SUNRISE TELECOM®
Productivity Rising™

RxT™ 10GE Module

DATA SHEET

Business and Carrier Ethernet Service Test Set

The RxT 10GE delivers the industry's most compact and powerful 10 Gigabit Ethernet multifunction test set for the installation and maintenance of carrier-grade Ethernet and Internet Protocol (IP) services. The RxT 10GE performs simultaneous and independent tests at full line rate over its three test ports for 10/100M, Gigabit and 10 Gigabit Ethernet. The packet-technology-specific user interface optimizes testing time and minimizes test configuration and training time.

Key Features

- One XFP port for full line rate Ethernet traffic generation, or smart loopback at up to 10 Gigabits, LAN (10.3125 Gbps) or WAN (9.953 Gbps)
- Two 100/1000BASE-X SFP ports, and two 10/100/1000BASE-T RJ45 ports
- Multi-port and multi-rate capability for network element pre-qualification testing
- IntelliSAM™ Service Activation Methodology
- RFC 2544 Throughput, Latency, Frame Loss, and Back-to-back tests
- BER testing at Layer 1, Layer 2, Layer 3 (IP) and Layer 4 (TCP/UDP)
- IP verification with Ping, Trace Route, HTTP, and FTP Throughput across a routed network
- Class of Service (CoS) via VLAN P-bit and IP Type of Service (TOS)/DSCP traffic prioritization settings
- Bidirectional monitoring of live Ethernet networks
- Control/Respond Loopback feature loops-up/down any far end Sunrise Telecom Ethernet test set
- Measurements presented intuitively, including test graphics
- Color, high resolution touch-screen is easy to use in all lighting conditions
- Meets demanding environments and test conditions in a robust, handheld chassis
- Designed for field engineers who install and maintain next-generation Ethernet services
- Directly linked to back office applications, workforce management, via Ethernet
- realACCESS™ allows seamless remote access from any computing device using a web browser
- Performs three independent tests in parallel
- User-defined thresholds and test profiles make for fast efficient and consistent turn-up of services
- Stores test results and transfers files locally or remotely
- No PC required to maintain instrument software, manage test configurations, process measurement results, or generate customer test reports
- Field replaceable high-capacity Li-Ion battery pack extends testing time

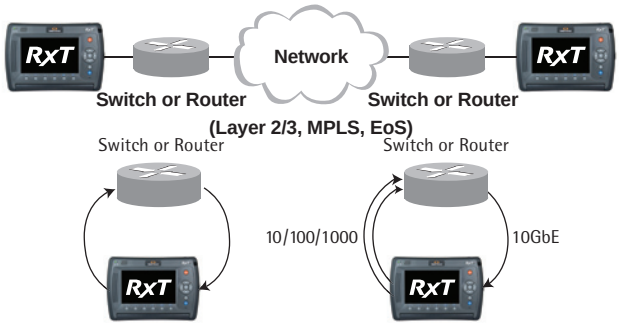
Benefits

- Complete solution for Installation & Maintenance (I&M) of Ethernet and IP services
- Simplifies testing of Complex QoS settings for verifying Metro Ethernet services and Service Level Agreement (SLA)
- Tests and troubleshoots via remote control using web browser
- Standardized and customizable RFC 2544 benchmarking
- Test profile storing and loading for one button testing
- Fully integrated graphical report generation
- Completely interoperable with entire Sunrise Telecom Ethernet test family for multi-service deployments
- Tests Higher Layer Protocols and applications with Packet Capture

Test modes and applications

Turn Up Test

The most common method of turning up and qualifying Ethernet services is to perform a throughput test using packets that are fully configurable in such a way to allow maximum realism and detailed measurement of network performance. The RxT 10GE generates test traffic at a specified bandwidth to the far end, where the frames are either looped or analyzed by another test set. By measuring Loss Rate, Delay, Delay Variation, and Errors Rate, compliance to a level of service can be confirmed. Stressing the network is achieved by generating traffic with multiple streams with different parameters, such as varying the frame length, sending constant or bursty traffic, and by intentionally introducing errors and stressing the network or link.



Service Activation Test

ITU-T Y.1564 - IntelliSAM™

ITU-T Y.1564 is the official Ethernet Service Activation Test Methodology, designed to verify the correct configuration and performance of business and carrier Ethernet services at the time of service activation. RxT 10GE's IntelliSAM™ Service Activation Test offers bandwidth profile testing with CIR, CBS, EIR, EBS, CM, and Traffic Policing testing capabilities.

RFC2544

Originally designed for device benchmarking, RFC 2544 has been a de-facto methodology for testing Ethernet service. To optimize the speed and efficiency of these tests, the RxT 10GE allows users to modify the test parameters from their standard values. Test results are shown in both tabular and graphical form, following RFC 2544 specifications.

Transport and Application Layer Tests

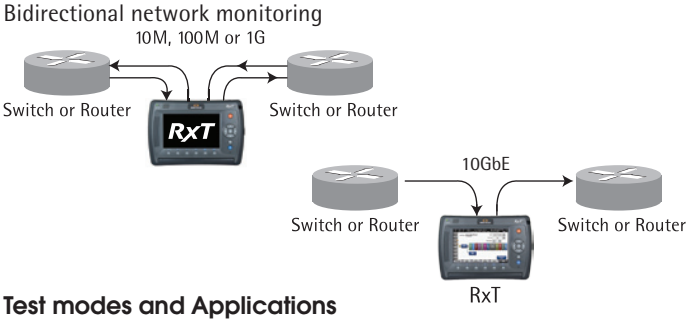
The complexity of a routed IP network can make traditional throughput testing cumbersome and time consuming. Ping and trace route verify Layer 3 connectivity without the detailed stream generation found in BER testing. HTTP and FTP upload and download tests server response time as well as network health. IP tests have an advantage in that they work on any routed networks, and do not require a second test set. Unlike similar functions available on a PC, the RxT 10GE can perform this test directly into an optical Gigabit or 10 Gigabit Ethernet interface.

Loopback

Loopback mode allows the Ethernet port to send incoming Ethernet frames back to the sender for end-to-end testing. Performing loopback tests is a common means of verifying the roundtrip delay of the network. The Ethernet loopback functions have been designed to emulate those used in traditional T-carrier networks. Manual mode immediately sets the port into loopback, whereas Responder mode allows the near end unit to send loop up and loop down commands.

Monitor

Bidirectional network monitoring



Test modes and Applications

Troubleshoot Tough to Find Problems

To find problems consistently in the ever changing world of Ethernet and IP, you must have visibility into all messages and layers of the stack and in order to make sense of all of it, advanced filter and capture capabilities are required. The RxT 10GE can capture the data on any port, during any test or monitor session and analyze it locally or export in industry standard pcap file format for analysis on a PC using industry leading decode engines.

Specifications

Test Interfaces

XFP port: 10 Gigabit Ethernet (10GBASE-R/W, LAN/WAN)
2 SFP ports: Gigabit and 100M Ethernet (100BASE-X, 1000BASE-X)
2 RJ-45: Ethernet (10/100/1000BASE-T) Automatically detects and adapts to straight or cross-over cables

10 Gigabit Ethernet

XFP: 10-Gigabit small form-factor pluggable
Connector: LC

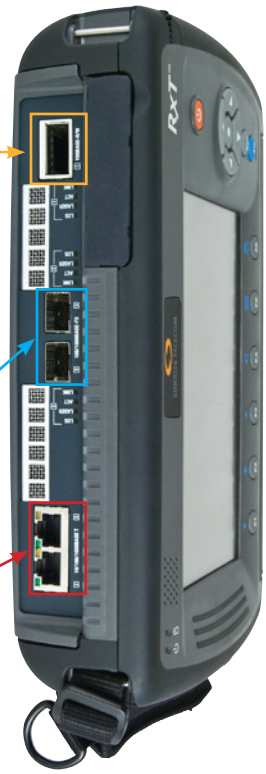
10GBASE-SR/SW, 850 nm
10GBASE-LR/LW, 1310 nm
10GBASE-ER/EW, 1550 nm
XFP Port

Gigabit Ethernet

SFP
Connectors: LC or UTP

1000BASE-SX, 850 nm
1000BASE-LX, 1310 nm
1000BASE-ZX, 1550 nm
100BASE-FX, 1300 nm
100BASE-LX
SFP Ports

10/100/1000 BASE-T
RJ-45 Ports



Auto-negotiation

Results displayed showing link partner status, local & remote pause settings
Auto-negotiation: Enable/Disable
Pause: Enable/Disable, Independent Tx/Rx Pause
10/100M Advertisement: 10M or 100M, Half or Full-Duplex
1000M Advertisement: 1000M, Full-Duplex

Hardware LEDs

10 GigE: Link, Activity, Laser On, LOS
SFPs: Link, Activity, Laser On, LOS
Copper/UTP: Link, Activity

Software LEDs

Link, Activity, Error, Pattern, Bit, Remote Fault, Local Fault

BER/Throughput Test

Test Layer

Layer 1 Unframed
Layer 2 PRBS + FCS
Layer 2 MAC
  User-defined EtherType/Length field
  Optional LLC and SNAP Header
Layer 3 MAC + IP
  User-defined IP Header
  TOS, ID, Fragmentation, TTL, Protocol
Layer 4 MAC + IP + TCP/UDP
  User-defined TCP Ports and Header
  User-defined UDP Ports

VLAN

VLAN ID: 0 to 4095
Priority: 0 to 7
Stacked VLAN: Up to 3 VLAN tags

MPLS

Up to 3 MPLS tags
Unicast or Multicast

Frame Length

60 to 12,000 bytes

Test Patterns

PRBS

2^{31}-1, 2^{23}-1, 2^{20}-1, 2^{15}-1
Pattern inversion

User Patterns

Pre-defined: 1111, 0000, 1010
User-defined: 32 bits, 1024 bits, 10 stored patterns per port

Traffic Generation

Traffic Shapes: Constant, Ramp, Burst
Bandwidth: 0.01% to 100.00%

Minimum IPG

10GigE: 9.6 ns
1GigE: 96.0 ns
100M: 0.96 µs
10M: 9.6 µs

Traffic Streams

16 per port

Measurement Summary

Gives date and time for all errors and conditions
Signal: Vendor, Wavelength, Rx Power
  Signal measurements are dependent upon optical plug-in module, and may not be supported by modules not purchased through Sunrise Telecom.

Aggregate Defects

Data Errors: FCS/CRC, IP Checksum, TCP/UDP Checksum, Lost Frames, Out of Sequence, Duplicate
Loss of Signal Seconds: Aggregate, Current, Minimum, Maximum, Average
Loss of Sync Seconds: Aggregate, Current, Minimum, Maximum, Average

Tx/Rx Traffic Statistics

Total Frames, Total Bytes, Utilized Line Rate, Information Rate
Frame Rate and Utilized Line Rate: Current, Minimum, Maximum, Average
Frame Types: Unicast, Multicast, Broadcast, Test Traffic (Rx Only), Non Test Traffic (Rx Only), Keep Alive, Invalid, Total VLAN, Single-Tagged, Multi-Tagged, IPv4, Unicast IPv4, Multicast IPv4, Broadcast IPv4, TCP, UDP, Flow control
Frame Size Counters: Under 64, 64, 65-127, 128-255, 256-511, 512-1023, 1024-1518, Over 1518

Tx/Rx Per Stream Defects

Data Errors: FCS/CRC, IP Checksum, TCP/UDP Checksum, Lost Frames, Out of Sequence, Duplicate, Bit, Loss of Pattern seconds, No BERT traffic seconds
Service Disruption: Based on maximum packet interval measured during tests, Events, and Duration: Minimum, Maximum, Average

Per Stream Only Measurements

Latency: Minimum, Maximum, Average
Frame Gap: Minimum, Maximum, Average
Frame Delay Variation: Minimum, Maximum, Average

Error Injection

FCS/CRC, Bit, IP Checksum, TCP/UDP Checksum, Out of Sequence frame, Lost frame, Duplicate frame
Broadcast Error across all streams or send on selected stream only
Modes: Single, Burst, Rate

IntelliSAM – Ethernet Service Activation Test (RXT5000SW-SAM)

Business and Carrier Ethernet Services Activation tests are based on ITU-T Y.1564, the official Ethernet Service Activation Test Methodology for verifying the correct configuration and performance of business and carrier services at the time of service activation. The IntelliSAM Service Activation Test offers:

  Service Configuration and Service Performance Testing
  Tests up to 16 services simultaneously
  Tests CIR, EIR, CBS, EBS, CM bandwidth profile parameters, as described in MEF 10.2
  Tests Traffic Policing
  Supports color-aware and non-color-aware service testing
  Tests according to the bursty nature of Ethernet traffic
  Measures
    - Availability per ITU-T Y.1563
    - Frame Delay on every frame
    - Frame Loss Ratio
    - Frame Delay Variation
  Tests a bandwidth profile to Service Level Agreements (SLA)
  * Refer to the IntelliSAM's Data Sheet for further details and availability

RFC 2544

Test Parameters

Throughput
Duration: 1 to 9999 seconds or 1k to 150,000,000k frames
Starting Rate: 0.01 to 100%
Resolution: 0.01%

Latency
Duration: 4 to 3600 seconds
Warm-up Period: 1 to 60 seconds
Repetitions: 1 to 50
Test Rate: Measured throughput rate or user-defined

Frame Loss Rate
Duration: 1 to 99999 seconds or 10k to 1,000k frames
Starting Rate: 0.01 to 100%
Step Size: 0.01 to 100%

Back-to-back Frames
Duration: 2 to 100 seconds
Repetitions: 1 to 100

Frame Configuration
Preset Frame Lengths: 64, 128, 256, 512, 1024, 1280, 1518, 4096, 12000
All frame lengths are user-configurable

Extended Features

The following features go beyond the RFC 2544 standards, improving the ease, speed, and interpretation of the tests.

Quick Latency
The Quick Latency test is an alternative to the time-consuming RFC 2544 standard. When enabled, the Quick Latency test measures the latency of the frames during the Throughput test and requires no additional testing time.

Thresholds
The thresholds for Throughput and Latency provide a pass/fail indication for service compliance so that the RFC 2544 test results can be interpreted quickly and easily.

Network Element Test
The tests are performed as a ramp test, incrementally stepping through rates, rather than finding optimum throughput rate. The user defines the step size and duration, as well as the starting and stopping rates. This is designed for burn-in testing, and avoids problems associated with testing at maximum throughput rates.

Estimated Test Time
The length of time the RFC 2544 test will take is estimated as the configuration is changed. Allows user to weigh the detail of the RFC test vs. the time it will take.

Advanced IP Test

Ping Test Configuration
Ping Rate: 1 to 10 pings per second
Number of Pings: 1 to 9999 or Continuous
Frame Length: 64 to 1518 bytes
TTL: 0 to 255
Timeout: 1 to 5 seconds
Ping Destination: IP Address or URL

Ping Results
Sent: Number of pings sent to the network
Received: Number of correct Echo Response packets received
Unreachable: Number of Echo Response packets w/unreached label receive
Lost: Number of Echo Response packets missing
Roundtrip: Measure of roundtrip delay, current, average, maximum, minimum

Ping Response
Automatically responds to incoming Echo requests; runs continuously in background while an IP connection is in place.

Trace Route Test Configuration
Maximum Hops: 1 to 30
Timeout: 1 to 5 seconds
Destination: IP Address or URL

HTTP/FTP Tests
HTTP web page download and FTP file download: Server response time, download size and duration, average, minimum, maximum, download rate
FTP file upload with user defined file size: Server response time, upload duration, average, minimum, maximum upload rate

Loopback

Loopback Layers

Layer 1 (with FCS/CRC): Frames are looped without any modification
Layer 2: Frames are looped with their MAC Source and Destination addresses swapped
Layer 3: Frames are looped with their MAC and IP Source and Destination addresses swapped

Loopback Modes

Manual: Fully compatible with all other Ethernet devices
Responder: Loops up or down based on commands received from any other Sunrise Telecom Ethernet Test Set
Loopback Commands: Loop Up, Loop Down

Monitoring

The RxT 10GE provides in-service monitoring of live traffic. All throughput measurements including signal status, Rx statistics, and defects (excluding bit errors) are available.

Monitoring ports

Copper and SFP: One bidirectional test, two unidirectional tests
10GigE: One unidirectional test

Results and Reports

Test reports can be saved in PDF or CSV format, for easy retrieval and sharing, and for ease of use in data analysis. Results can be downloaded or uploaded from realGATE™.

10GbE WAN Features (RxT-5000SW-10GW)

10GbE WAN-PHY encapsulates the Ethernet traffic into an SDH/SONET frame. 10G port can be configured to use SDH or SONET terminology.

Alarm Generation / Detection

SONET:
LOS, LOF, AIS-L, RDI-L, LOP-P, AIS-P, UNEQ-P, PLM-P, RDI-P
SDH:
LOS, LOF, MS-AIS, MS-RDI, AU-LOP, AU-AIS, HP-UNEQ, HP-PLM, HP-RDI

Error Detection and Rate Calculation

SONET:
B1, B2, REI-L, B3, REI-P
SDH:
B1, B2, MS-REI, B3, HP-REI

Packet Capture and Decoding (RXT5000SW-PCAP)

Wire-speed packet capture
Programmable capture filters for efficient problem isolation, diagnostics, and troubleshooting
Saves capture file in industry-standard libpcap file format
Remote users can save capture files to their local hard drives
Pre-installed free copy of Wireshark®[1] network protocol analyzer
Off-line deep protocol decoding, powerful filtering, and service troubleshooting
Direct launch from RxT 10GE Test Application's test records
No need to transfer files or use separate PC for analysis
Exports capture files to leading protocol analyzer formats, as well as TXT, CSV, XML, PostScript

[1] Wireshark and the "fin" logo are registered trademarks of the Wireshark Foundation.

General Specifications

Module Size (W x H x D):
208 x 158 x 31 mm (8.2 x 6.2 x 1.2 inches)
Module Weight:
0.92 kg (2.0 Lb)

Environmental

Operating Temperature:
0° to 40°C [32° to 104°F]
Storage Temperature:
-20° to 70°C [-4° to 158°F]
Humidity:
5% to 90% non-condensing

Order Information

RXT5022E . . . . . **RxT 10GE Test Set - GigE Version**
RxT Platform with RxT 10GE Test Module for 10/100/1000BASE-T and 100/1000BASE-X Ethernet Testing. Offers dual 10/100/1000BASE-T (RJ45) electrical and dual 100/1000BASE-X (SFP) optical interfaces; up to 16 streams per test. Field upgradeable to 10GE.

RXT5100E . . . . . **RxT 10GE Test Set - 10GE Version**
RxT Platform with RxT 10GE Test Module for 10GE Ethernet LAN Testing. Offers 10GBASE-X (XFP) optical interfaces; up to 16 streams per test. Field upgradeable to GigE.

RXT5122E . . . . . **RxT 10GE Test Set - GigE and 10GE Version**
RxT Platform with RxT 10GE Test Module for 10/100/1000BASE-T, 100/1000BASE-X, and 10GE Ethernet LAN Testing. Offers dual 10/100/1000BASE-T (RJ45) electrical, dual 100/1000BASE-X (SFP) optical, and 10GBASE-X (XFP) optical interfaces; up to 16 streams per test.

RXT5000ER . . . . . **RxT 10GE Ethernet Responder Set**
RxT Platform with RxT 10GE Responder Module for 10/100/1000BASE-T, 100/1000BASE-X, and 10GE Ethernet LAN Loop Responder. Offers dual 10/100/1000BASE-T (RJ45) electrical, dual 100/1000BASE-X (SFP) optical, and 10GBASE-X (XFP) optical interfaces; layer 1, 2, and 3 loopback capabilities. Field upgradeable to Ethernet testing capabilities.

RXT5000SW-1GE2 . . **Dual GigE Ethernet Testing**
Adds dual 10/100/1000BASE-T and 100/1000BASE-X Ethernet testing capabilities to RXT5100E or RXT5000ER.

RXT5000SW-10GE . . **10G Ethernet LAN Testing**
Adds 10GBASE-X Ethernet testing capabilities to RXT5022E or RXT5000ER.

RXT5000SW-10GW . . **10G Ethernet WAN Testing**
Adds 10G Ethernet WAN testing capabilities to RXT5122E or RXT5100E.

RXT5000SW-IP . . . . . **Advanced IP Test**
Provides IP Ping, Traceroute, FTP, and HTTP tests

RXT5000SW-PCAP . . **Packet Capture and Decoding**

RXT5000SW-SAM . . . **IntelliSAM - Y.1564 Service Activation Testing for Carrier Ethernet Services**
Enables Y.1564-based SLA verification testing for CIR, EIR, CBS, EBS in color-aware and non-color-aware modes on all enabled Ethernet interfaces (formerly known as Y.156sam)

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