10G SFP+/RJ45 Test Modules – XM-RM882 / XM-RM882-2

Saving valuable time and expenses while testing for network product designs and quality control in mass-production scale, XM-RM series modules provide a flexible, reliable, and high-precision solution.

Specifically designed for NuStreams chassis, XM-RM series modules supports hot swap, multi-user operation, and Rapid- Matrix, a technology that can generate multi-stream traffic simultaneously with different kinds of frames/packets with almost any required protocol headers, tags and payload for each port.

NuStreams chassis with XM-RM series test module cards can perform synchronized tests to ensure the test precision. Also, the time consumed for all DUTs' multi-task testing will be shortened dramatically.

Along with the advanced technology mentioned above, Xtramus also provides several software applications, such as NuWIN-RM, NuApps-MultiUnits-RM, and other ongoing softwares complied with RFC 2544, RFC 2889 and etc. XM-RM series can test the network equipments in conformance, performance and stress tests.

Equipped with 10G SFP+ interface for maximums 4 ports per module, XM-RM882 supports either common SFP+ fiber optical transceiver or 10G /5G/2.5G/1G/100Mbps electrical port with specific NBase-T copper SFP+ transceiver.
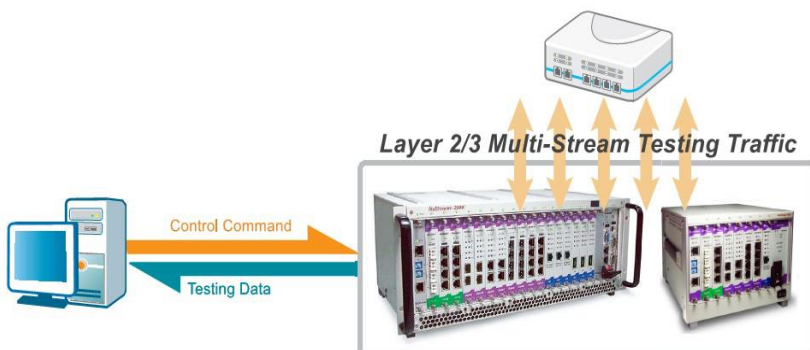
FEATURES

- Multi-rate(10G/5G/2.5G/1G/100Mbps) switchable with specific NBase-T copper SFP+ transceiver
- Wire-speed based traffic generation and analysis
- High density, up to 64 ports per single chassis
- Stream based wire-speed load generation for layer 2~3 traffics
- Diversified software utilities for different tasks – stream generation, RFC 2544/2889, IGMP…
- Wire-speed capture with programmable filter and trigger criteria
- High-precision performance measurement of throughput, latency, loss, sequence and mis-ordering error
- Remote management of test points
- Validation with negative and abnormal test conditions per packet byte
- Real-time statistics for each port, including transmitted/received frames for VLAN, IPv4/fragment/extension , ICMP, ARP, total bytes/packets, CRC, IPCS error and over-and-under size frames
- Multi-user access
- Supports IPv6

MAIN APPLICATIONS

Layer 2/3 Multi-Stream Testing Traffic

- Quality control in production line.
- Verification for the design of networking products.
- Telecommunication operator, R&D research, laboratory, data center...

SPECIFICATION

Model	XM-RM882	XM-RM882-2
Interface	**SFP+ port × 4** or **10G/5G/2.5G/1G RJ45 Port x 4 (with specific NBase-T copper SFP+ transceiver)**	**SFP+ port × 2** or **10G/5G/2.5G/1G RJ45 Port x 2 (with specific NBase-T copper SFP+ transceiver)**
LED Indicator	SYS, L/A (Link/Active): 1, 2, 3, 4	SYS, L/A (Link/Active): 1, 2
Port Speed	10G(SFP+)	
Frame Length	Tx Packet Length: 48 bytes ~ 16K bytes	
Payload	• **Burst Mode:** User-defined pattern, User-defined raw data, Random • **Rapid-Matrix Mode:** User-defined pattern: Byte Increase/Decrease, Word Increase/Decrease, 8'0 8'1, 16'0 16'1, 32'0 32'1, 64'0 64'1, Random. (Bit is presented by 0 or 1. 8'0 means 8 bits 0, 8'1 means 8 bits 1)	
Data Integrity/ Sequence	• 2nd level CRC check function independent from standard CRC • Sequence miss check and frame loss check by X-TAG	
BERT Test	Support Layer 2 BERT Test	
Error Packet Generation	CRC (Good/Bad/None), Undersize, Oversize, Alignment Error, Dribble Error, IP Checksum Error	

Hardware Counters

	Port-based Statistics Counters	
Tx Counters per Port	Frame Count, Byte Count, Pause Frame Count, Collisions, Single Collision, Multiple Collision, Excess Collision, Tx ARP/ICMP Request/Reply	
Rx Counters per Port	Valid Rx Frame Count, Valid Rx Byte Count, Broadcast Frame Count, Multicast Frame Count, Unicast Frame Count, Pause Frame Count, VLAN Tagged Frame Count, IPv4 Frame Count, Rx ARP/ICMP Request/Reply, RMON counters, Alignment Error, Dribble Error, Undersize, Oversize, CRC Error, Data Integrity Error, IP Checksum Errors	
Tx/Rx Rate Counter	Tx/Rx Packet Rate, Tx/Rx Line Rate, Tx/Rx Utilization	

Streams Counter

Advanced Stream-based Statistics Counters
- Tx Stream Counter Set: 512 sets by Rapid Matrix (supports up to 512 streams)
- Tx Counters per Stream: Frame Count, Byte Count
- Rx Stream Counter Set: 256 sets by X-TAG Stream Counter (supports up to 256 streams)
- Rx Counters per Stream: Frame Count, Byte Count, Frame Loss, Sequence Miss, IP Checksum Error, Latency

Statistics Counters Based on USC

USC (Universal Stream Counter) is packet filtering rule based on:
- DA (Destination Address)
- VID (VLAN ID)
- D Port (Destination Port)
- DIP (Destination IP)
- MPLS
- SA (Source Address)
- VLAN CoS (Class of Service)
- S Port (Source Port)
- SIP (Source IP)

Capture Criteria

SDFR (Self-Discover Filtering Rules) technique is able to capture packets by different criteria in either a unique value or a range of values by user-friendly UI.
- MAC Layer Event
- Network Layer Event
- SDFR Pattern (set)
- 2nd level CRC

Transmit Modes

- **Single Mode**
- **Continuous Mode**
- **Burst Mode**
- **Transmitting-by-time Mode**

Software Support

- **NuWIN-RM:** Virtual Control Suit for NuStreams Chassis
- **NuApps-MultiUnits-RM:** Multi Units All Purpose Mass Production Test
- **NuApps-2544-RM:** Test Suit Based on RFC 2544 and RFC 1242
- **NuApps-2889-RM:** Test Suit Based on RFC 2889 and RFC 2285
- **NuApps-IGMP-RM:** Test Suit Based on RFC 2432 and RFC 3918 (IGMP, Internet Group Management Protocol)
- **NuCommander:** Hardware Control (voltage, fan speed, and temperature) of NuStreams Chassis

Miscellaneous

- Support Cross-Module Latency test
- Support Global Command
- Different ports can be shared by different users
- Support Jumbo Frame
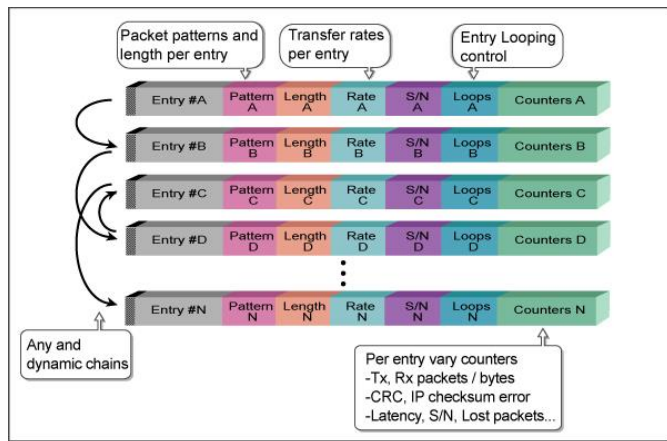- Support Hot Swap

TECHNICAL TERMS

Rapid-Matrix

Rapid-Matrix, specifically designed for generating multi-streams traffic per port simultaneously, is used to verify functions and performance of Ethernet devices/solutions /networks.

Features & Advantages

• Generate up to 512 Streams Per Port

Rapid-Matrix consists of up to 512 individual entries for each port. Each entry has independent settings for a unique data stream. Multiple entries can be correlated to compose a complicated data streams.

• Flexible/Versatile Protocol Support

Rapid-Matrix supports various network protocol headers/ tags defined based on testing requirements in order to create multi-streams testing traffic.

• Flexible Packet Length and User Define Pattern

In order to meet advanced/complex testing requirements, jumbo frames are also supported by Rapid-Matrix for packet generation.

The packet length generated by the same Rapid-Matrix entry can range from 48 bytes to 16K bytes. Other than defined headers/ tags, the rest part of the packet is filled up with selected patterns based on testing requirements.

• Configuring Settings Online Dynamically

All settings regarding to Rapid-Matrix entries can be changed under Rapid-Matrix's transmission mode. Therefore, it is possible to modify bandwidth and traffic simultaneously during transmitting.

• Dynamic Multi-streams Traffic Generation

In real network traffic, different data streams' packet sequence is changing dynamically. In other words, each data stream's loading is a very important factor to be managed in order to verify the function/ performance of DUT. The module card generates dynamic variations of test traffic, and each stream's bandwidth can be controlled individually based on testing requirements.

• Transmission Statistics per Entry

For generating multi-streams traffic, information regarding to statistics in every stream is very important. Rapid-Matrix supports the following statistics functions per entry:

➢ Total transmitted packet count
➢ Total transmitted byte
➢ Transmitting packet rate (packets/sec.)
➢ Transmitting byte rate (bytes/sec.)

Comparing statistics regarding to packets generated by Rapid-Matrix and statistics from receiving ports can help users analyzing how DUT handles the multi-streams traffic.

SDFR

SDFR (Self-Discover Filtering Rules) is a technology that makes capturing or filtering over Ethernet easy and convenient.

➢ User- friendly interface that display values such as source IP, destination IP and other criteria for filtering. All these values can be input directly without calculating mask.

➢ SDFR value for capture or filter includes several network protocols (such as TCP, UDP, FTP, OSFP…), various frame length (oversize, undersize), and various frame/packet types (CRC error, IP checksum error…).

➢ SDFR values can be a single value or a range of values between specified values. All packets that fit the value will be captured.

➢ Multiple filter condition can be activated easily simply by clicking different options.

➢ Displaying captured packet in real-time while the network is still running.

➢ Value of SDFR and filter condition can be changed dynamically during capture procedure.
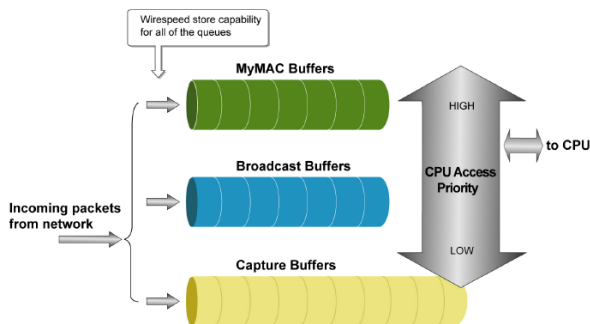
RxHost

RxHost: Smart Function for receiving packet.

➢ Received packets are divided into different priorities for different buffers. MyMAC packets with destination addresses have higher priority on the receiving side.

➢ Incoming packets are stored in separated buffer so the system can keep receiving important packets (such as ARP, Ping, and etc.) even the buffer itself is overflowed with broadcast packets.

➢ Received packets can be captured for applications or stored in buffer for other purposes at the same time.

USC

Universal Streams Counter

When monitoring data flows in a network environment with Network TAP devices, it is common to use packet analyzers (or sniffers) for capturing and analyzing packet frames. However, information acquired this way may be too vast and complicated for pinpointing the possible cause of network/product problems.

Unlike these common packet analyzers or sniffers mentioned above, Universal Stream Counter (USC) offers real-time statistics of network events during packet monitoring and capturing.

Based on X-TAG and VLAN for each ports and system, the streams counter shows its related counters (such as Packet counts, Bytes, S/N Error, Packet Loss, Latency and Transmission Rate in Mbps) as illustrated below.

Features & Advantages of USC

➢ **Wirespeed Performance:**
The performance of Multi-stream Counter can support up to wirespeed (100% utilization of 10G Ethernet traffic). Receiving frames are processed in real time.

➢ **Flexible Protocol Support:**
Several often-used protocols (like IPv4) are served as pre-defined patterns for Multi-stream Counter's trigger conditions. Multi-stream Counter also supports user-defined patterns by SDFR. Proprietary protocols or private headers/ tags can also be triggered by Multi-stream Counter based on user- SDFR.

➢ **Pre-filtering to Trigger Designated Packets:**
Multi-stream Counter can correlate with filtering. Incoming packets will be filtered first. Only packets meet filtering criteria are forwarded to Multi-stream Counter. Filtering options are very flexible in order to meet different testing requirements. Several default parameters are available for frequently-used protocols such as IPv4 and etc. User defined triggers are also supported for custom testing requirements.

➢ **Real-Time Hardware-generated Statistics:**
All statistics are provided by hardware instead of software, making real-time network statistics possible.

➢ **Real-time Statistics for Individual Stream:**
The information provided by USC is real-time statistics for the target data streams. Instead of getting the final statistics at the end of the test, USC is capable of providing real-time statistics of individual stream for each port in every second during testing process. This feature helps when analyzing any dynamic changes of target data streams.

➢ **Sequence Miss and Packet Loss Check:**
Sequence number is embedded in X-TAG generated by Rapid-Matrix. USC uses this to check any sequence miss or packet loss occurrences for each individual stream.

➢ **Latency Measurement:**
USC can analyze data carried by X-TAG in the receiving frames of designated data streams for Latency Measurement.

Transmitting Side

Transmit Streams	Packets	Bytes
N'	2,445	500,991
N'+1	90,343	7,103,151
N'+2	88,672	8,092,043
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Receiving side

Received Streams	Packets	Bytes	S/N Error	Packet Loss	Source port information	Latency	Rate (Mbps)
N'	9,320	710,573	13	0	Slot=2 Port=1	3.2 us	1.3
N'+1	41,117	5,900,988	3	1	Slot=8 Port=1	4.5 us	17.2
N'+2	15,095	18,678,003	87	21	Slot=9 Port=2	4.4 us	25.8
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X-TAG Streams Counter

CHASSIS REQUIREMENTS

The XM-RM series modules are specifically built to support NuStreams chassis series.

NuStreams-700

- **Slot:**
  7-slot for test cards
- **Power:**
  AC 100~240V
- **Management Card & Speed:**
  XM-3S3GS: RJ-45 10/100/1000 Mbps x 1
- **Dimensions:**
  22.5 cm (W) * 19.3 cm (D) * 18.6 cm (H)

NuStreams-2000i

- **Slot:**
  16-slot for test cards, plus installed IPC
- **Power:**
  AC 90~240V
- **Management Card & Speed:**
  XM-2S19: RJ-45 10/100 Mbps x 2
  XM-2S8G: RJ-45 10/100/1000 Mbps x 4
- **Dimensions:**
  48.5 cm (W) * 29.5 cm (D) * 19.6 cm (H)

CONTACT INFORMATION

Website: http://www.xtramus.com
E-mail: sales@xtramus.com
        ts@xtramus.com
TEL: +886-2-8227-6611
FAX: +886-2-8227-6622