ITU-T Y.1564 ExpertSAM[™] (1 Gbps, 2.5 Gbps, or 10 Gbps)

GL Communications Inc.

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Ethernet Network Testing





PacketExpert[™] 10GX - Portable Unit (PXN100, PXN101)



Physical Specifications	• Length: 8.45 in (214.63 mm)
	• Width: 5.55 in (140.97 mm)
	• Height: 1.60 in (40.64 mm)
	Weight: 1.713 lbs
External Power Supply	 +12 Volts (Medical Grade), 3 Amps (For portable units having serial number ≥ 188400)
	 +9 Volts, 2 Amps (For portable units having serial number < 188400)
BUS Interface	• USB 3.0
	Optional 4-Port SMA Jack Trigger Board(TTL Input/Output)
Protocols	IEEE 802.3ae LAN PHY compliance
	RFC 2544 compliance



MTOP™ Rack Units



High Density 1U Rack option



Stacked High Density 1U Rack option

Physical Specifications	 Length: 16 in (406.4) Width: 19 in (482.6) Height: 1U / 2U
External Power Supply	ATX Power Supply
BUS Interface	 1U mTOP™ (MT001 + 3x PXN100) Rackmount Enclosure can support up to 3 PXN100s 2U Rack Mount (with 6x PXN100) Rackmount Enclosure can support up to 6 PXN100s Optional 4 to 12 Port SMA Jack Trigger Board (TTL Input/Output)
SBC Specifications	 Intel Core i3, Window® 11 Pro 64-bit OS USB 2.0 and USB 3.0 Ports, ATX Power Supply USB Type C ports, Ethernet 2.5GigE port Min 256GB Hard drive, 8G Memory Two HDMI ports



mTOP[™] Probe with 10GX Hardware Unit + SBC



Physical Specifications	• Length: 10.4 in. (264.16 mm)							
	Width: 8.4 in. (213.36 mm)							
	• Height: 3.0 in. (76.2 mm)							
	Optional 4-Port SMA Jack Trigger Board (TTL Input/Output)							
	External USB based Wi-Fi adaptor							
External Power Supply	 +12 Volts (Medical Grade), 3 Amps 							
SBC Specifications	Intel Core i3 or optional i7 NUC Equivalent,							
	Windows® 11 64-bit Pro Operating System							
	USB 2.0 and USB 3.0 Hub, 12V/3A Power Supply							
	USB Type C ports, Ethernet 2.5GigE port							
	256 GB Hard drive, 8G Memory (Min)							
	Two HDMI ports							



Optical Connectors and SFP Transceivers

LC Connectors



850nm/1310nm/1550nm SFP Module

• PacketExpert™ 10GX supports LC connectors and 850nm/1310nm/1550nm SFP (Small Factor Pluggable) modules

Note: In case customer have different type of connectors, then we need converters like LC-to-SC, LC-to-FC and vice-versa.



Ethernet / IP Testing Modules



PacketExpert[™] 10GX

- Wire-Speed BERT
- Layer-wise and Smart Loopback
- RFC 2544 (Single and Dual Port)
- ITU-T Y.1564 (ExpertSAM™)
- Wire-Speed Record / Playback with Filter
- WAN Emulation (IPLinkSim[™])



ITU-T Y.1564 (ExpertSAM™)



- A single test to validate service-level agreements (SLAs) as per ITU-T Y.1564 standard
- ITU-T Y.1564 completes this testing in two phases based on the SLA parameters:
 - Service Level Agreement Parameters: Information Rate (IR), Frame Transfer Delay (FTD), Frame Delay Variation (FDV), Frame Loss Ratio (FLR)
 - Service Configuration Test
 - Service Performance Test





- Complete validation of Ethernet service-level agreements (SLAs) in a single test
- ITU-T Y.1564 standard compliance
- Service Configuration and Service Performance tests methodology supported
- KPIs like Information Rate (IR) or Throughput, Frame Loss Ratio (FLR), Frame Transfer Delay (FTD) or Latency, and Frame Delay Variation (FDV) or Jitter, measured simultaneously for multi streams, and Pass/Fail verdict declared
- Capability to generate traffic at throughput of CIR (guaranteed traffic), EIR (best effort bandwidth), and traffic policing (dropped bandwidth) rates ensuring Key performance indicators (KPI) validation
- EMIX frame sizes supported per service up to 5 frame sizes can be defined per service
- Supports multiple services with varying performance requirements that meets full load conditions
- Stacked VLAN supported C-Tag and S-Tag to simulate Carrier Ethernet traffic
- Simultaneous validation of all the services quality over time

RFC 2544 VS Y.1564 (ExpertSAM™)

	RFC 2544	Y.1564
Measurements	Throughput, burstability, frame loss and latency	Throughput, burstability, frame loss, latency, packet jitter, QoS
Services	Link level	Multiple concurrent service levels
Performance	Measuring maximum performance	Key performance indicators (KPI) validation
Throughput	No separation of the committed and excess traffic	CIR, EIR and Traffic Policing constantly ensuring that KPI are met during the test
Frame Delay	Tests one frame in every test time and does not consider any latency variation that might occur over a longer test period.	Latency is measured during the test on all the generated frames measuring any deviation out of the defined range
Frame loss	Frame loss is measured during rate distribution throughput test where the frame loss distribution doesn't align with committed rate without complying to the KPI	Frame loss measurement during throughput test
Frame Delay Variation	Frame delay variation is not measured	Frame delay variation is measured for traffic generated up to the CIR ensuring proper traffic prioritization



ITU-T Y.1564 (ExpertSAM™)

- Service Configuration Test confirms the end to end configuration with the SLA parameters for all configured traffic streams
- Service Performance Test transmits all configured traffic streams simultaneously CIR confirming all traffic is able to transverse the network under full load with the above mentioned parameters.



ITU-T Y.1564 (ExpertSAM™) Graph



- Committed information rate or CIR is the average bandwidth guaranteed by a service provider. At any given time, the bandwidth should not fall below this committed figure.
- Excess Information Rate or EIR is the CIR plus excess rate that service provider claims to provide on a 'best-effort' basis.



Service Configurations

	Services
	Service Services 1 Copy
	Frame Size - Fixed,512 🔹
ervices	Layer - Ethernet, VLAN, IPv4, UDP
	Ethernet
Service Services 1 Copy	MAC
France Class Fixed F10	Source MAC Address 00-21-c2-00-2d-11
	Destination MAC Address 00-00-00-01-01 Resolve
Layer - Ethernet, VLAN, IPv4, UDP	
Ethernet - 00-21-c2-00-2c-80 -> 00-00-00-01-01, Len/Type(08-00)	VLAN
	VLAN Enable
VLAN - C-Tag,S-Tag	C-Tag Type 81-00 V ID 6 Priority 6
IPv4 - 192.168.1.101 -> 192.168.1.12 Protocol (UDP)	VS-1ag Type 88-A8 D 12 Priority 7
UDP - 1101 -> 1201	IPv4 - 192.168.1.101 -> 192.168.1.11 Protocol (UDP)
	UDP - 1101 -> 1201 ▼
Payload - Fixed Pattern, 12-34	Payload - Fixed Pattern, 12-34
BW Profile - CIR = 60.000 Mbps,EIR = 80.000 Mbps,Policing Rate = 100.000	CIR 625.00 Mbps
Color Aware = On, Color Method = VLAN S-Tag PCP	EIR 650.00 Mbps
SAC Decemptore ELD = 1 000 % ETD = E 000 more EDV = E 000 more	Traffic Policing Rate 700.00 Mbps
SAC Parameters - 1 LK - 1.000 %,1 1D - 5.000 mset,1 D4 - 5.000 mset	Color Aware = On, Color Method = VLAN S-Tag PCP
	Color Aware
Service Configuration Collapsed Summary View	Color Method VLAN S-Tag PCP
o 1 <i>i</i>	Green Frames 7
	Yellow Frames 3
	SAC Parameters
	Frame Loss Ratio 1.00 %
	Frame Transfer Delay 5.000 msec 🛩
	Frame Delay Variation 5.000 msec 💌

Service Configuration Expanded View

V-LAN C-Tag Configuration



* Tag Control Information (TCI)

VLAN C-Tag Frame Format



Service Configuration Test Results

Servio	e Configuration Resul	ts Overview	,				
Over	rview 者						
#	Service Name	Verdict	Current Step	Max IR(Mbps)	FLR(%)	Max FTD(msec)	Max FDV(msec)
1	A Service 1	1	-	625.00	0.000	0.0014	0.000038
2	Service2	1	-	625.00	0.000	0.0014	0.000038
3	A Service3	1 d	-	625.00	0.000	0.0014	0.000038
4	Service4	- V.	-	625.00	0.000	0.0014	0.000038
5	A Service5	×	-	625.00	0.000	0.0014	0.000038
6	Service6		-	625.00	0.000	0.0014	0.000038
7	Service7	×.	-	625.00	0.000	0.0014	0.000038
8	Service8	- 4 ,	-	625.00	0.000	0.0014	0.000038
9	A Service9	- V _	-	625.00	0.000	0.0014	0.000038
10	Service 10		-	625.00	0.000	0.0014	0.000038
11	Service 11	×.	-	625.00	0.000	0.0014	0.000038
12	Service 12	√.	-	625.00	0.000	0.0014	0.000038
13	Service 13	×	-	625.00	0.000	0.0014	0.000038
14	🕂 Service 14	- V .	-	625.00	0.000	0.0014	0.000038
15	Service 15	×	-	625.00	0.000	0.0014	0.000038
16	Service 16	1	-	625.00	0.000	0.0014	0.000038

Service Result Overview

Service	ervice Configuration Results Details														
Service	e Service1	V IR(M	bps), FLR(%	6), FTD(ms), I	FDV(ms)	Vertical	IIII FTD U	nit msec 💌	FDV Unit	msec 💌					
Test	Verdict	IR (Curr)	IR (Min)	IR (Avg)	IR (Max)	FL (Count)	FLR (Rate)	FTD (Curr)	FTD (Min)	FTD (Avg)	FTD (Max)	FDV (Curr)	FDV (Min)	FDV (Avg)	FDV (Max)
CIR	PASS	624.99	624.99	625.00	625.00	0	0.000	0.001	0.001	0.002	0.001	< 1us	0.000	< 1us	< 1us
EIR	PASS	649.99	649.99	650.00	650.00	1	0.000	0.001	0.001	0.002	0.001	< 1us	0.000	< 1us	< 1us
I															
I															
l															



Service Performance Test Overall Status

Overall Status			Ψ×
Overall Status 🔺 🚽	Global Verdict PASS	~	
Test	Stream No	Subtest	Step No
Service Performance Test	_	-	-
Alarm	Status		<u>^</u>
Link Status	•		
IR	•		
FLR	•		
FTD	•		
FDV	•		~



Service Performance Test Results

Service Pe	Service Performance Results														
IR (Mbps	IR(Mbps), FLR(%), FTD(msec), FDV(msec) Test Time 00:00:16 Vertical IIII FTD Unit msec V FDV Unit usec V														
Service	Service Verdict IR (Curr) IR (Min) IR (Avg) IR (Max) FL (Count) FLR (Rate) FTD (Curr) FTD (Min) FTD (Avg) FTD (Max) FDV (Curr) FDV (Min) FDV (Avg) FDV (Max)														
1	PASS	625.00	625.00	625.00	625.00	2	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
2	PASS	625.00	625.00	625.00	625.00	2	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.115000
3	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.115000
4	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
5	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
6	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.128000
7	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.115000
8	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
9	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
10	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
11	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.115000
12	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
13	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
14	PASS	625.00	625.00	625.00	625.00	3	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
15	PASS	625.00	625.00	625.00	625.00	2	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.122000
16	PASS	624.95	624.94	624.95	624.95	2	0.000	0.018	0.001	0.015	0.021	0.003000	0.003000	0.003000	8.128000



Report Generation

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Report Generation

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Sample PDF Report



Thank you

