The Verification Experts

USER MANUAL

RXT-45XX/FX180

Optical Spectrum Analyzer

Please direct all questions to your local VeEX® Sales Office, Representative, or Distributor. Or, contact VeEX technical support at www.veexinc.com.

 D07-00-114P RevC00

Table of Contents

Go back to Top

1.0 General Information

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

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

This manual describes software and/or a device that uses software either developed by VeEX Inc. or licensed by VeEX, Inc. from third parties. The software is confidential and proprietary of VeEX, Inc. The software is protected by copyright and contains trade secrets of VeEX, Inc. or VeEX's licensors. The purchaser of this device and/or software, downloaded or embedded, agrees that it has received a license solely to use the software as embedded in the device and/or provided by VeEX Inc., and to use it solely as intended and described in this manual. The purchaser is prohibited from copying, reverse engineering, decompiling, or disassembling the software.

Go back to TOC

1.1 Customer Support

For more technical resources, visit www.veexinc.com.

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

Support hours may vary depending on the product.

Product Technical Support

Support is generally available 8:00 AM to 8:00 PM, Eastern Standard Time, Monday to Friday.
Phone: +1 510 651 0500
E-mail: customercare@veexinc.com

MPA Product Technical Support

Support is generally available 8:30 AM to 5:30 PM, Eastern Standard Time, Monday to Friday.
Phone: +1 877 929 4357
International: +1 727 475 1206
E-mail: serviceandsupport@veexinc.com

Go back to TOC

1.2 Warranty

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

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

Go back to TOC

1.3 Patent Information

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

Go back to TOC

1.4 Documentation Conventions

Icons used in this manual:

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

Go back to TOC

2.0 Product Introduction

The ***RXT-1200 Modular Test Platform*** features the ***OSA Test Module*** used in the installation and troubleshooting of CWDM and DWDM fiber networks. The ***FX180 Micro Optical Spectrum Analyzer*** also features CWDM or DWDM C-band troubleshooting. The OSA product is designed using proprietary micro-optics and tunable technology. It measures the optical spectrum of optical signals injected into the OSA over a defined operating wavelength range. Critical channel parameters, such as channel power, wavelength, or OSNR can be analyzed for the measured spectrum. The OSA family of products support various zones of wavelength range band, such as C-band, L-band, or Full band. For more information on measurement range, see the product data sheet on www.veexinc.com.

2.1 RXT-1200 Platform Highlights

For more details, see the RXT1200 User Manual at www.veexinc.com. Features and specifications are subject to change. Refer to the datasheet for the latest specifications.

- Compact field test unit with fast boot-up and color touch-screen for simple zooming and navigation; superior shock resistance, ultra-low power consumption and low temperature sensitivity
- Broad range of available test modules covering Access (copper and fiber), Metro, Transport and Core technologies, including DWDM
- Rechargeable Li-Ion battery with capacity indicator, low voltage alarm and Auto-off function (8400 mAH battery; Continuous operating time > 8 hours per Bellcore TRNWT-001138)
- High power sensitivity with excellent accuracy
- Precise measurement of WDM wavelengths with built-in reference, wide range, and high accuracy and resolution
- Periodic calibration not required
- User defined test profiles and thresholds
- Dedicated test functions
- View test results and create detailed reports by region, area, system, and technician
- High-capacity internal data storage (16G storage card)
- USB-A Host Interface supporting:
    - USB flash drives
    - Fiber inspection probe connection
    - Bluetooth dongle support for pairing with mobile smartphones and tablet PCs
    - 3G UMTS data card support. See the RXT-1200 platform's datasheet for more information at www.veexinc.com.
- Ethernet (10/100T) LAN Interface supporting:
    - Web browser remote control (screen mirroring)
    - Perform software upgrades
    - Basic IP testing (Ping, Trace route, Web browser)
- Built-in Remote Web Browser for transfer of fiber test data, upgrade software and perform remote control
- VeExpress to check/upgrade software and installed options status

2.2 FX180 OSA Highlights

- Compact, hand-held field test unit with color touch-screen for easy viewing, fast navigation, and easy operation
- Internal 8G data storage
- Micro-USB OTG interface for flash drives, fiber inspection probe connection and test data transfer
- Built-in Remote Web Browser for remote control, software upgrade, and file management and transfer
- EZRemote feature allows user access behind firewall
- Rechargeable Lithium Polymer battery with >9 hours continuous operation and featuring a capacity indicator, low voltage alarm and Auto-off function
- Optional WiFi and Bluetooth support to perform software upgrades and pair mobile devices, respectively
- OTG to Ethernet support option

2.3 OSA Test Module Key Features

Features and specifications are subject to change. Refer to the datasheet on www.veexinc.com for the latest specifications.

Features and specifications subject to change. Refer to datasheet for more information.

- DWDM channel monitoring per ITU G.694.1 grid
- *DWDM C-Band Wavelength range from 1527 to 1567 nm
- CWDM channel monitoring per ITU G.694.2 grid
- CWDM Wavelength range from 1260 to 1650 nm
- C+L Band Wavelength range from 1521 to 1611nm *(RXT-45xx)*
- Dual Band (Full + C) Wavelength range from 1260 to 1650nm *(RXT-45x0)*
- Resolution: 0.1 to 3.5 (refer to datasheet)
- Channel ON/OFF or out-of-service in-band OSNR measurement
- *i*OSNR measurement for improved out of band signal-to-noise measurement results
- **i*OSNR measurement: value up to 40 dB
- Fast continuous scanning at ≤ 5 sec
- Single or Continuous sweep with min/max hold
- Simultaneous measurements of up to 200 channels *(RXT-4500)* and up to 96 channels @ 50 GHz *(FX180)*
- DWDM channel spacing down to 37.5 GHz *(RXT-4500);* 25 GHz *(RXT-4510*); 50 GHz *(FX180)*
- Channel power measurement (peak or composite)
- Channel threshold detection
- Span power measurement
- Channel frequency and wavelength delta vs. ITU grid
- High wavelength accuracy: ± 50 pm
- High dynamic range: ≥ 65 dB
- Special noise filter (*i*OSNR) for improved noise measurement accuracy which can improve OSNR by up to 5 dB @ 50GHz (FX180 only)
- Low Polarization Dependent Loss (PDL): < 0.3 dB
- DWDM Optical Rejection Ratio: >40dB @ 200 GHz
- Universal optical interface with industry standard adaptors
- Supports 10/40/100 Gbps transmission modulation types *(RXT-4500)*

OSNR values can vary with filter resolution, signal levels, modulation, and channel spacing.

2.4 OSA Test Module Package Contents (RXT-45XX)

- RXT OSA Test Module
- AC/DC adaptor
  - Input: 100-240 VAC (50/60 Hz), 1.5A max
  - Output: 16VDC
- Li-Ion battery (8400 mAH battery
- Nylon Soft Carry case

*The **OSA User Manual** and **Software Upgrade instructions** can be downloaded from the product page at www.veexinc.com.*

Go back to TOC

3.0 Safety Information

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

Optical Connectors

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

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

Electrical Connectors

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

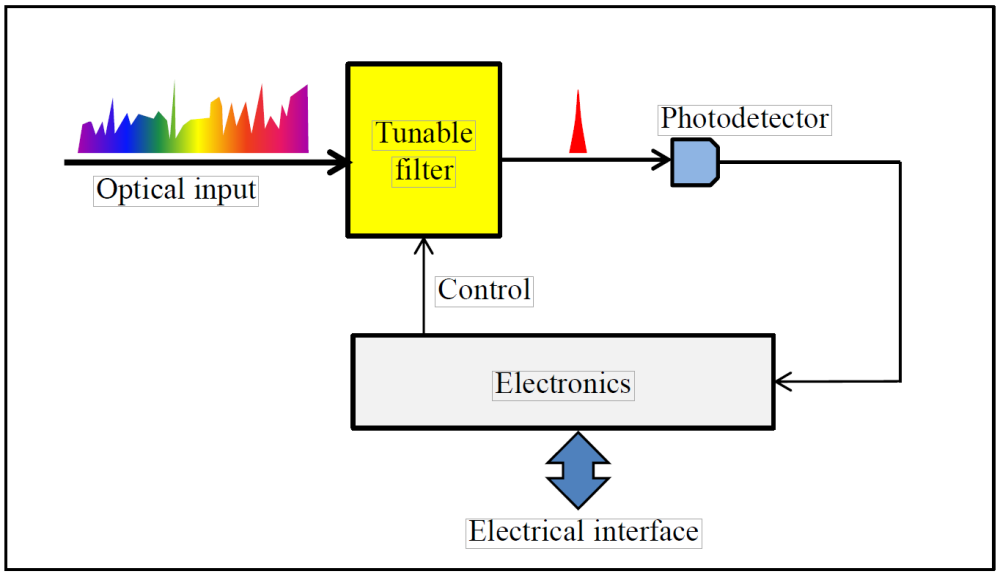
Go back to TOC

4.0 Theory of Operation

The OSA device measures optical spectrum of optical signals injected into the OSA device over the defined operating wavelength range. From the measured spectrum, critical channel parameters, such as channel power, wavelength, or OSNR can be analyzed.

4.1 OSA

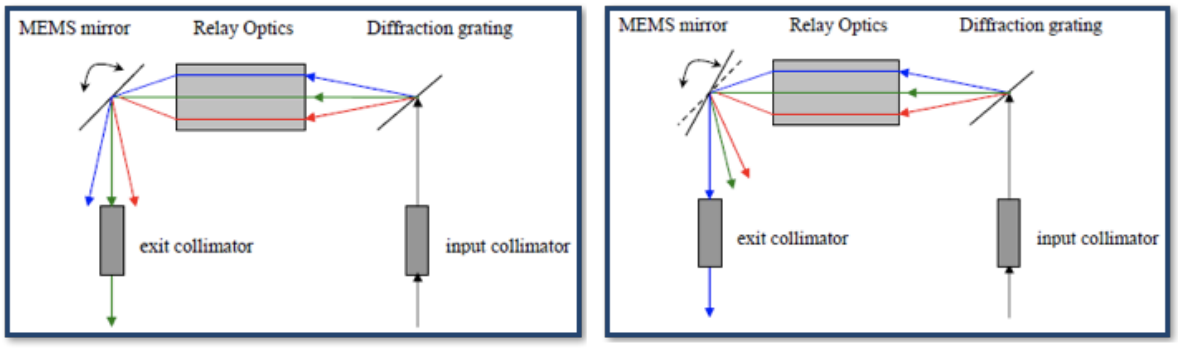
The OSA consists of a bandpass tunable optical filter, a photodetector, and low noise, high-dynamic range electronics, as shown below.



When a wide band spectrum is incident to the tunable filter, it allows a narrow band of input light centered at a given wavelength to pass through the filter. By altering the central wavelength of pass band of the tunable filter, the spectrum information of incident signal is detected sequentially. The photodetector converts the light passing through the filter into electrical current. The data processing unit analyzes the data and then outputs the spectrum to the customers.

4.2 MEMS Technology

The OSA employs a micro-electromechanical system (MEMS) tilted scanning mirror to achieve optimal testing by reducing the need to recalibrate due to vibration and temperature changes.

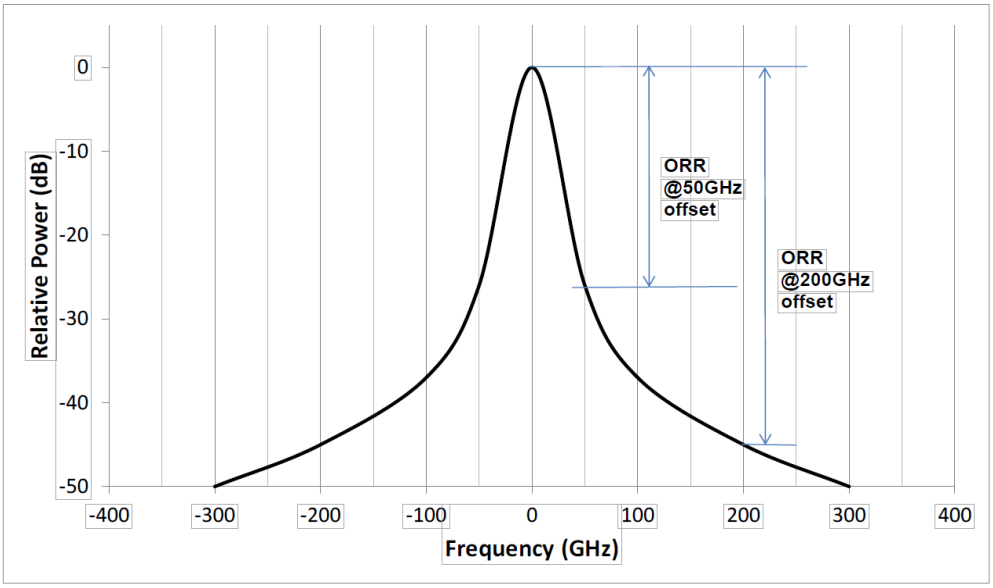


Incoming light hits the diffraction grating and different colors (wavelengths) are dispersed at different angles. The relay optics routes the dispersed beams to the MEMS mirror. The MEMS mirror selects one wavelength to the exit fiber.

Rotating the MEMS mirror changes the wavelength that will exit the collimator, i.e. each angle of the MEMS mirror 'selects' a different wavelength to the exit fiber. Scanning the angle of the MEMS mirror continuously allows the incoming spectrum to be reconstructed sequentially.

4.3 Parameters

Parameter	Description
Operating Wavelength Range	Specifies the spectral region between the minimum and maximum wavelengths over which the OSA device can operate and measure spectrum.
Input Power Range	Specifies the power range of narrow-band signals over which the OSA device can operate and measure spectrum. When measuring DWDM signals, it is the channel input power range.
Maximum Input Power	Maximally allowed value of total optical input power to the OSA device.
Wavelength Resolution	Specified by the Full Width at Half Maximum (FWHM) of the tunable filters. It is also called the 3-dB bandwidth.
Absolute Wavelength Accuracy	Maximum wavelength error when measuring laser signals over operating wavelength range. The wavelength error is calculated as the difference of the measured wavelength values between the OSA device and the calibrated wavelength meter.
Wavelength Repeatability	Maximum variation of wavelength measurements over operating wavelength range within 24 hours at any fixed measurement condition.
Absolute Power Accuracy	Maximum power error when measuring laser signals over operating wavelength range and input power range. The power error is calculated as the difference of the measured powers between OSA device and the calibrated power meter.
Relative Power Accuracy	Calculated as the maximum difference between the maximum and the minimum power errors over operating wavelength range from any single scans.
Power Repeatability	Maximum variation of power measurements over operating wavelength range within 24 hours at any fixed measurement condition.
Polarization Dependent Loss (PDL)	Maximum power difference of power measurements between any two polarization states.
Optical Rejection Ratio (ORR)	Isolation of the filter at a given location offset away from the center of the filter profile, as shown below.



Optical Rejection Ratio (ORR)

Parameter	Description
Noise Floor	Electronics background noise when there is no light input from the fiber port to the device
Optical Return Loss	Ratio between the reflected power from the device and the input power to the device
Operating Temperature	Specifies the minimum and maximum ambient temperatures within which the device can operate and meet its specifications
Storage Temperature	Specifies the minimum and maximum ambient temperatures within which the device can be stored without damage, and the device can meet its specifications when working over operating temperature range
Response Time	Total time span from host command issuing to the end of reporting data to host
Power Consumption	Peak electrical power when the device operates

4.4 OSNR

The OSA devices uses the In-band method to measure OSNR. OSNR (Optical Signal-to-Noise Ratio) is used to predict signal impairment (BER) carried by a system that includes effects from amplifiers/ROADMs. This ratio indicates service quality on the optical layer. A low OSNR at the receiver site indicates poor transmission quality (a high BER). The higher the OSNR, the higher the service quality.

To maintain BER when upgrading from 10G to 40G, the OSNR must increase by 6dB, but spectra overlap limits OSNR measurement. **Overestimating OSNR** by 5dB can **artificially** imply excellent service when in reality, the service is bad.

Use of Forward Error Correction (FEC) can reduce required OSNR requirements by 5 to 7dB, as shown in the example below. However, this depends on data rate, transmission modulation, FEC characteristics and coherence.

Service Quality	BER Limit	10G	25G	40G	100G*	150G*	200G*	400G**	600G**
Excellent	10^{-21}	14 dB	20 dB	26 dB	12.5 dB	18 dB	21.5 dB	23 dB	27 dB
Acceptable	10^{-12}	12 dB	18 dB	23 dB	10.5 dB	16 dB	19.5 dB	21 dB	25 dB
Bad	10^{-7}	9 dB	15 dB	21 dB	8.5 dB	14 dB	17.5 dB	19 dB	23 dB

* Baudrate = 32G
** Baudrate = 64G

Example of Service Quality BER vs OSNR

Data Rate	Baud Rate	Polarities	Modulation	Channel Size	BW (w/ FEC)	ficiency (bits/s/H	Min. OSNR
10G	833M	1	NRZ/PAM10	822MHZ	10.7G	0.8	18 dB
40G	11.5G	2	DPQSK	9.2942 GHz	37.2G	0.8	23 dB
100G	32G	2	DP-QPSK	37.5GHz	128G	2	10.5 dB
150G	32G	2	DP-8QAM	37.5GHz	192G	3	16 dB
200G	32G	2	DP-16QAM	37.5GHz	256G	4	19.5 dB
200G	56G	2	DP-8QAM	62.5GHz	224G	3	17.5 dB
400G	64G	2	DP-32QAM	62.5GHz	560G	5	23 dB
200G	64G	2	DP-QPSK	75GHz	256G	4	14.5 dB
400G	64G	2	DP-16QAM	75GHz	512G	4	21 dB
600G	64G	2	DP-64QAM	75GHz	768G	6	25 dB

Example of Data Rate vs OSNR

Manual Channel ON/OFF

For 40Gb/s or higher, the **OSNR Channel On/Off** mode is required for "True OSNR". See Channel ON/OFF Mode for more information.

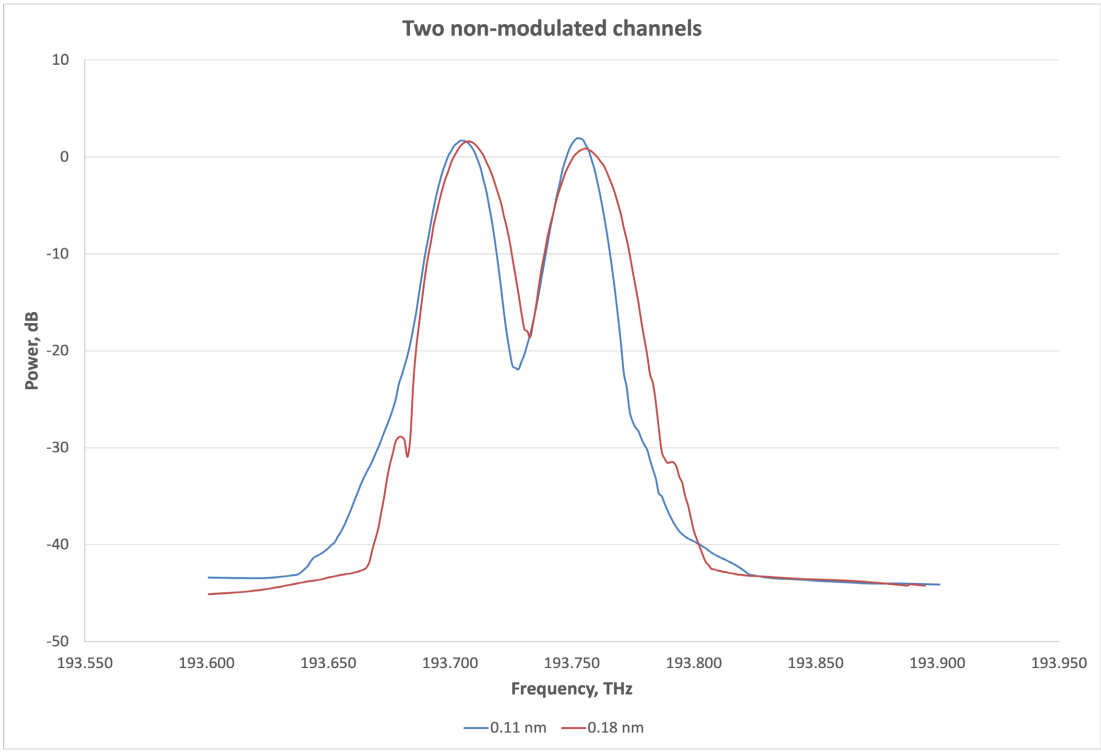
The table below illustrates examples of how 40G non-coherent service quality suffers when OSNR drops.

Service Quality	OSNR	Characteristics
Excellent	21dB *Low bit errors*	• Clear video picture • High voice quality • No errors in data transmission / data downloads
Good	~17dB *Increased BER*	• Pixilation in the video signal • Poor voice quality, echoes and volume fluctuations • Errors in data transmission/drop and reconnect during data downloads
Bad	15dB or less	• Dropped video channels • Dropped voice calls • Inability to transmit/download data

4.4.1 RBW Filter Impact on OSNR Limit

Amplifiers/ROADMs will filter the spectral signal, making it difficult to accurately determine the noise level from interchannel power measurements. At 10 Gb/s and 50 GHz channel spacing, modulation spectra overlap putting a limit on OSNR measurement so value isn't improved even by reducing RBW filter.

While reducing from 0.2nm to 0.1nm RBW filter makes significant improvements, further decreasing RBW<0.05nm has minimal effect on OSNR measurement limits as channel spacing is reduced, as shown below.



Impact of RBW Filter vs Channel Spacing

5.0 Basic Operation

Touch Screen Navigation

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

5.1 RXT-1200/RXT-45X0 Front Panel Layout

For details on platform operations, see the RXT1200 User Manual at www.veexinc.com.

5.1.1 LED Indicators

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

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

5.1.2 Rubber Keypad

Power: Press for 2 seconds to turn the test set ON or OFF.

Cursor Keys: Used to move markers or navigate menus. Depends on active application and unit configuration.

Enter: Enters the desired value or selects active menu, check box or radio button. Depends on active application and unit configuration.

Escape: Exits the menu.

Alt Alternate function: Links the buttons to the GUI soft Function Keys (MTT Emulation Mode only)

Clear History: Resets blinking LED reminders of past Errors or Alarms. Test results are not affected (not used in OTDR).

Power+Enter+UP ARROW: Initiates the platform firmware upgrade process.

Volume and Brightness Control: (Acts as the MTT F1 key, when the Alt key is active) Accesses Sound and Screen Brightness controls. Use cursor buttons to adjust the levels.

App/Test Application Selector (Acts as the MTT F2 key, when the Alt key is active). Switches between the active Test Application (OTDR, OLS, OPM, VFL) and RXT platform. Active test is not affected.

Lock/Unlock Touch Screen: Locks the touch panel. Can also be programmed to capture Screen Shots (>Utilities >Settings>Global>Save Settings)

Home: Accesses the Main Menu

Save Test Results: Saves the current Test Results (OTDR, OPM, Ethernet, Fiberscope). Depends on active application and unit configuration.

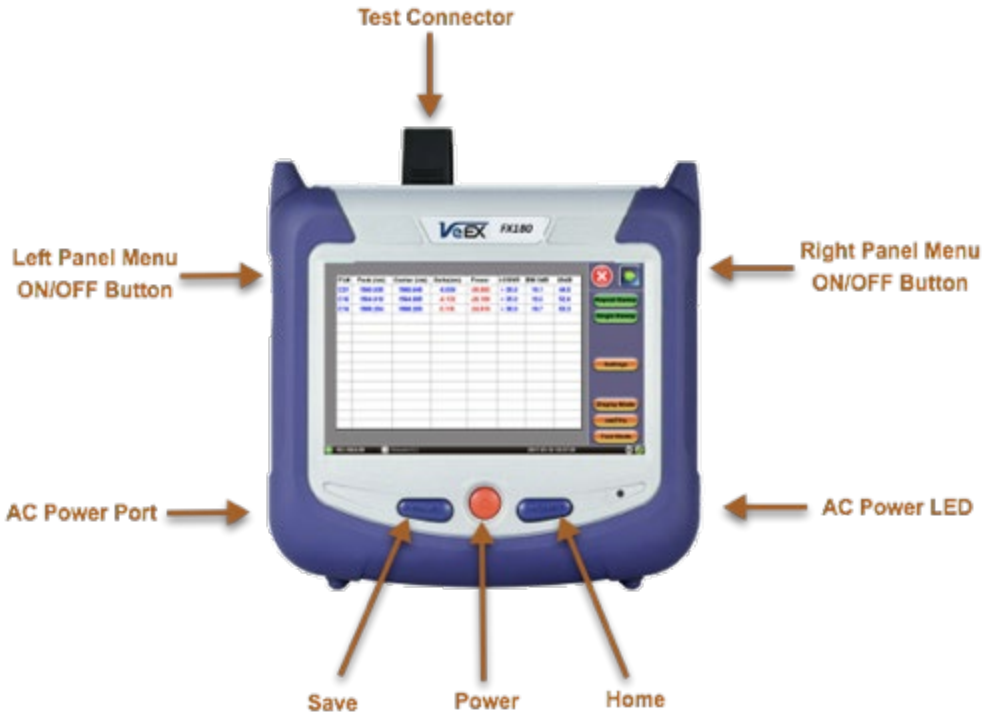
Table of Contents RXT-1200 Front Panel Layout

5.2 FX180 Front Panel Layout

The FX180 Optical Channel Meter has two models:

- Full band or CWDM: 1260 – 1650nm
- DWDM C-Band: 1527 - 1567nm

Test Modes include: Spectrum, ITU drift analysis, and Channel ON/OFF.



5.2.1 LED Indicators

Power LED: A single LED indicates the power state of the unit.

- The LED is off when the unit is powered off.
- The LED is green when the unit is powered on.
- The LED is orange when the unit is connected to the AC power port and powered off (charging).

5.3 Getting Started with the FX180

5.3.1 View/Hide side menu panels

The left and right panels of the display provide icons to access key functions of the FX180. These panels can be minimized sto enable a better view of the application screens.

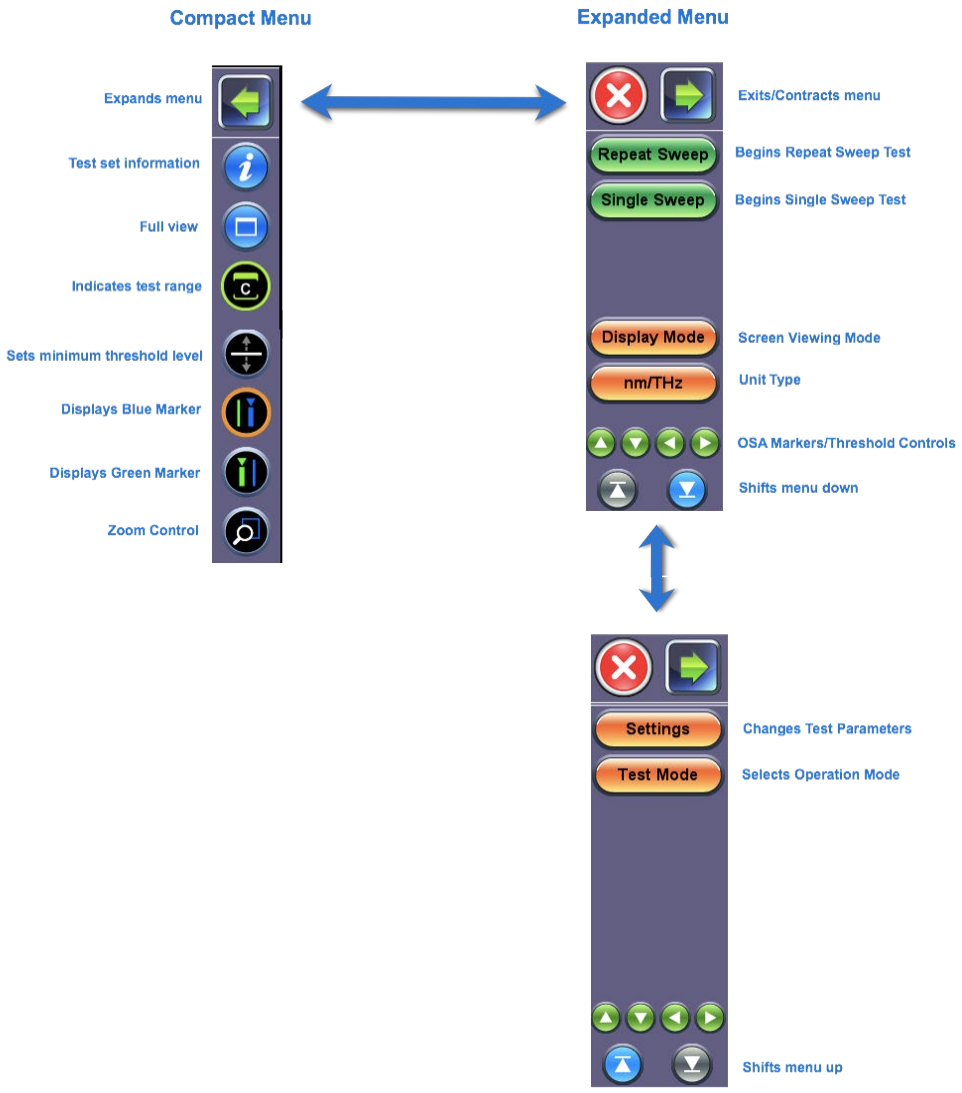
Use the rocker buttons located on the left and right sides of the unit to expand/contract the left and right menu panels.

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

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


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

The **RIGHT SIDE KEY** provides access to Spectrum Mode and ITU Test Modes.

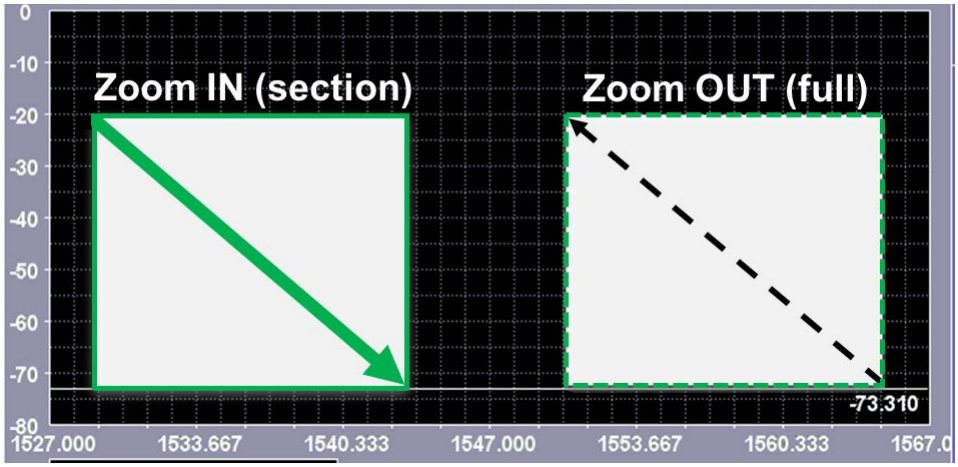


Spectrum Mode and ITU Test Modes: Right side Touchscreen Controls

5.3.2 Zoom Controls

Use the stylus provided with the test set and select the **Zoom**icon to enable zoom on the touchscreen. Swipe from upper left to downward right in a diagonal motion to zoom in. Swipe from downward right to upper left in a diagonal motion to zoom out.

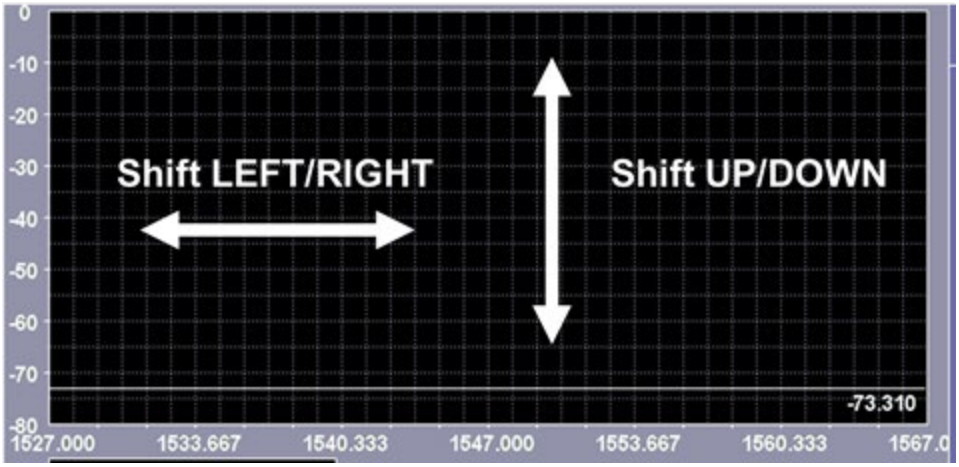
Zoom/Un-Zoom



Zoom Touchscreen Control

To shift waveform, use the stylus provided with the test set and select **Zoom** icon. Then, swipe from left to right or right to left to shift horizontally. Swipe down to up or up to down to shift vertically.

Shift waveform in viewing window



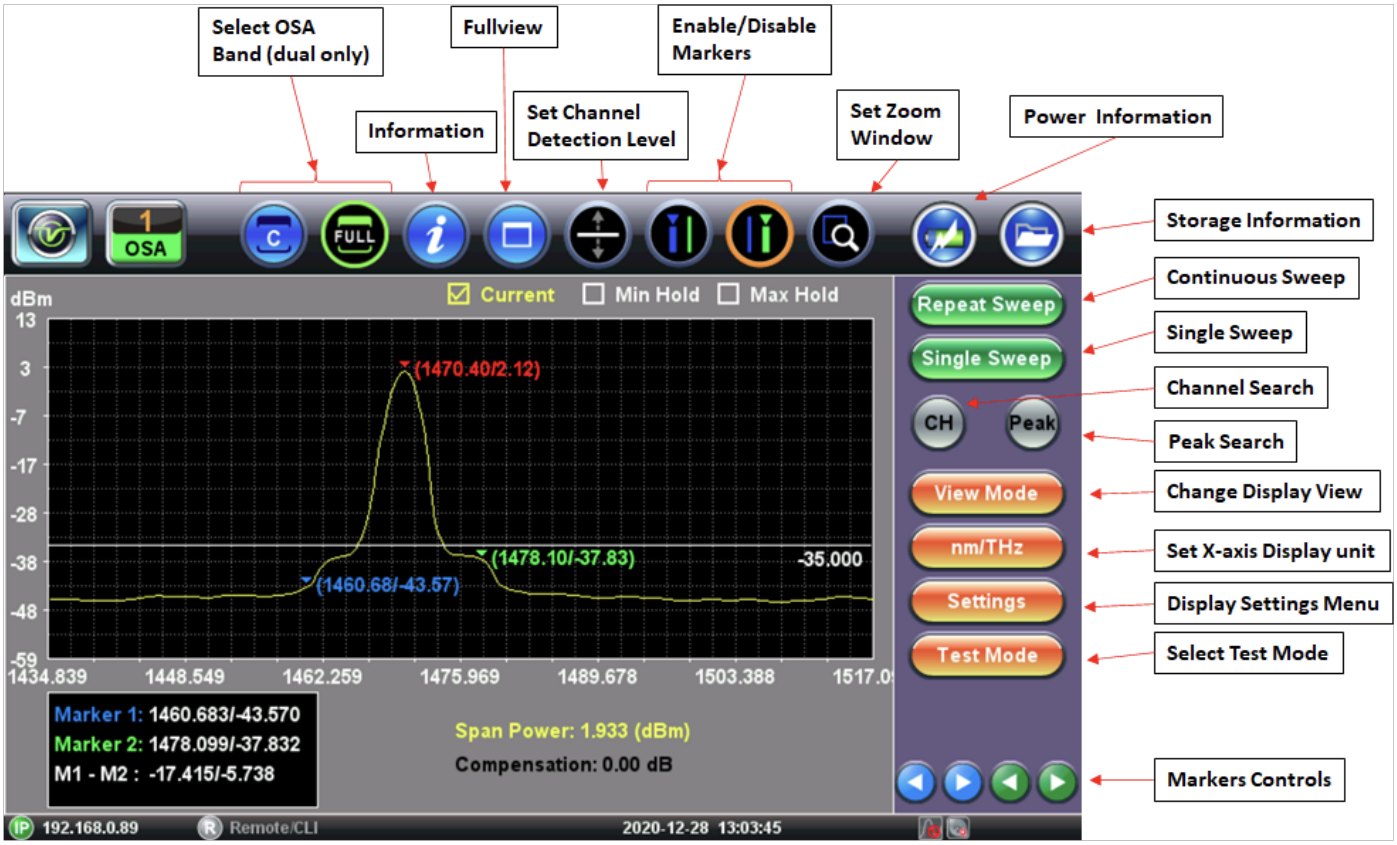
Shift Touchscreen Control

Table of Contents FX180 Getting Started

6.0 OSA Module (RXT-45XX)

6.1 Main Display

6.1.1 Spectrum View Control Buttons

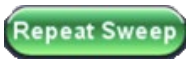


OSA Application: This is the default operating mode upon powering on the unit. Use this button to return to the OSA operating mode. The below buttons are used to manage primary test functions and information.

Test Mode: Displays the Test Mode screen to select the desired test mode.

Settings: Displays and change the settings for the selected test mode.

View Mode: Cycles through available display views for the selected test mode.



Repeat Sweep/Stop: Activates a Continuous Sweep mode. When this mode is active, the button will change to **Stop**.

Single Sweep: Performs a single test sweep.

Peak: Places a marker at the highest peak in spectrum.

Ch: Turns the Channel # ON/OFF on the Spectrum view and Table. Only channels that exceed the Channel Threshold level will be assigned a Channel #.

nM/THz: Switches the X-axis display units between wavelength (nm) and frequency (THz). When these buttons are active, the ring around the button will change to an Orange color.

Threshold: Sets the Channel detection level threshold. Double tap to remove the threshold.  Tap to move the white threshold setting level up and down or drag the level to the desired position.

Blue Marker: Tap to select and display on viewing window.
Tap **Spectrum** to position the Blue Marker or tap the arrows  to move the marker position.

Green Marker: Tap to select and display on viewing window.
Tap **Spectrum** to position the Green Marker or tap the arrows  to move the marker position.

Zoom: Tap to select Zoom. Use stylus to create a zoom box starting from upper left to lower right. A green color box will initially appear on screen, but continue to drag down until the box changes to a white color, which indicates a valid zoom area has been created and release.

Fullband: Displays that the cellular data card is attempting to connect to a network.

Fullband, C-band, L-band, DWDM, CWDM: Indicates which band is being measured actively.
Note: *You can view 1 OSA band (Fullband, C-band or L-band). One dualband modules, you can view one band at a time, but not both simultaneously.*

Full View: Returns from zoom view to full display view.

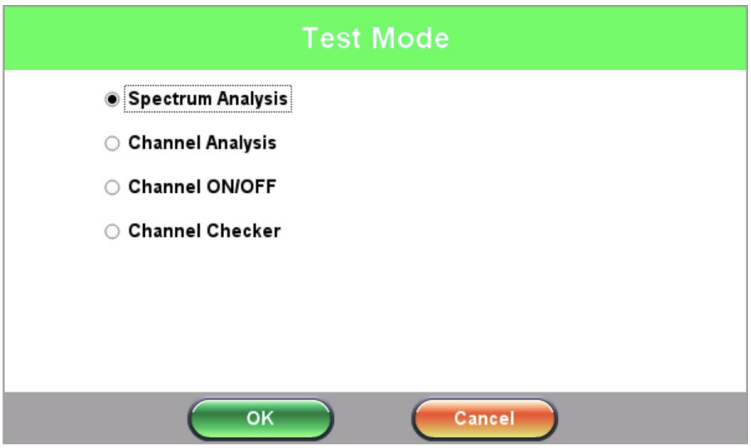
Information: Pops up the information window about the Test Module (Serial Number, Firmware Version, Hardware Version, Temperature and Manufacture Date).

Table of Contents OSA Main Display

7.0 Working with the OSA

7.1 Test Modes

Use the **Test Mode** screen to select the type of test you want to perform. The available Test modes vary by model and options configured on the OSA.



OSA Test modes

The following Test modes are available:

- **Spectrum Analysis** – Displays the spectrum in either Full-band or DWDM spectrum range. Manually set the criteria for identifying specific measurement settings, such as OSNR, ITU Grid, Channel ON/OFF, Deviation (%), Span Power, dB M1<->M2, and Compensation. View test results in a variety of display modes.
- **Channel Analysis** – Scans and detects channels automatically, according to pre-defined ITU spectrum grids. **DWDM bands** can support 25, 33.3, 37.5, 50, 100, and 200GHz channel spacing (depends on the C and C+L band filter specification). Full-band OSA supports CWDM optional only.
- **Channel ON/OFF** – Measure out-of-service, in-band OSNR. Each channel must be turned off manually.
- **Channel Checker** – Display ITU channels in bar graph and table view only.

Table of Contents

7.2 Spectrum Analysis (Test Mode)

7.2.1 Sweep

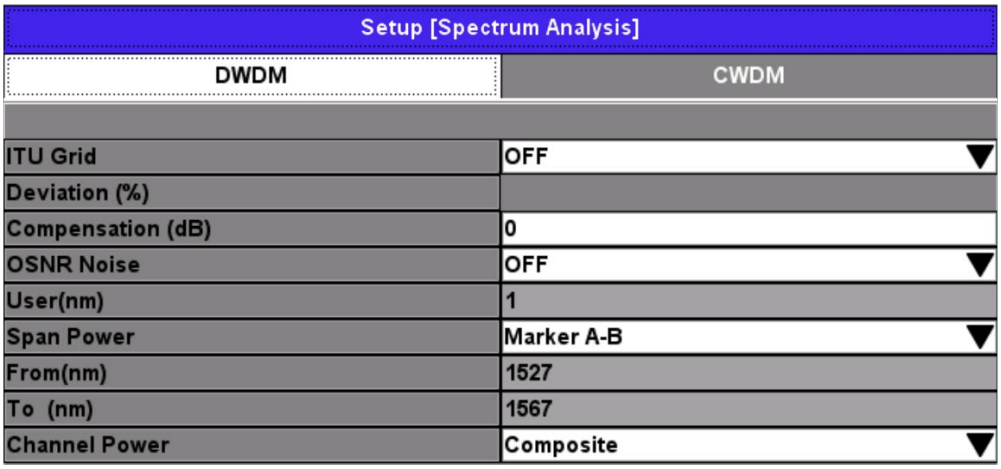
The following measurement options are available:

- **Single Sweep**: Initiates a single test sweep and the resulting test result will appear.
- **Repeat Sweep**: Continues sweep until measurement is terminated manually by selecting the **Stop** button. When in Repeat Sweep test mode, the label will change to **Stop**.

7.2.2 Settings

After selecting the type of test you want to perform on the Test Mode screen, press **Settings** to 

select the test configuration.



Spectrum and ITU Grid Test Mode settings

OSNR Noise: Standard OSNR Noise measurement per IEC 61280-2-9 is calculated using an out-of-band technique (Linear interpolation). *i*OSNR Noise calculation requires an empty channel within 3 channels to left or right-side of specified channel. If no empty channel is available, then N/A will be displayed. The *i*OSNR limit is 40dB. All values over 40dB will show > 40dB. Select the desired OSNR Noise settings (OFF, 0.2nm (50GHz), 0.4nm (100GHz), User (nm), *i*OSNR 50 GHz or In-Band 100 GHz.

- **OFF**: Turn off OSNR measurement.
- **0.2nm/50GHz**: OSNR is taken from the channel's peak (A), 0.2nm to the left (B), 0.2nm to the right (C), OSNR = (A-B)+(A-C) divided by 2 per IEC 61280-2-9.
- **0.4nm/100GHz**: OSNR is taken from the channel's peak (A), 0.4nm to the left (B), 0.4nm to the right (C), OSNR = (A-B)+(A-C) divided by 2 per IEC 61280-2-9.
- **User**: Similar to 2 above, the window's range is max 15nm per IEC 61280-2-9.
- ***i*OSNR**: The iOSNR will use the noise from an available empty channel next to test channel to calculate OSNR using out-of-band technique.

Channel ON/OFF: Turn Channel # on or off in Spectrum view.

ITU Grid: See Channel Analysis Settings for more information.

Deviation (%): Assign a Channel # to a peak signal provided the wavelength is within the entered value.

Span Power: Display Span Power on the viewing window (OFF, From (nm) To (nm) or between markers M1<->M2)

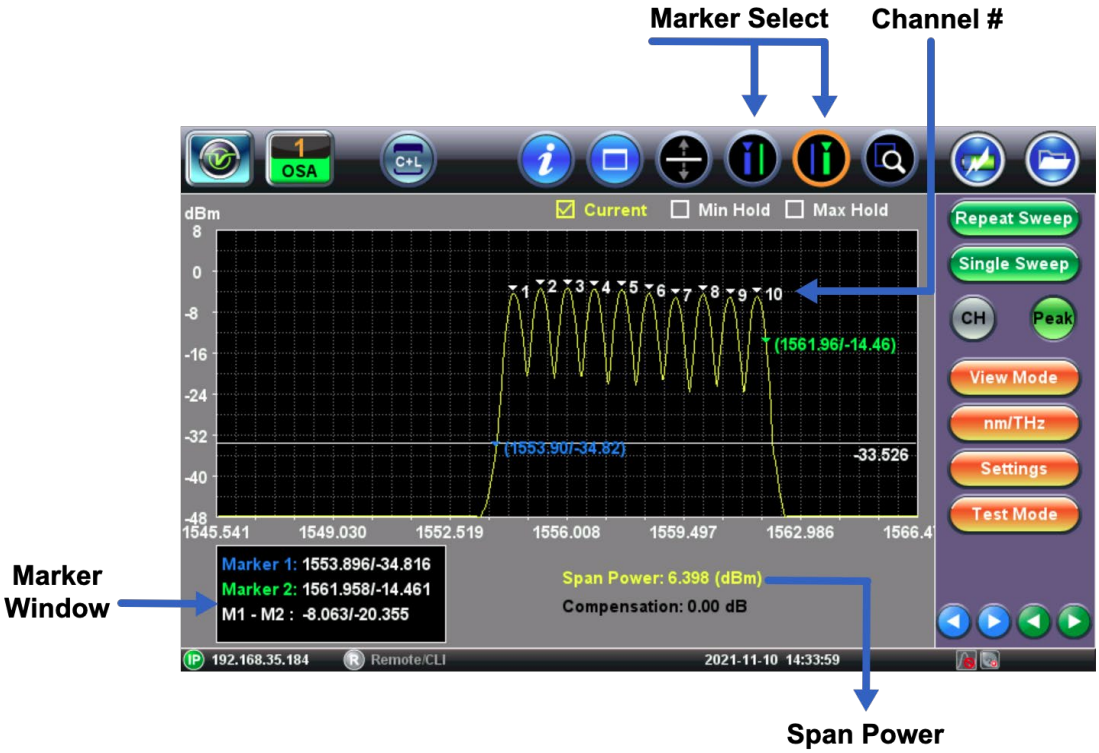
- **OFF**: No span power measurement.
- **Wavelength Range**: The span depends on the OSA in use; C, C+L or All band.
- **M1 <> M2**: Span power between the Green and Blue markers.

*The **Span Power** measurement measures Current, Min (if selected) or Max (if selected).*

Compensation: Enter the value of any external attenuator that is used to reduce the OSA input power.

7.2.3 Spectrum+Marker View

The Blue and Green markers can be placed by selecting the marker and tapping the spectrum or arrow buttons. Tapping the **Peak Search** button on the right menu will display which channel has the highest signal level which is marked with a Red marker.



7.2.4 Table View

The Table Display mode display results in a table format. The table will display the following results: ITU Channel #, Wavelength (nm), Frequency (Ghz), Channel offset (nm/GHz), Channel Peak Power/Integrated levels (dB), 3dB Bandwidth (GHz), and 20db Bandwidth (GHz).

ITU#	Peak (nm)	Center (nm)	Delta(nm/GHz)	Power(dBm)	OSNR	BW 3dB	20dB(nm)
1	1554.377	N/A	-0.243 / 30.2	-0.4/-0.1	18.600	0.301	N/A
2	1555.193	N/A	-0.253 / 31.4	0.5/0.8	17.285	0.299	N/A
3	1556.010	N/A	-0.263 / 32.6	0.7/1.0	17.611	0.305	N/A
4	1556.809	N/A	-0.255 / 31.5	0.3/0.6	17.818	0.305	N/A
5	1557.628	N/A	-0.265 / 32.7	0.2/0.4	18.176	0.294	N/A
6	1558.447	N/A	-0.275 / 33.9	-0.4/-0.2	18.053	0.291	N/A
7	1559.212	N/A	-0.229 / 28.2	-1.4/-1.1	17.416	0.298	N/A
8	1560.033	N/A	-0.239 / 29.4	-0.6/-0.4	18.428	0.293	N/A
9	1560.855	N/A	-0.249 / 30.6	-1.1/-0.9	18.029	0.290	N/A

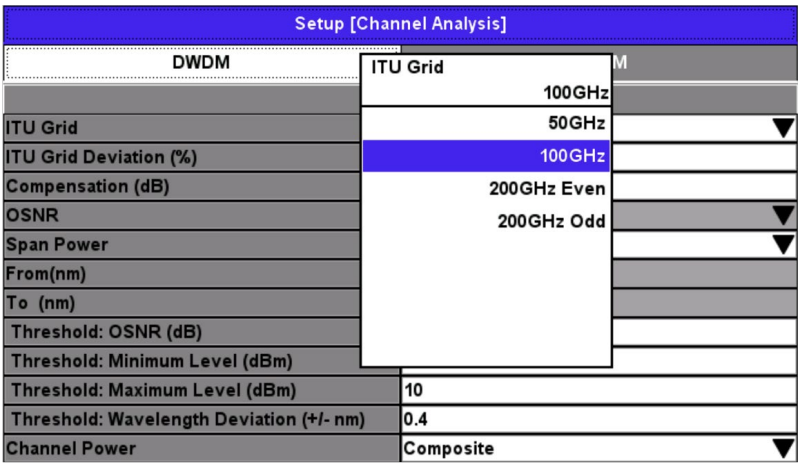
ITU Grid Test Mode: Table view

Total/Integrated channel power is a feature introduced in August 2017. For the most accurate measurement, older OSA modules should be re-calibrated. The RXT-4500 modules with S/N starting with TS3XXXXXXXXX will not support integrated channel power calculations.

Table of Contents Spectrum Analysis (Test Mode)

7.3 Channel Analysis (Test Mode)

7.3.1 Channel Analysis Settings



Spectrum and ITU Grid Test Mode settings

ITU Grid: Select from the following available ITU Grid (Off, 25, 33, 37.5, 50 GHz, 100 GHz, 200 GHz or CWDM). The actual ITU Grid supported can vary with model.

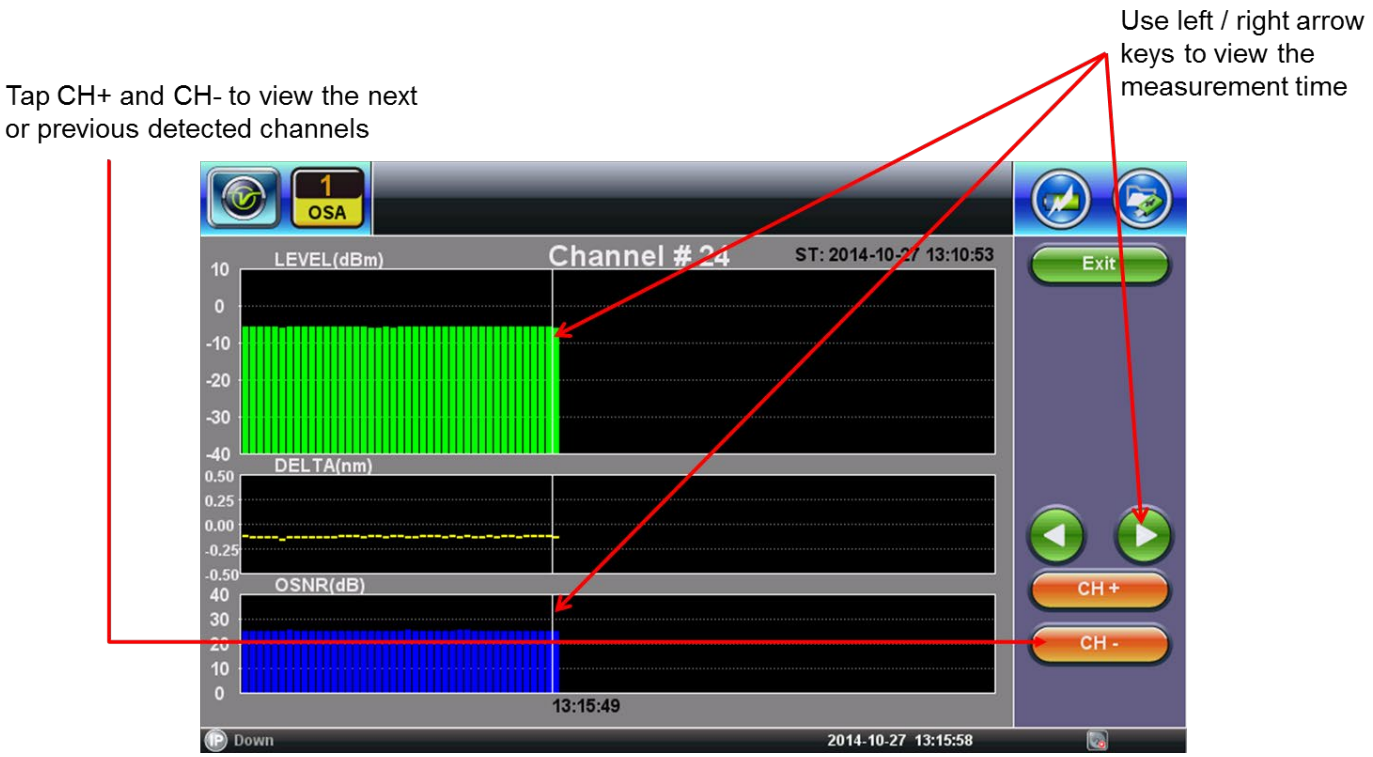
- **OFF**: ITU Grid type not selected.
- **25/50/100/200 GHz**: The ITU Grid that is selected will only show the frequency and level of the channels detected when compared to the nearby ITU channels, provided the channel peak is within the acceptable deviation (delta) from the ITU channel.

Threshold: Define measurement limits when viewing a specific channel analysis.

For information about other settings, refer to Settings.

7.3.2 Channel History

In Repeat Sweep Test Mode, tap on any Channel bar to view the prior 20 minutes of test data of a specific ITU Channel for signal level, wavelength and OSNR using First In/First Out. The left and right arrow buttons can be used to determine the time that this measurement was made. To view the history for another channel, press the CH+ or CH- buttons until the desired channel is reached. To exit this mode and return to the previous Display mode, press the Exit button.



Repeat Sweep: Channel History

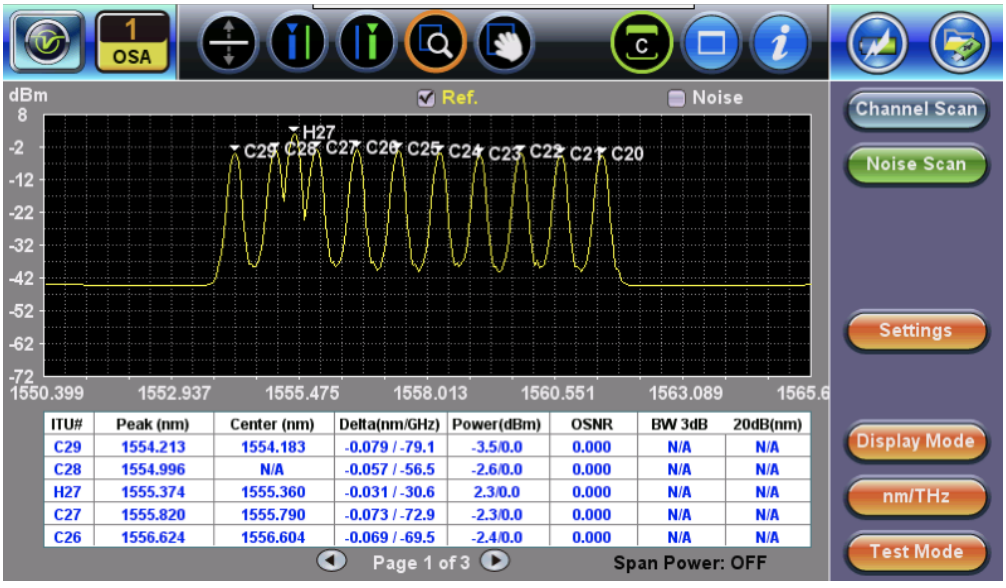
Table of Contents

7.4 Channel ON/OFF Mode

Use this mode to measure in-band OSNR. This test is designed to test 2+ channels and will not provide valid testing for a single channel. The original OSNR values will be shown before any Channel is OFF for comparison purposes.

To make an in-band OSNR measurement using the Channel ON/OFF mode:

1. Press **Channel Scan** to perform a Channel Scan with ALL channels turned on.

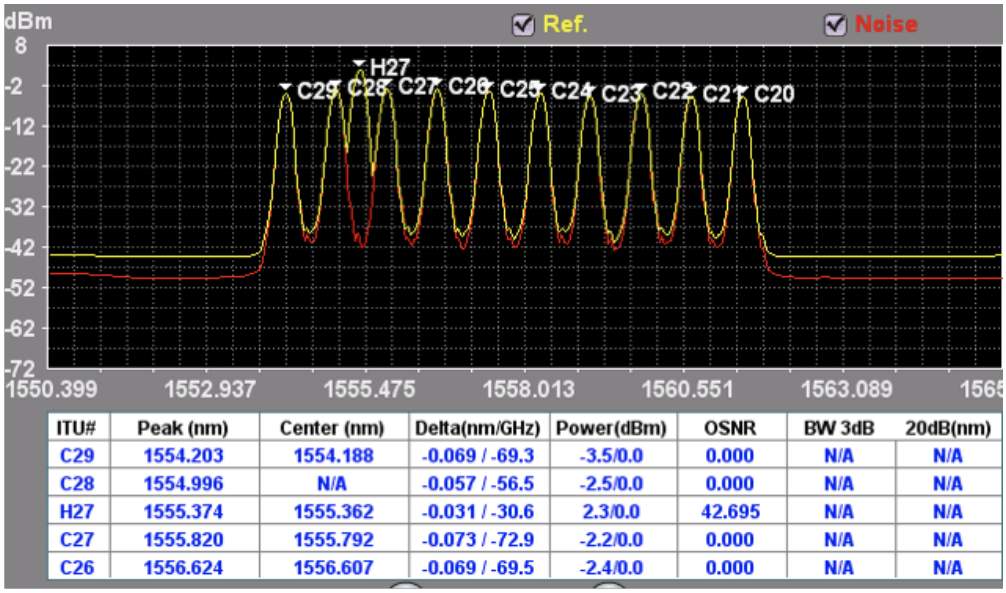


Channel Scan

2. Turn off a channel, and then press **Noise Scan**. A new spectrum appears, showing how noise changes in red (*see example Noise Scan illustrated below: H27 in-band OSNR = 42.695*). Turn off additional channels, as needed.

When saving the file, In-band OSNR Noise results will be saved unless you uncheck **Noise**.

Do NOT change Test Settings between tests until the noise file has been saved.



ITU#	Peak (nm)	Center (nm)	Delta(nm/GHz)	Power(dBm)	OSNR	BW 3dB	20dB(nm)
C29	1554.203	1554.188	-0.069 / -69.3	-3.5/0.0	0.000	N/A	N/A
C28	1554.996	N/A	-0.057 / -56.5	-2.5/0.0	0.000	N/A	N/A
H27	1555.374	1555.362	-0.031 / -30.6	2.3/0.0	42.695	N/A	N/A
C27	1555.820	1555.792	-0.073 / -72.9	-2.2/0.0	0.000	N/A	N/A
C26	1556.624	1556.607	-0.069 / -69.5	-2.4/0.0	0.000	N/A	N/A

Noise Scan

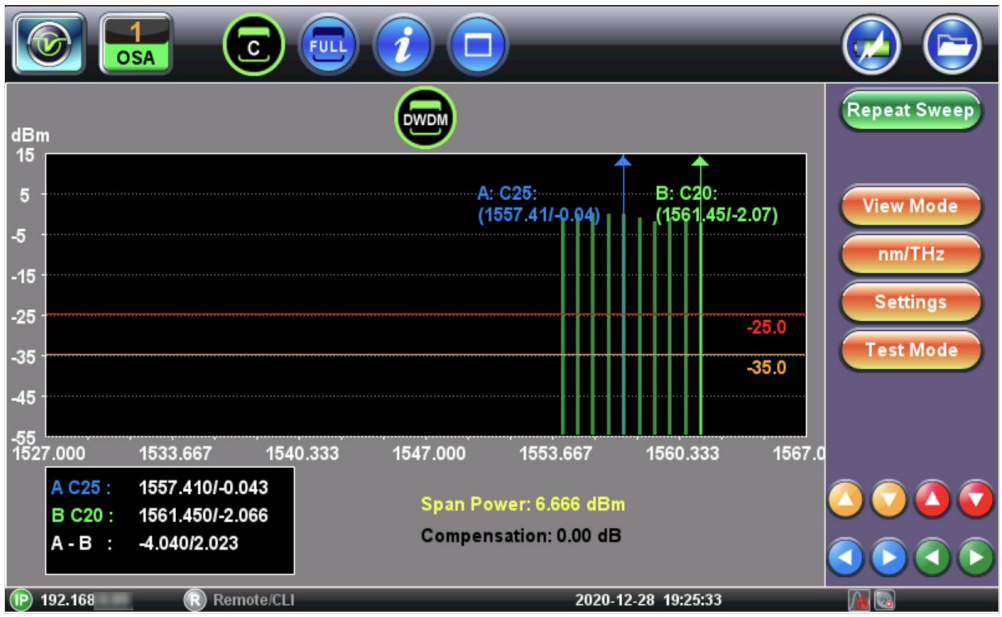
Table of Contents Channel ON/OFF Mode

7.5 Channel Checker Mode

Use this mode to do quick verification of ITU channels' power levels. This test is designed to provide simplified testing on multi-channel tranceivers or WDM network testing of two plus channels.

7.5.1 Bar Graph View

View all ITU channels on a single graph. Move the vertical markers to get specific details for each bar or compare two channels. The yellow horizontal threshold is the minimum channel threshold and the red threshold indicates Pass/Fail limit.



Channel Checker Mode - Bar Graph view

7.5.2 Table View

Measurement results can be viewed in table view.

Channel Checker Mode - Table view

Table of Contents Channel Checker

7.6 Event Log

In **Repeat Sweep** mode, the **Event Log** will capture the past 1000 events that trigger an Alarm. The information provided will be when the event occurred, the ITU Channel #, the type of Event, Alarm trigger type, and the measured value.

Time	Channel #	Event Type	Alarm	Value
2014/10/27-13:18:18	29	Level Low	Start	-26.602
2014/10/27-13:18:18	28	Level Low	Start	-25.883
2014/10/27-13:18:18	27	Level Low	Start	-25.895
2014/10/27-13:18:18	26	Level Low	Start	-25.758
2014/10/27-13:18:18	25	Level Low	Start	-26.781
2014/10/27-13:18:18	24	Level Low	Start	-27.535
2014/10/27-13:18:18	23	Level Low	Start	-28.742
2014/10/27-13:18:18	22	Level Low	Start	-27.953
2014/10/27-13:18:18	21	Level Low	Start	-29.195
2014/10/27-13:18:18	20	Level Low	Start	-29.980

Repeat Sweep: Event log

Table of Contents

8.0 Certifications and Declarations

Declaration of Conformity

What is CE?

The CE marking is a mandatory European marking for certain product groups to indicate conformity with the essential health and safety requirements set out in European Directives. To permit the use of a CE mark on a product, proof that the item meets the relevant requirements must be documented.
Use of this logo implies that the unit conforms to requirements of European Union and European Free Trade Association (EFTA). EN61010-1

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

RoHS Compliance

VeEX QUALITY AND ENVIRONMENTAL POLICY

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

ROHS Statement

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

RoHS and WEEE Position Statement

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

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

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

For more information about RoHS as it relates to VeEX Inc, go to the VeEX web site at www.veexinc.com/company/rohscompliance.

Go back to TOC

9.0 About VeEX

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

Visit us online at www.veexinc.com for the latest updates and additional documentation.

VeEX Incorporated
2827 Lakeview Court
Fremont, CA 94538
USA
Tel: +1 510 651 0500
Fax: +1 510 651 0505

Customer Care

Tel: + 1 510 651 0500
Email: customercare@veexinc.com

Go back to TOC