RXT-6402

Advanced Dual 400G Multi-service Test Module

400G Down to 10M Ethernet Testing
OTN, SDH/SONET, PDH/DSn
Fibre Channel

NEW

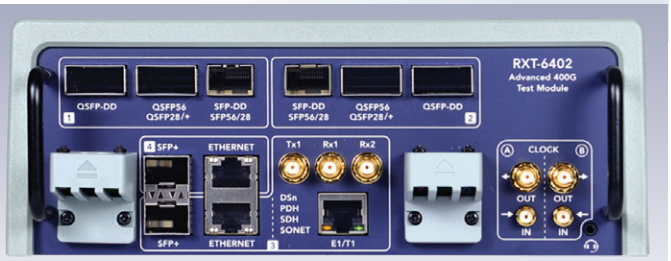
True All-in-One, from 1.5M to 400G
Dual test ports for all interfaces
Up to four independent tests
Best-in-class intelligent cooling system

for RXT-1202

Modular Test Platform

Advanced 2x400GE Multi-service handheld test set for Lab to Field Applications

VeEX® RXT is the industry's most flexible, compact, and future-proof handheld test solution for Core, Metro, Datacenter, and Access applications. The RXT-6402 Dual 400G offers the flexibility of testing current interfaces and supporting future expandability for applications including Transport, Aggregation, cross-connect, 5G x-haul, and NEMs field support.



Dual 400G Module Highlights

The RXT-6400 family has been the leading test solution for portable 400G testing. The RXT-6402 expands its applications and flexibility. Equipped dual test ports to support all common optical transceiver form-factors, AOCs and DACs, this module is a perfect complement to the RXT Platform, extending its testing range to 2x400 Gbps and offering an upgrade path to all-in-one 400GE multi-service testing. Installation, verification, commissioning, evaluation and maintenance tasks are simplified thanks to a combination of intuitive GUI and powerful test functions. Novice users benefit from the easy-to-use GUI, while experienced users will appreciate an array of advanced layer 1-to 4 test features, such as FEC codeword Error distribution analysis, PAM4 pre-emphasis, skew, transceiver check and stress, Lane BERT, Throughput test, IPv4/IPv6 and much more.

As 400GE becomes mainstream, it is important for test equipment to support all test interfaces required to maintain existing legacy infrastructure and data links.

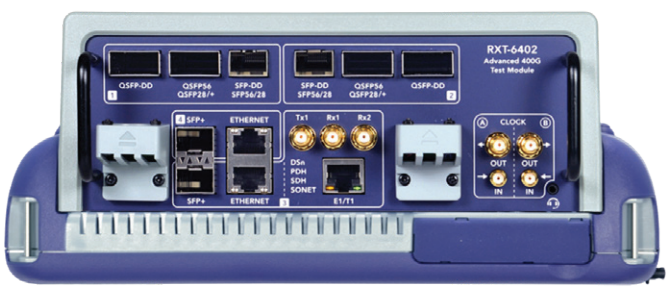
- 2x400GE concurrent testing capabilities
- Offers dual ports for all pluggable optics form factors, required for AOC/DAC, fan-out and wrap-around tests (from 10M to 400GE)
- Up to four concurrent and independent tests
- Native QSFP-DD, QSFP56, SFP-DD, and SFP56 PAM4 hardware for best-in-class signal integrity (no adapters required).
- Supports testing for all common form factors, including QSFP-DD, QSFP56, SFP-DD, and SFP56 transceivers, DACs, AOCs, network equipment and 400GE links.
- Advanced and flexible state-of-the-art FPGA-based design provides future-proof hardware support for emerging standards, test functions and applications.
- Wide range of supported 400GE interfaces, including 400GBASE-SR8, FR8, LR8, DR4, FR4, LR4, CR8, CR4 and 400ZR/ZR+.
- Complete industry-standard Ethernet link test feature set for Layers 2, 3 and 4.
- I2C/MDIO registers Read and Write.
- Per-lane PAM4 host pre-emphasis settings.
- Signal integrity check with FEC codeword symbol errors distribution and Skew.
- Transceivers power consumption monitoring (voltage, current) and variable voltage supply.
- Dedicated QSFP-DD head cooling fans (field replaceable) to optimize operating temperature verification of high-power class transceivers, such as ZR/ZR+
- All-in-one solution with common legacy test interfaces.
- Internal and external (cage) QSFP-DD temperature monitoring with overheating protection.
- High-capacity power supply provides support for long range coherent line interface transceivers and 2x400GE applications
- Battery (backup) operation improves mobility and efficiency in large hyperscale data centers, nodes, COs, R&D, evaluation labs and other field applications.
- High-efficiency intelligent cooling system
- Full-feature portable hand-held test set form factor, without compromises.

Applications

- Bring-into-service, verification and troubleshooting of high-speed Ethernet links.
- Optical transceivers verification.
- DAC and AOC verification, requiring full dual port capabilities.
- Fan-out tests.
- Evaluation labs and field support.
- Comprehensive test applications for layers 1-4, from 10M to 400GE.
- Full rate 400GE Throughput and frame loss measurements.
- PCS & RS-FEC layer testing.
- PAM4 signal integrity testing with multi-lane unframed BERT.
- I2C/MDIO verification and programming.
- Advanced optical transceiver test.
- Portable for field testing, evaluations, demonstrations, interop check, benchmarking, troubleshooting, link verification, etc.
- Maintenance and troubleshooting of legacy transmission equipment, interfaces and links.
- Robust construction and enhanced cooling for field applications.

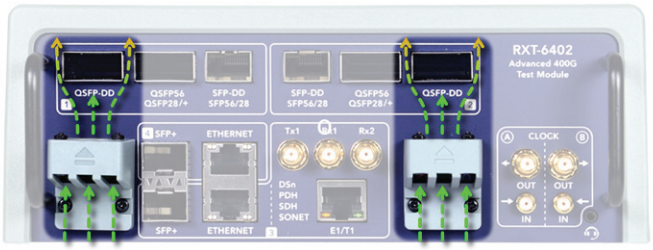
Test Interfaces

- 2x QSFP-DD (PAM4)
- 2x QSFP56/QSFP28/QSFP+ (PAM4/NRZ)
- 2x SFP-DD/SFP56/SFP28 (PAM4/NRZ)
- 2x SFP+/SFP (NRZ)
- 2x RJ45
- 1x RJ48 and 3x SMA (legacy)
- 2x Clock Inputs and 2x Outputs
- Four independent test port groups



PAM4 Interfaces

- Native PAM4 support for 400G QSFP-DD, QSFP56, SFP-DD, SFP56, transceivers.
- 400GBASE-SR8, FR8, LR8, DR4, FR4, LR4, CR8, CR4, and 400ZR/ZR+.
- Supports IEEE 802.3bs and MSA compliant transceivers.
- 300W supply supporting power classes 1 through 8.
- Cage temperature monitoring.
- QSFP-DD high-temperature warning threshold, overheat protection and field-replaceable external QSFP-DD head cooling system.
- Per-lane post and pre-emphasis settings.
- Lane BERT with independent test patterns.



MDIO Read/Write

- Complete MDIO I2C access.
- Raw read/write capability for all MDIO registers.
- Formal display of commonly used fields.
- Module hardware control pin read/write access.

Optical Power Measurement

- Global and per lane output enable/disable.
- Received per lane and composite optical power level monitoring.

Transmit Clock Sources

- Internal 2.5 ppm VCXO and optional GPS 1PPS.
- Recovered: from the incoming signal.
- External: 1.544 MHz, 2.048 MHz, 10 MHz, BITS/1.544 Mbps, SETS/2.048 Mbps, and 1PPS via 50 Ohm SMA Connector.

Line Frequency Offset Generation

- Line frequency offset generation ±100 ppm in steps of 0.1 ppm.

Line Frequency Measurement Capability

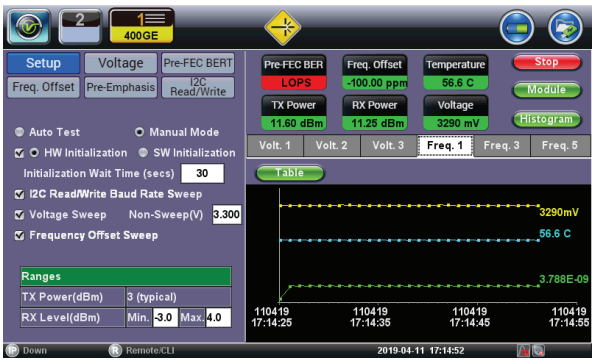
- Displays measured transmit line frequency in kHz.
- Displays measured transmit line frequency offset from reference clock in current, min, max ppm.
- Measures all lanes.

Stress Test: Pre and Post-FEC Test Suite

- Simple one button pass/fail test for verifying all transceiver properties.
- Advanced user defined thresholds.
- Simple test report includes settings, Pass/Fail, and detailed results.
- Frequency pulling range stress test.
- Pre and Post FEC test.

Advanced Optical Transceiver Test Suite

- Pre-FEC BER validation on a per-lane basis, over operational voltage and frequency offset range to verify optical module integrity before FEC is applied to the PAM4 signal (400GE interfaces).
- Pre-Framed BER (Lane BERT) validation for non PAM4 interfaces.
- Voltage, temperature, and Pre-FEC BER are monitored and displayed for the duration of the test. A histogram function clearly displays all three measurements for easy correlation and tracking of any abnormal changes.
- Pre-FEC BER and Optical Power threshold settings for PASS/FAIL indication.
- Pre-emphasis: Pre-taps, post-taps, and attenuation settings for PAM4 signal conditioning on the host side to help verify and stress transceiver tolerance and performance.
- Supply Voltage Tolerance Verification: Sweep range from 3.135V to 3.465V (3.300V +/- 5%) to verify compliance with optical transceiver MSA standard.
- Power Consumption Verification: Monitors the optical transceiver's power consumption (Watts), to verify conformance to its specified power class.
- Temperature Monitoring: QSFP-DD module and cage temperature monitoring with built-in shutdown protection of the optical module if the temperature increases beyond a certain high temperature.
- Frequency Tolerance Verification: Sweep range from -100 ppm to +100pm (in 0.1ppm/step), to verify compliance with the 400GE IEEE 802.3 +/- 20 ppm tolerance specification.
- I2C Baud Rate Sweep: QSFP-DD and OSFP sweep range 100K to 4000K. QSFP28 sweep range (20K to 1000K).



Ethernet Testing

Reliability, scalability and Quality of Service are the attributes needed for Ethernet to turn into carrier-grade Ethernet. With standard features including RFC2544, VSAM, Throughput, MPLS and VLAN support, this test set has all the tools necessary to truly ensure end-to-end carrier-grade Ethernet services.

Key Features

- Transmit frequency offset to stress the network up to ±150 ppm
- Optical Lane BERT
- FEC Layer Testing with Skew generation/monitoring
- PCS Layer Testing with Skew generation/monitoring
- Throughput, latency, jitter, frame loss, and back-to-back measurements per industry-recommendation RFC2544
- ITU-T Y.1564 Support
- Multi-stream testing with up to 32 fully independent and configurable streams
- IPv4 and IPv6 traffic generation
- MAC Flooding
- Q-in-Q (VLAN stacking) and multiple MPLS tag support
- BER testing at Layer 2 and Layer 3 with or without VLAN and MPLS tags
- Smart Loop mode for Layer 2, Layer 3, and Layer 4 with all key measurements on received traffic provided on the loopback port
- One-way latency measurement between remote devices (with GPS synchronization)
- Line rate packet capture with Wireshark™ decode

Test Interfaces

MSA compliant transceiver interfaces

QSFP-DD
- 400GBASE

QSFP56/QSFP28/QSFP+
- 200GBASE
- 40GBASE-R

SFP-DD/SFP56/SFP28
- 100GBASE-R
- 50GEBASE-R
- 25GBASE-R

SFP+/SFP
- 10GBASE-X
- 1000BASE-X
- 100BASE-FX

RJ45
- 10/100/1000BASE-T

400GE Testing

- Layer 2-4 support.
- Throughput (16 streams).
- Service Disruption Time measurements.
- RFC2544.
- ITU-T Y.1564 (V-SAM)
- IP Functions: Ping, Trace Route, ARP.
- Packet Capture (PCAP) and Decoding.
- PCS/FEC Analysis.
- Multi-lane Unframed BERT Testing.

200GE/100GE/50GE/40GE Testing

- Throughput (16-32 Streams).
- V-SAM (ITU-T Y.1564).
- RFC2544.
- PCS Analysis.
- IP Functions: Ping, Trace Route, ARP.
- Loopback: Layer 2 and Layer 3.
- Multi-Lane Unframed BERT Testing.
- Packet Capture (PCAP) and Decoding..
- Passthrough Monitor Mode (100GE and 40GE).

25GE/10GE/1GE Testing

- Throughput (32 streams on 10GE and 25GE).
- V-SAM (ITU-T Y.1564).
- RFC2544.
- IP Functions: Ping, Trace route, ARP.
- Loopback: Layer 2 and 3.
- Packet Capture.

Multi-lane Unframed BERT Testing

Per lane BERT testing for transceiver and equipment characterization and acceptance testing

Test Patterns

- Modes: 8 x 53.125G.
- PRBS 2^{31}-1, 2^{13}-1, PRBS31Q, PRBS13Q normal or inverted.
- Per lane test pattern selection.
- Pre-FEC error threshold definition
- Error Generation.
- Bit error per lane and global.
- Insertion: single.

Error Measurement

- Per lane loss of pattern sync.
- Per lane bit error count, average and current bit error rates.
- Aggregate bit error results.
- Events table tracking.

FEC Layer Generation

Skew Generation

- Per lane static skew generation.

FEC Lane

- FEC lane marker swapping and rotation.

Error Generation

- FEC Correctable Codeword, single and rates.
- FEC Uncorrectable, single and rates.
- Invalid Transcoded block.

Alarm Generation

- Per lane FEC alignment marker loss (LOAMPS).
- FEC LOA.
- High SER.

FEC & Skew Layer Analysis

FEC Lane

- FEC lane identification.
- FEC Codeword error distribution (signal integrity).

Skew Analysis

- Per lane skew analysis in bit time and picoseconds.
- User defined alarm threshold for received skew measurement Error Measurement.
- Supports counts, current and average error rates.
- FEC Correctable Codeword.
- FEC Correctable Symbol.
- Correctable Bits, Ones, Zeroes.
- FEC Uncorrectable.
- FEC Symbol Error Distribution.
- 256B/257B transcoding error.

Alarm Measurement

- Per lane FEC alignment marker loss.
- FEC LOA, LoAMPS.
- High SER.

Ethernet/IP

Traffic Generation/Test Stream Flow

Test flow is generated with a signature field in the beginning of the UDP payload area for traceability and measurement purposes

- MAC/IP/UDP formatted traffic generation.
- IP Version: IPv4 or IPv6.
- MAC/IP/UDP source and destination addressing.
- User defined Ethernet Type, Traffic Class, Hop Limit, Flow label fields.
- Frame sizes: 64 to 16,000 bytes.
- Test Pattern: Variable.
- VLAN tags up to 4 levels with user defined TPID, PCP/QOS, DEI, VID.
- MPLS tags up to 4 levels with user defined label, TC, S(bottom), TTL.

Traffic Rate Generation

- Full rate generation and analysis.
- Constant rate by % BW and Mbps.

Error Generation

Supports single and rate generation.

- Test pattern bit and sequence errors.
- IP Checksum.

Alarm Generation

- Remote and local fault alarms.
- Auto reply to local fault.

Results

Result Filtering

- Results can be filtered by VLAN tag TPID.

Transmit and Receive Port Counts

- Packets, packets/second, bytes, Mbps, % BW.
- VLAN packets, MPLS packets.
- IPv4 & IPv6 packets.

Receive Port Counts

- UDP, IGMP, ICMP packets.
- Broadcast, multicast, unicast.
- Jumbo, super jumbo packets (greater than 9000 bytes).

Distribution Results

- VLAN distribution by tag level and quality of service level.
- MPLS distribution by tag level and traffic class.
- Packet size distribution for 64, 65-127, 128-255, 256-511, 512-1023, 1024-1518, 1519–max byte ranges with support for counts, percentage and graphing.

Utilization Counts

- Total, IPv4, IPv6, VLAN, MPLS.
- Current, min, max, and average % BW, Mbps, and packets per second statistics for generated and received traffic.

Errors

Displays counts, errored seconds, current and average error rates.

- Code, undersized, invalid FCS, invalid IP.

Alarms

- Loss of link, local fault, remote fault.

Test Stream Results

- Transmitted and received packet counts, byte counts and rate in %BW.
- Test stream sequence errors, bit errors and lost frame counts in errored seconds, current and average rates.
- User-defined pass/fail threshold alarm from sequence errors, bit errors and lost frames.
- Latency min, max, and average measurements in microseconds.
- Packet jitter min, max, and average measurements in microseconds.

Test Results & Reports

- LEDs and detailed statistical counters.
- Graphs and Histograms.
- Event log history showing event, count, day/time, and duration.
- Test reporting options including PDF.

Test Profiles

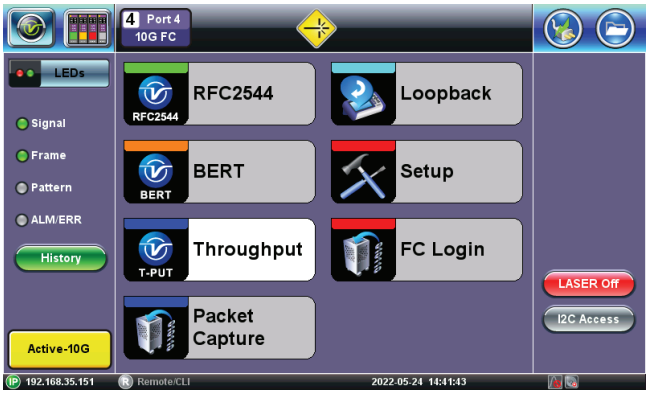
Supports save and restore of test profiles.

Fibre Channel Testing

Key Features

- Storage Area Networks (SAN) testing for 1G, 2G, 4G, 8G, 10G, 16G
- FC-1 and FC-2 BERT and Throughput
- RFC2544: Throughput, Latency, Frame Loss, and Back-to-Back frames tests
- FC-2 Smart Loop mode
- Layer 1 and layer 2 loopbacks
- Full line rate traffic generation and analysis
- Primitive Sequence Protocol support
- Flow control support with Buffer-to-Buffer credits
- Service Disruption Measurement
- FC-2 Frame Header configuration
- Test traffic shaping: constant, ramp, and burst
- Frame Length configuration up to 2148 bytes
- Point-to-point topology
- Terminated and Loopback operation

Test Interfaces



SFP+/SFP

- 16GFC 14.025 Gbps
- 10GFC 10.519 Gbps
- 8GFC 8.500 Gbps
- 4GFC 4.250 Gbps
- 2GFC 2.125 Gbps
- 1GFC 1.062 Gbps

Test Features

- Traffic generation
- Throughput test
- RFC2544 Benchmarking and compliance
- Bit Error Rate Test (BERT)
- FC-1 and FC-2 Loopback modes
- Optical power levels: transmit and receive optical levels in dBm
- Error Measurements: Bit error count, BER, symbol, FCS/CRC, oversize, undersize, frame loss (count and %), out of sequence frame count
- Alarm Detection: LOS, pattern loss, service disruption
- Traffic Statistics: bandwidth utilization, data rate, frame count, byte count, frame size distribution, buffer-to-buffer credit count, RR_RDY count, frame loss count and round trip delay
- Rates: line rate, framed rate, data rate, frames per second rate
- Delay (min, max, avg, current): round trip delay, frame arrival delay

OTN Testing

Full range of EoOTN and OTN testing capabilities for all standard OTN interfaces, including service-activation (Bringing-into-Service), performance verification, maintenance, and troubleshooting. It offers multi-layer testing from physical layer, OTL, OTUk/ODUk, to bulk payloads, and Ethernet traffic generation up to 100% rate.

Test Interfaces

QSFP28/QSFP+

- OTU4 111.810 Gbps
- OTU3 43.108 Gbps

SFP+/SFP

- OTU2e 11.095 Gbps
- OTU1e 11.045 Gbps
- OTU2 10.709 Gbps
- OTU1 2.666 Gbps

Key Features

- Advanced Mapping/Multiplex Structures
- EoOTN testing with internally generated Ethernet payload mapped into ODU0, ODUflex, GFP-F, OTU1e, OTU2e, OTU3 or OTU4
- Internally generated SDH/SONET test payloads, with or without PDH/DSn
- OTU, ODU, OPU overhead manipulation and monitoring
- OTU, ODU, OPU layer alarms/errors generation and analysis
- OTU, ODU, TCMi trace messages
- Service Disruption monitoring
- Forward error correction (FEC)
- Tandem Connection Monitoring
- Frequency offset generation and measurement

Test Features

- Bit Error Rate Test (BERT)
- Ethernet over OTN (EoOTN) with Throughput, BERT, RFC2544
- Alarm Generation (LOS, OTL, OTUk, ODUk, OPUk, FEC, TCMi, payload)
- Error Injection (OTL, OTUk, ODUk, OPUk, FEC, TCMi, payload)
- Overhead Analysis and Generation
- Tandem connection monitoring
- GCC0, CCC1, GCC2 channel testing
- PCC/APS and SDT
- FTFL (forward and backward faults)
- Events log
- Signal levels
- Transceiver information

SDH/SONET, PDH/DSn Testing

As 400G, 200G and 100G high-speed links become mainstream technologies, traditional service providers will still need multi-service testing capabilities to troubleshoot legacy transport technologies present in their network. Whether they are physical SDH/SONET interfaces, OTU1/ OTU2/OTU3/OTU4 payloads or transported via circuit emulation, with simple or multiplexed SDH/SONET or PDH/DSn clients. This test set provides all the flexibility to address complex test scenarios.

Test Interfaces

SFP+/SFP

- STM-64/OC-192 9.953 Gbps
- STM-16/OC-48 2.448 Gbps
- STM-4/OC-12 622.080 Mbps
- STM-1/OC-3 155.520 Mbps
- STM-0/OC-1 51.840 Mbps

SMA (electrical, unbalanced)

- STM-1e/STS-3 155.520 Mbps
- STM-0e/STS-1 51.840 Mbps
- E4 139.264 Mbps
- T3 44.736 Mbps
- E3 34.368 Mbps
- E2 8.448 Mbps
- E1 2.048 Mbps

RJ48 or Bantam (electrical, balanced)

- E1 2.048 Mbps
- T1 1.544 Mbps

Key SDH/SONET Features

- Bulk VC/STS/VT, PDH/DSn and multiplexed payloads
- Overhead manipulation and monitoring
- Alarms/errors generation and analysis
- Round Trip Delay
- Tributary Scan
- Tandem Connection Monitoring
- Pointer Test Sequences

Key PDH/DSn Features

- PDH/DSn with unframed, bulk and channelized payloads
- Alarms/errors generation and analysis
- Pulse mask analysis

Test Features

- Bit Error Rate Test (BERT)
- Alarm Generation
- Error Injection
- Overhead Analysis and Generation
- Tributary scan
- Pointer test sequence generation and monitoring
- Tandem connection monitoring
- Round Trip Delay (RTD)
- APS and SDT
- Events log
- Signal levels
- Transceiver information

Beyond the Test Set

VeEX Ecosystem – Manage, access, collaborate, train, support, analyze, track and more

Web Remote Access (WiFi, LAN, VPN)

Control, access and monitor test sets remotely, within private networks. Platform/OS independent, works with standard web browsers on PC, Mac, tablets and smartphones. No app or software installation required. No registration or personal data required.

EZ-Remote™ Cloud Service (Internet, Worldwide)

Control, access and monitor test sets at remote sites over the internet. Platform/OS independent, works with standard web browsers on PC, Mac, tablets and smartphones. No app or software installation required. Secured QR links to invite remote colleagues to collaborate. No registration or personal data required.

VeExpress™ License & Asset Management

This basic cloud service helps keep the test set fleet up-to-date and optimizes license ownership, by managing software updates, licenses (owned, rented, or shared), with basic asset tracking.

VeSion® R-Server Asset & Workflow Management

Advanced cloud/hosted service manages test set fleets, test results, data aggregation and analysis, workflow and job closing, reporting, asset management and protection.

Fiber Optics Tools Integration

Fiberizer™ Cloud integration (load, analyze, collaborate, etc.)[1]
CWDM/DWDM OSA Modules (e.g., Coherent wavelength check)[2]
OTDRs and CWDM/DWDM Tunable OTDR Modules[2]
Wired and wireless micro OTDR support.
Wired and wireless Fiber Connector Inspection Scopes
OPM and micro OTDR tethering (USB, Bluetooth, WiFi)

Platform Highlights

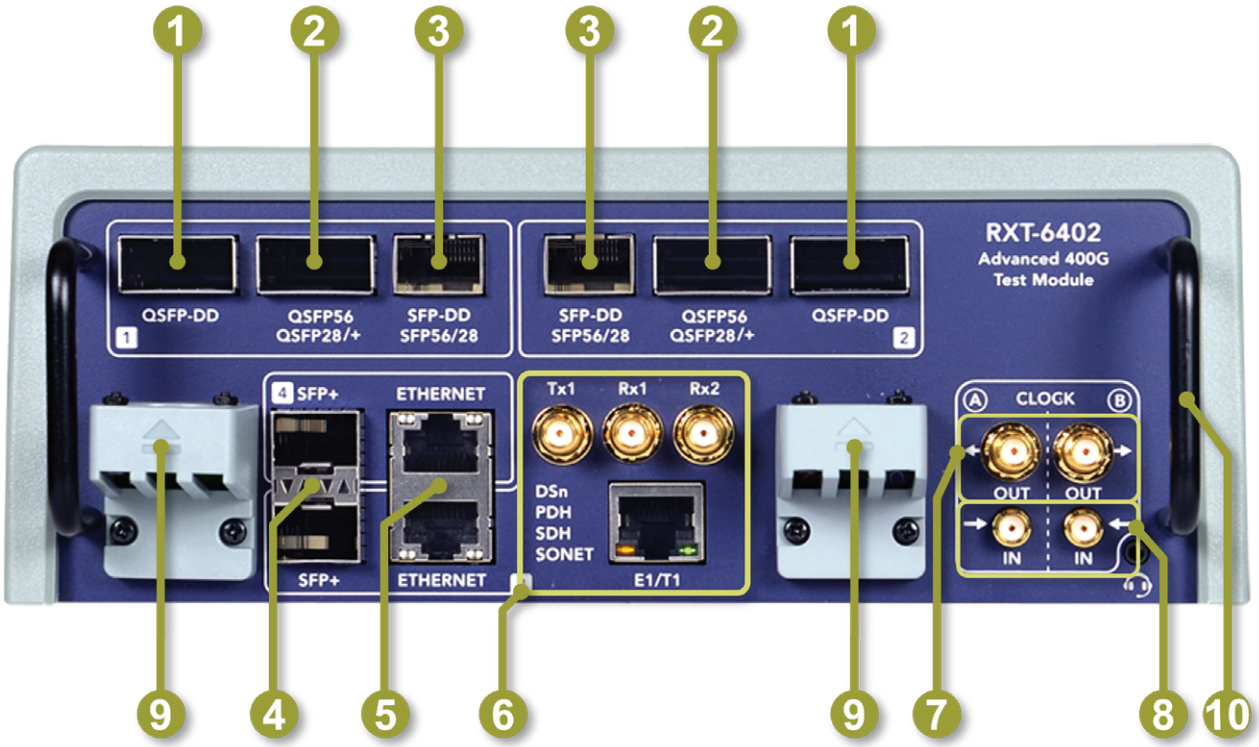
The RXT family of advanced test modules offer a full range of link and service testing capabilities, from Core to Access, from Lab to Field and from 64k to 400G, with a complete range of communication technologies, including OTN, SDH/SONET, PDH/DSn, Carrier Ethernet, SyncE, 1588v2 PTP, Fibre Channel, OTDR, OSA. All supported by a single rugged forward-looking hand-held test platform.

- Smallest, lightest, most complete, and truly portable hand-held 400G test solution.
- Built-in VeExpress™ client for cloud-based asset management, software updates and licenses. Buy, rent or share licenses.
- Built-in VeSion® R-Server™ client for test results upload, workflow integration, and asset management.
- Complementary full-featured C/DWDM OSA and tunable OTDR modules available in the RXT family.
- Flexible remote access and remote control via EZ Remote™, web browser, VNC®, ReVeal RXTS PC software, and SCPI commands.
- Fast test results transfer via USB memory stick and web client.
- LAN, WiFi and Bluetooth® management interface options.
- Intuitive graphical user interface for straightforward operation.
- Fast boot-up and ready-to-test times.
- The RXT-1202 high-power platform can run up to four simultaneous tests, including 2x 400G and high-power class transceivers.
- High-capacity field-exchangeable Li-ion battery pack offers over 30 minutes of continuous operation at 400GE (single LR4). FAA, TSA, US DoT, IATA, UN38.3 (49 CFR 175.10) compliant for safe carry-on transportation in passenger aircraft cabins.
- Optional built-in high-precision multi-band GNSS Receiver and/or Atomic Clock references for frequency and timing applications.
- Color LCD with touch screen.

General

Power Consumption	
Maximum	300 Watts[3]
Environmental	
Operating Temperature	0 to 40°C (32 to 104°F)[4]
Storage Temperature	-20 to 70°C (-4 to 158°F)
Humidity	5% to 90% non-condensing
Dimensions	
RXT-6402 Module	208 x 155 x 77 mm (8.2 x 6.9 x 3.0 in)
RXT-1202 Chassis	260 x 180 x 65 mm (10.2 x 7.1 x 2.6 in)
Test Set (combined)	260 x 200 x 108 mm (10.2 x 7.9 x 4.3 in)
Weight	
RXT-6402	1.73 kg (3.8 lb.)
RXT-1202	1.32 kg (2.9 lb.)
9-cell Li-ion battery	0.54 kg (1.2 lb.)[5]
Total (Test Set)	3.59 kg (7.9 lb)

1. Basic web and cloud services available free of charge
2. Check with factory for specific module versions compatible with the new RXT-1202 platform
3. Requires RXT-1202 high-power platform and A01-00-019G 24VDC/12.5A AC/DC adapter.
4. Range specified up to 100G operation. For 400GE it is recommended to be operated below 32°C (90°F).
5. Requires B02-09-007G high-capacity 400G-ready battery pack.



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1. 2x QSFP-DD (400GBASE-X, 400ZR/ZR+)
2. 2x QSFP56/QSFP28/QSFP+ (200G, 100G, 50G, 40G BASE-X; OTU4/3)
3. 2x SFP-DD/SFP56/SFP28 (100G, 50G, 25G BASE-X)
4. 2x SFP+/SFP (10/1G BASE-X and 10/5/2.5G BASE-T; OTU2/1, OTU2e/1e, ODUflex, GFP-F; STM64/16/4/1, OC192/48/12/3/1; 16/10/8/4/2/1G FC)
5. 2x RJ45 (10/100/1000 BASE-T)
6. 3x Coaxial SMA and RJ48 (STM1/0, STS3/1, E4, T3, E3, E1 unbalanced; E1, T1 balanced)
7. 2x Independent Recovered Clock Outputs
8. 2x Independent Reference Clock Inputs
9. External QSFP-DD Cooling Fans
   Cools exposed transceivers' head (Field replaceable)
10. Protective Metal Bars

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