test both xWDM and non-commissioned FTTH/P networks using a single test module. All VeEX OTDRs can be used to test PON with 1x6 single splitter. Testing cascade PON or 1x64 or more splits require specially tuned PON OTDRs.

# Optical Time Domain Reflectometer (OTDR)

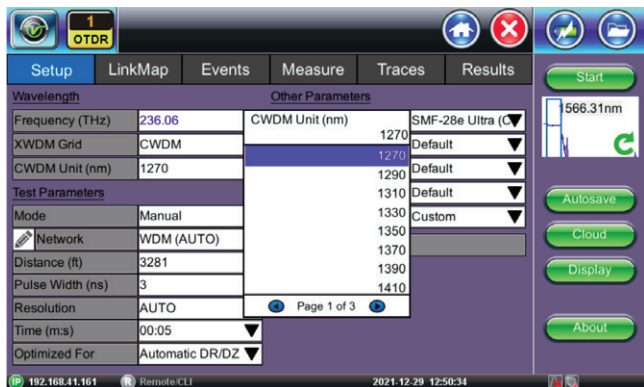
## Intuitive Test Setup

Novice and expert users can quickly and easily configure test parameters for both CWDM and DWDM networks.

**DWDM** - Extended C-band is 98 wavelengths as defined in the ITU 6.694.1 grid are supported via a precise and stable tunable laser. Channel grids of 50, 100, and 200 GHz is supported.



**CWDM** – Configure with 8/10/18 wavelengths as defined in ITU G.694.2 grid. Simply select via pull down menu.

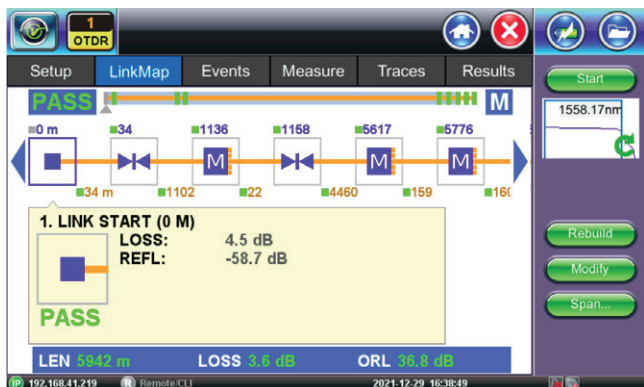


## Analysis Thresholds

User defined thresholds for splice loss, connector loss, fiber lengths and reflectance can be preset to assess a fiber's condition.

## V-Scout Link Mapping

Advanced algorithms analyze multiple test acquisitions and characterize the fiber using intuitive icons. This optional feature eliminates trace interpretation and provides greater fiber analysis confidence to the user, regardless of OTDR skill set.



## Advanced Trace Analysis

Reliable event detection and accurate analysis are crucial to document fiber links at the time of installation. These baseline records are essential to troubleshooting faulty networks and reducing system downtime afterwards.



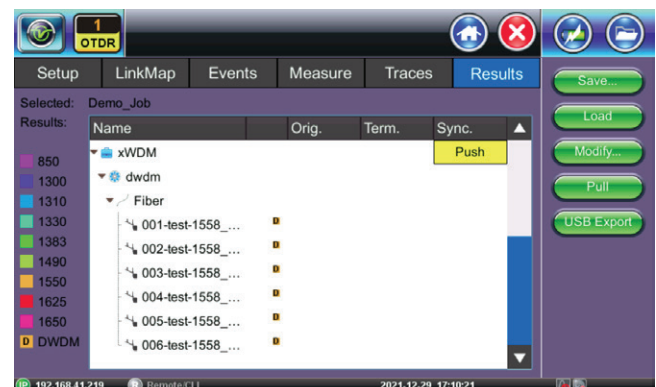
The unit employs specialized software algorithms developed from years of experience to measure fiber attenuation including anomalies such as connectors, splices, and macro-bends.



## OTDR Results

OTDR Traces are saved in Telcordia SR-4731 format in a logical hierarchy for easy sorting and storage.

Traces can be pushed directly to Fiberizer Cloud using any available internet connection or can be pulled for fault finding and reference purposes.



## Optical Connector Protector (Hardware Option)



Optical Connector Protector



Replaceable Ferrule



Optical Protector Cover  
(optional)

1 Patent pending  
2 Spare ferrules available in  
pack of 4 for APC or UPC

The innovative, patent pending field-replaceable optical ferrule system<sup>1</sup> adds an extra layer of protection to the internal end-face of calibrated optical test ports, preventing contamination and accidental damage.

Users can quickly replace the ferrule<sup>2</sup> without the need for any tool while maintaining the integrity of the instrument's factory calibration. This novel approach eliminates the downtime, logistical hurdles and high cost associated with sending test sets to a service center for repair and recalibration.

All components in the system are reusable, with the exception of the small replaceable ferrule, helping to reduce environmental waste.

### Field-Replaceable Optical Ferrule System

#### Universal Adapter

The universal connector adapter allows users to change the optical connector type conveniently whenever needed. Available in FC, SC, ST and LC.

#### Locking Ring

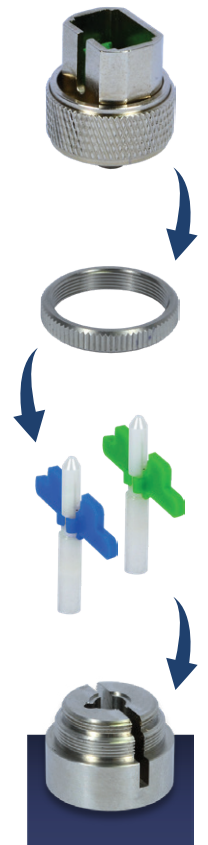
To secure the replaceable ferrule at its optimum location for the best performance.

#### Replaceable Ferrule with APC or UPC End-face

The self-aligned field-replaceable ferrule can be changed out in seconds. Users can select between APC or UPC end-face, ensuring compatibility with any test application requirement.

#### Optical Connector Protector Base

The panel mount protector base is made from high-grade stainless steel using a precision CNC process. This achieves proper alignment of the replaceable ferrule, minimizing insertion loss.



Optical<sup>1</sup>

OTDR Parameter			
	DWDM	CWDM <sup>2</sup>	Grey/Standard
Wavelengths (nm), THz	C-band standard: 1529.16 to 1563.86 nm 191.70 to 196.05 THz Ch-17 to 60.5 Extended optional: 1529.16 to 1563.86 nm / 191.70 to 196.05 THz Ch-14 to 62.5: 1527.60 to 1566.31 nm/ 191.40 to 196.25 THz	18-Chs: 1271/1291/1311/1331/1351/1371/ 1391/1411/1431/1451/1471/1491/1511/1531/1551/1571/1591/1611 10-Chs: 1431/1451/1471/1491/1511/1531/1551/1571/1591/1611 8-Chs: 1471/1491/1511/1531/1551/1571/1591/1611	1310/1550//1625(F)
Wavelength/Frequency Accuracy	±2.5 GHz typ. (0.02 nm), ±3.75 GHz max. (0.03 nm)	±3 nm	±20/±20//±10
Spacing per ITU-T 694.x grid	50, 100, or 200 GHz	20 nm	n/a
Number of Channels	88 (Std.); Ch 17 to 60.5 range	8, 10 or 18 options	n/a
Dynamic Range (dB) <sup>1</sup>	41 dB typical	39.5 typical	40/38//39 dB typical
Side-Mode Suppression Ratio (dB)	40 (min) DWDM laser	n/a	
Pulse Widths (ns)	10 nsec to 20,000 nsec	3, 10, 25, 100, 300, 500, 1000, 3000, 10000, 20000	
Event Dead Zone (m) <sup>3</sup>	1.1 typ.	0.85 typ. wavelength dependent	
Attenuation Dead Zone (m) <sup>4</sup>	<4 typ.	<3.5 typ. wavelength dependent	
Distance Display Range (km)	1 to 400		
Distance Units	Kilometers, Meters, Kilofeet, Feet, Miles		
Distance Accuracy (m) <sup>1,6</sup>	±(0.5 + resolution + 3x10 <sup>-5</sup> x L)		
Sampling Resolution (m)	0.03 to 8.2 standard, 16 available		
Sampling Points	Up to 500,000		
Loss Readout Resolution (dB)	0.001		
Attenuation Linearity (dB/dB)	±0.03		
Group Index Range (IoR)	1.2000 to 1.8000 in .0001 steps		
Measurement Time	Fixed time intervals, Auto and Real Time (Live)		
Internal Memory Capacity (SD card)	>10,000 traces & link maps, Bellcore GR196 and Telcordia SR-4731 sor format		
Fiber Analysis	Automatic, event table, user defined PASS/FAIL thresholds		
Fiber Type	Single mode, 9/125 μm		
OTDR Laser Safety	Class 1, 21 CFR 1040.10		
Optical Connectors (OTDR/LS)	Fixed or Universal 2.5 mm, UPC or APC interface, FC/SC/ST/LC adaptors (optional)		
<b>Laser Source Option</b>	<b>DWDM</b>	<b>CWDM<sup>2</sup></b>	<b>Standard</b>
Laser Source Power (dBm)	shares OTDR test port		
Power Output (dBm)	> -0.5 dBm	> -1.5 dBm	
Operating Modes	CW, 270, 330, 1000, 2000		
Stability (dB)	0.05 (15 min)		
<b>Power Meter Option</b>			
Calibrated Wavelengths (nm)	850, 1300, 1310, 1490, 1550, 1625, 1650		
Optional CWDM Wavelengths (nm)	1270, 1290, 1330, 1350, 1370, 1390, 1410, 1430, 1450, 1470, 1510, 1530, 1570, 1590, 1610		
WaveID	Standard feature; Auto detection of OLS wavelength		
Measurement Range (dBm)	-65 to +10 (PM1)/-50 to +25 (PM2)		
Accuracy, % (dB)	±5 (0.22 dB)		
Linearity, % (dB)	±2.5 (0.11 dB)		
Optical Connector	Non-contacting Universal Adapter SC/LC/FC/ST		
<b>Visual Fault Locator Option</b>			
Wavelength (nm)	650 ± 10		
Output (mW) <sup>7</sup>	<1		
Laser Safety	IEC 60825-1, Class II		
Optical Connector	Universal 2.5 mm interface; optional 2.5 to 1.25 mm converter adapter		

**Notes**

1. Unless noted, all specifications are valid at 23°C ± 2°C (73.4°F ± 3.6°F) using FCUPC connectors.
2. Depends on module (8/10/18 options available). CWDM setup menu label is 1xx0nm.
3. Typical dynamic range using 20 µsec after three-minute averaging and SNR = 1.
4. Typical deadzone using shortest pulse width -45 dB reflection.
5. Typical deadzone using shortest pulse width with -55 dB reflection; add 1 m for -45 dB reflection.
6. Excludes uncertainty due to fiber refractive index (IoR) setting; (0.5 + resolution + 5x10<sup>-5</sup> x L) across full operating temperature range.
7. <1mW using SMF

Order #	CWDM + DWDM Modules
Z07-22-185P	18 channels - CWDM 1270-1610nm//DWDM module
Z07-22-186P	10 channels - CWDM 1430-1610nm//DWDM module
Z07-22-187P	8 channels - CWDM 1470-1610//DWDM module
DWDM Module	
Z07-22-191P	DWDM Tunable Ch 17-60 module
DWDM + Standard Module	
Z07-22-225P	DWDM Tunable Ch 17-60 module and 1310/1550//1625nm(F) 40/38//39 dB OTDR
CWDM Modules	
Z07-22-188P	18 channels - CWDM 1270-1610 nm module
Z07-22-189P	10 channels - CWDM 1430-1610 nm module
Z07-22-190P	8 channels - CWDM 1470-1610 nm module
Z07-22-192P	10 channels - CWDM 1270-1450 nm module

Additional Options	
499-05-638	V-Scout option
499-05-710	Additional DWDM tuning C60-62
499-05-829	Additional DWDM tuning C14-17, C60-62
499-05-841	Additional CWDM OPM calibration 1271-1611 nm
Z66-00-170P	Standard OPM +10 to -65 dBm option
Z66-00-171P	High Power OPM +25 to -50 dBm option
Z66-00-322P	Visual Fault Locator option
F99-00-158G	FC-1.25 mm Conversion Adapter
Z66-00-168P	Light Source Option (single port OTDR modules)
Z66-00-268P	Light Source Option (multi-port OTDR modules)
Z06-00-008P	DI-1000 wired FiberScope
Z06-00-040P	DI-1000MPO wired FiberScope with built-in XY control
Z06-00-043P	DI-3000 WiFi FiberScope

**General Specifications**

Size (including chassis)	290 x 140 x 66 mm (W x H x D) 11.40 x 5.50 x 2.60 in
Weight (including chassis)	Less than 3 kg (less than 6.6 lb)
Operating Temperature	0°C to 50°C (32°F to 113°F)
Humidity	5% to 95% non-condensing
Ruggedness	1m flat drop on all sides
Languages	Multiple languages supported
System Memory	Mbyte RAM, 16 Gbyte SD



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