RXT-6400

Advanced 400G Test Module

400G Ethernet

VeEX

for RXT-1200

Modular Test Platform

Native 400GE PAM4 test module, in portable form factor for Lab-to-Field transition

VeEX® RXT is the industry's most flexible, compact, and future-proof handheld test solution for core, metro and access. The RXT-6400 module adds 400G Ethernet testing and future expandability for applications including transport, metro, Aggregation, Datacenter inter/intra/cross-connect, Cloud computing, 5G backhaul, and NEMs.
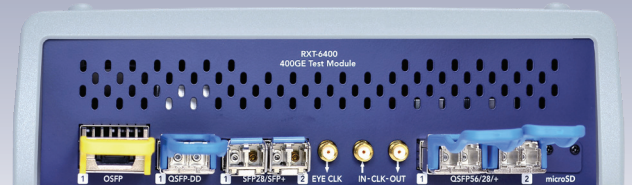
Platform Highlights

The RXT family of 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 eCPRI, CPRI/OBSAI, 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.

- Optional built-in precision GNSS Receiver and/or Atomic Clock references for frequency and timing applications.
- Extended Sleep Mode (standby) with frequency and phase holdover
- 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
- 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
- LAN, WiFi and Bluetooth® management interfaces
- Intuitive graphical user interface for easy operation
- 7" color LCD with touch screen
- High capacity field-exchangeable Li-ion battery pack offers over 30 minutes of continuous operation at 400GE
- Smallest and lightest multi-rate multi-protocol test platform, weighing 1.86 kg (4.1 lb) including its high-capacity Li-ion battery, and 3.1 kg (6.8 lb) total test set weight with 400GE module

400G Module Highlights

The RXT-6400 is the first truly portable 400G test set supporting native PAM4 QSFP-DD and OSFP. Equipped to support all common transceiver form-factors, this module is a perfect complement to the RXT Platform, extending its testing range to 400 Gbps and offering a future upgrade path for all-in-one 10M-to-400GE 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 1-4 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.

General

- Native OSFP and QSFP-DD PAM4 hardware for best-in-class signal integrity (no adapters required)
- 400G Ethernet testing per IEEE 802.3bs specification with KP4 Forward Error Correction (FEC)
- Provides all the necessary features to test transceivers, DAC and AOCs, including OSFP and QSFP-DD transceivers, networking 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 and CR4
- MDIO/I2C registers Read and Write
- Per-lane PAM4 pre-emphasis settings
- KP4 FEC codeword symbol errors distribution and Skew

Module Highlights *cont'd*

- Ethernet Throughput test
- Also supports QSFP56, QSFP28, QSFP+, SFP28, SFP+ interfaces for lower rate applications
- Battery backup for efficient operation and mobility within datacenters (no need for constant rebooting)

Applications

- Bring-into-service, verification and troubleshooting of high-speed Ethernet links
- Transceivers, DAC and AOC verification
- Evaluation labs and field support Comprehensive 400GE test applications for layers 1-4
- Full rate 400GE Throughput and frame loss measurements
- PCS & RS-FEC layer testing with skew generation and analysis
- PAM4 signal integrity testing with multi-lane unframed BERT
- MDIO verification and programming including and QSFP-DD Module Health check and stress feature
- High speed lane clock stressing/analysis and optical power level verification
- Portable for field testing, evaluations, demonstrations, interop check, benchmarking, troubleshooting, link verification, etc.
- Battery power for mobility within large datacenters, nodes, COs, R&D and evaluation labs.
- No carts or long reboots required.

Test Interfaces

- 1x OSFP PAM4
- 1x QSFP-DD PAM4
- 2x QSFP28/QSFP+ NRZ
- 2x SFP28/SFP+/SFP NRZ
- 2x Clock Input/Output
- 1x Eye Clock Output

PAM4 Interfaces

- Native support for 400G QSFP-DD and OSFP transceivers
- 400GBASE-SR8, FR8, LR8, DR4, FR4, LR4, CR8 and CR4
- Supports IEEE 802.3bs and MSA compliant transceivers*
- 15W supply supporting power classes 1 through 7
- Transceiver voltage control and power consumption monitoring
- Internal transceiver's and cage temperature monitoring
- Native PAM4 electrical interface (no internal or external adapter required)
- Advanced transceiver verification test
- Per-lane post and pre-emphasis settings
- Lane BERT with independent test patterns

400G Ethernet Testing

- 400G Ethernet per IEEE 802.3bs
- Optical signal levels (TX and RX lanes), frequency
- Advanced KP4 FEC stress testing and analysis
- Physical, PCS/FEC, and Ethernet layer verification
- Throughput test, Frame Loss, Round Trip Delay (RTD). Errors, Alarms, events counters and rates
- Error and Alarm Injection

400G Ethernet/IP

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

Advanced PHY Features
- Per lane user controllable swing, pre & post emphasis signal conditioning settings to stress transceiver interfaces

Optical Testing
- Global and per optical lane power output enable/disable
- Received per lane and broadband optical power level monitoring

Transmit Clock Sources
- Internal 2.5ppm XO 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 ±150 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 internal or external reference clock in current, min, max ppm
- Measures all lanes

Module Health Check & Stress Test
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

Acceptance Tests
- Module optical power threshold high/low
- Module line frequency generation and tolerance
- Module skew generation and tolerance
- Module BERT performance with PRBS and PRBSQ test pattern selection

Multi-lane Unframed BERT Testing

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

Test Patterns
- Modes: 16 x 26.5625G
- 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

PCS/RS-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

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

PCS/RS-FEC Layer Analysis

FEC Lane
- FEC lane identification

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
- 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[1] and analysis
- Constant rate by % BW and Mbps

Error Generation
Supports single and rate generation[1]
- 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

Results

- 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

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