

EX-280

Ethernet probe for service verification, monitoring, demarcation, aggregation and tapping

Ethernet Network Interface Device (NID), Service Tester, Monitoring and Aggregation Tap

Configurable Ethernet NID (2 x 2), Service Tester (2), Monitoring (4 x 2), Aggregation Tap (8)



Configuration

- System
 - Information
 - IP
 - IPv6
 - NTP
 - Log
- Performance Test
 - Loopback
 - BERT
 - RFC2544
 - Y.1564
- Ports
- Port Access
 - Rate Limiters
 - Access Control List
- Security
 - Password
 - Auth Method
 - SSH
 - HTTPS
 - Access Management
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 - System
 - Ports
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 - Traffic Overview
 - Detailed Statistics
 - Security
 - Access Management Statistics
 - Port Access
 - ACL Status
- Diagnostics
 - Ping
 - PingV6
 - VeriPHY
- Maintenance
 - Restart Device
 - Factory Defaults
 - Software Upload

Functions

Four 10/100/1000Base-T and four 100/1000Base-X ports
10/100/1000 Mbps line rate Ethernet stream generation
Layer 1 to Layer 4 BER test with 8 streams per port
IPv6 and IPv4 throughput and bandwidth performance
ITU-T Y.1564 Service Activation Methodology (SAM)
Independent stream configuration and measurement
QoS analysis through VLAN/CoS and IP ToS/DSCP
Carrier Ethernet service portfolio - PTN, PBB-TE, MPLS-TP
Link OAM (802.3ah) discovery and loopback
RFC2544 benchmarking suite
Smart and remote loopback with mirroring
Network interface device (NID) network demarcation
In-service pass through and monitoring
Service OAM (802.1ag) performance monitoring
Link, Switch or Analyzer tapping
Many-to-many port(s) aggregation
Media converter
Segment link (power failure switch over)
Traffic/Stream merging and regeneration
SNMP trap and OAM alarm events
Link failure propagation
19" 1U rack mount kit
Redundant and -48VDC power supply

Productivity

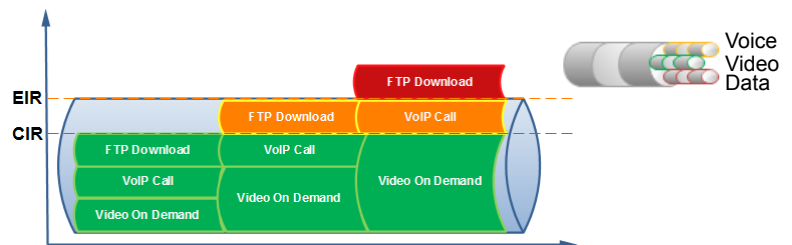
On-site, on-demand testing
Fast power-up time
Test profiles and measurement reports
Web based management
Remote operation and back office (OSS) integration

Integrity

Interoperable with other Ethernet testers
Ethernet service performance and quality assurance
Real time packet forwarding, filtering and processing in line rate
Minimal failover and down time
Network monitoring tool escalation (Sniffer, Wireshark, WebSense...)

Y.1564 Service Activation Methodology

Network Configuration and Service Tests provide faster and easier verification of SLA KPIs for differentiated services validation with multiple profiles in committed information rate (CIR), extended information rate (EIR), maximum information rate (MIR). 8 independent and simultaneous services with user defined pass/fail KPI criteria in CIR, Frame Delay (FD), Frame Delay Variation (FDV), Frame Loss Rate (FLR) and Out-of-Sequence (OOS) frames.



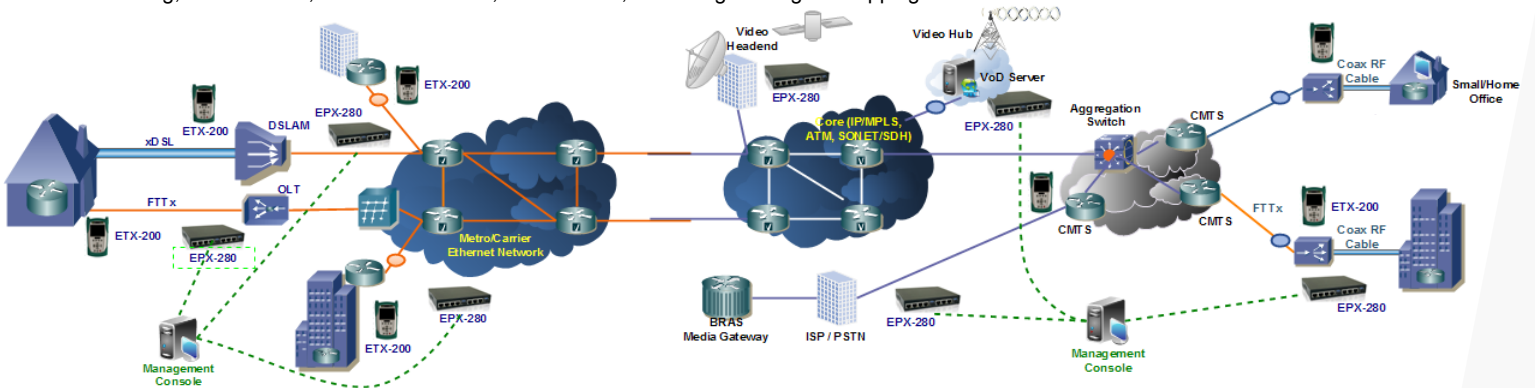
IPv6 and IPv4 Compatibility

IPv6 benefits include increased address space, better mobility support, multi-homing, better network security, scoped address space, efficient routing and management. Full IPv6 configuration is supported in Throughput/BERT, Y.1564, RFC2544, OAM, Loopback, Ping and DHCP testing.

Applications

Carrier/Metro Ethernet Service Deployment

Combination of EX-280 and EX-200 is designed for both Telecom and Cable networks deployment of Ethernet services for turn up installation, trouble shooting, maintenance, service assurance, demarcation, traffic engineering and tapping.



Bidirectional or Round-trip Measurement

With Bit-Error-Rate (BER), ITU-T Y.1564 and RFC2544 tests, major Service Level Agreement (SLA) KPIs are measured with independent stream configuration and statistics for first-time-right Ethernet service validation.

Ethernet Services Installation, Maintenance, and Emulation Testing

EX-280 validates the Ethernet services to deliver next-generation telecommunication services for business, enterprise and mobile backhaul. To ensure quality of performance, EX-280 supports various testing methodology for field technician to install, turn-up and maintain these Ethernet services.

Bit Error Rate Test (BERT)

Ethernet frames are carried across different physical media over long haul network in bit basis. BERT encapsulates pseudo-random binary sequence (PRBS) payload for frame-based error and bit-error-rate tests to support bit-error accuracy measurement for validation of physical layer transport systems such as DWDM, Ethernet over DWDM or dark fiber.

Quality of Service (QoS) and Service Level Agreement (SLA)

New and more multimedia services, such as voice, video, SMS, e-mail, gaming and online transaction, are carried over Ethernet circuits. Due to the differentiated nature and priority handling of these services, bandwidth performance are affected by network configuration characteristics such as latency, packet delay variation, packet loss and errors. EX-280 supports up to 8 independent streams per port to represent different application services and allows simultaneous traffic generation, measurement and error injection to emulate live network performance for validation.

RFC2544 Benchmarking Test Suite

Throughput, Latency (includes Packet Delay Variation), Frame Loss, Packet Delay Variation, Back-to-Back tests are included with user-configured bandwidth range, frame size, test duration, number of iterations and pass/fail threshold. EX-280 supports round-trip, bidirectional, symmetrical and asymmetrical RFC2544 tests. Each test iteration can be justified with pass/fail criteria based on the threshold value. Automatic test configuration can also be saved and executed without re-configuration.

Carrier Ethernet Packet Transport Network - PBB-TE (802.1ah), MPLS-TP, OAM (802.3ah/802.1ag)

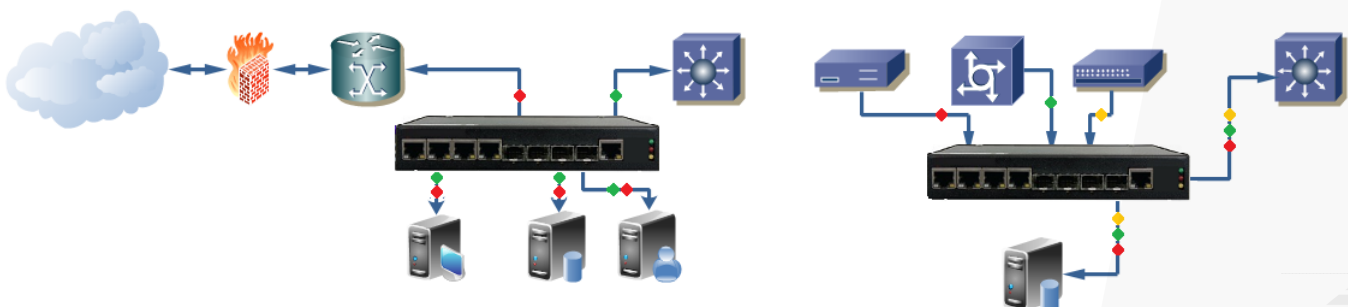
Packet transport network (PTN) technologies are evolved by broadband and telecom service providers worldwide to improve their network infrastructure in order to offer high and reliable bandwidth to support quality intensive services such as video, voice and critical data transactions. In-expensive and scalable Ethernet/IP convergence are expanded to the edge and Metro access network from the Core transport network. Connection-less Ethernet solution has to meet the QoS expectations without giving up the benefits of connection-oriented traditional TDM (SONET/SDH) solutions. In addition to the OAM features Implemented on EX-280/100, Provider Backbone Bridge Traffic Engineering (PBB-TE) and MPLS Transport Profile (MPLS-TP) are also offered to validate differentiated Ethernet services from end-to-end and tunnelling topologies.

Stream Prioritization - VLAN, Q-in-Q, CoS, ToS and DSCP

Various data services, such as triple-play services, are now supported over the same Ethernet network. The need to measure and qualify KPIs and statistics are required to ensure the satisfaction of QoS and Quality of Experience (QoE). EX-280 stream configuration allows user-defined VLAN ID, VLAN priority (802.1p), VLAN stacking (802.1ad Q-in-Q), DiffServ, IP ToS (RFC 791) and DSCP (RFC 2475) parameters to transmit voice, video and data streams. Bandwidth throughput, latency, frame loss, packet delay variation (RFC3393) and error statistics are measured and displayed for each stream.

Link-in-Line Aggregation/Regeneration Tap and Media Conversion

Aggregate and monitor the network in-service traffic from multiple data links or SPAN ports at once by combining symmetrical and asymmetrical traffic in meshed network or from load balancer. Media conversion between optical and electrical interfaces. Tap into a network link and provide mirrored copy of the traffic to any monitoring tool with SPAN (ingress) ports. Aggregation and re-generation from/to multiple network device and Analyzer (egress) ports.



Specifications

General Specifications

Size	205 (w) x 145 (d) x 31 (h) mm	Operating Temperature	0° ~ 45°C (32° ~ 113°F)
Power Supply	100~240VAC, 50/60Hz	Storage Temperature	-20° ~ 70°C (-4° ~ 158°F)
	12V DC, 1.2A	Relative Humidity	5% ~ 85% non-condensing
Warranty	1 year in hardware & software		

Functional Specifications

BERT/Throughput	
	8 streams per port, layer 1 to Layer 4 user defined headers, payload, bandwidth.
Configuration	Unframed, MAC source/destination address, stacked 802.1Q VLAN, 802.1p VLAN priority, LLC/SNAP, IPv6/IPv4 source/destination address, IP header (ToS, DSCP, TTL, protocol, fragment offset), layered MPLS tags, TCP/UDP source/destination port, frame size (48 - 11,000), frame size, payload, constant/ramp/burst bandwidth control (0%-100% with 0.01% resolution), continuous or timed measurement cycle.
Patterns	PRBS 2 ³¹ -1, 2 ²³ -1, 2 ²⁰ -1, 2 ¹⁵ -1, 2 ⁷ -1, all 1s, all 0s, user defined patterns. Normal or inverted.
Ethernet Statistics	Start/Elapse time. Per-stream and aggregate Tx/Rx line/data bit rate, utilization rate, frame count, frame rate, frame size distribution, VLAN, MPLS, broadcast, multicast, unicast, TCP/UDP, runt, jumbo (>9K), Inter-Frame Gap (IFG/IFG), non-test frames.
Latency Statistics	Per-stream and aggregate latency, packet delay variation, lost, pause, out-of-sequence frames.
Error Statistics	Per-stream and aggregate bit error count, bit error rate, error injected, FCS/CRC error, IP checksum, jabber, alignment, collision frames.
Error Injection	Per-stream and aggregate BIT, FCS/CRC, IP checksum error injection in count or rate.
Alarm Detection	LOS, link down, pattern synchronization/loss, error frames, out-of-service time, non-test traffic.
Q-in-Q and MPLS	3 stacked VLAN and 3 layered MPLS tags.
Asymmetrical Test	Unbalanced upstream and downstream traffic generation and measurement
MPLS-TP *	MPLS-TP data traffic generation and analysis in line rate, comprehensive MPLS-TP OAM (ITU-T G.8114, Y.1731 and IETF). OAM messages generation and monitoring at pseudo wire, LSP and section. OAM Continuity Check (CC), Loopback (LB), Alarm Indication Signal (AIS).
PBB-TE *	Configuration of B-MAC source/destination, B-VLAN and I-Tag (802.1ah).
ITU-T Y.1564 SAM (Service Activation Methodology)	
	Independent service stream and SLA KPIs
Network Configuration Test	8 configuration tests in sequence, min. data rate to CIR, CIR to EIR, EIR to overshoot, QoS KPIs Pass/Fail conditions.
Service Test	8 real-life CIR service tests, QoS KPIs enforcement with committed Pass/Fail conditions.
RFC2544	
	Throughput, Latency, Frame Loss Rate, Packet Delay Variation, and Back-to-Back benchmarking test suite. End-to-end (bidirectional) or loopback (roundtrip) mode. Symmetrical or asymmetrical test.
Configuration	Frame sizes (64 - 11,000), bandwidth range, test duration, number of iterations, pass/fail threshold values, MAC/IP source/destination address, IP header.
Batch and Quick Mode	Automatic batch and quick mode by combining multiple tests in sequence.
Loopback with Mirroring	
	Mirrored smart loopback with or without swapping MAC/IP source/destination addresses and TCP/UDP source/destination ports.
Filter	User defined loopback filter parameters: broadcast, multicast, MAC/IP source/destination address, VLAN ID and priority, TCP/UDP source/destination port.
Responder Scan	IP address range scan for remote Loopback units.
Remote Loopback	loop up/down control and respond.
Link OAM	IEEE 802.3ah connection, OAM frame statistics, active/passive discovery and Loopback control.
Link Aggregation, Tap/Analyzer	
Configuration	Flexible N-to-N ports mapping.
Aggregation	Combination of symmetrical and asymmetrical traffic from multiple data links or SPAN ports (ingress) to multiple egress ports.
Media Conversion	In-service pass through mode
Segment Link	Link failure/loss propagation.
Power Failure Switchover	Electrical power failure switchover
Ethernet Tap	Mirror copy of traffic to multiple egress ports connected to any monitoring tool with SPAN ports.
Others	
Event Log	Logging of critical events with timestamp like LOS, BIT errors, pattern synchronization error, frame loss, start/stop measurement time.
TCP/IP Tools	DNS client, Web/FTP access/connection test, Ping, TraceRoute (30 hops).
Ping	User defined TTL, source/destination IP/URL, gateway address, packet length, rate.
DHCP Client	Connectivity to IP network in static IP or DHCP mode.
Monitor Pass Through	In-service pass through mode for application monitoring or media conversion.
Cable Test	CAT 5/5e/6 UTP/STP cable length (≤150m), open/short status.
Optical Power Measurement	SFP DDM diagnostics of Tx/Rx power level (dBm or μW), wavelength, temperature, vendor name, laser bias current/voltage.
ARP Scan and Monitoring	Interception of ARP spoofing/attack/poison and IP conflict. Active defense. ARP cache protection. Attacker trace.
VLAN Scan	VLAN ID and priority discovery.
Port Flashing	Remote port LED flashing to identify network device wiring.
Profile and Report	16 configuration profiles and 80 CSV report files to be saved, loaded, and transferred to/from non-volatile or USB memory.
Web Management Port	RJ-45 in 10/100/1000Base-T can be used for device management, firmware upgrade, file transfer and remote control.

10/100/1000Base-T MDI/X and 100/1000Base-X

RJ45 UTP	Electrical Interface		
	10Base-T	100Base-T	1000Base-T
Type	-20 ~ -15	-15 ~ -8	-9.5 ~ -4
Tx Level (dBm)	100	100	100
Maximum Distance (m)	10 Mbps	125 Mbps	1 Gbps
Tx/Rx Bit Rate	±100	±100	±100
Tx Accuracy (ppm)	±4.6	±4.6	±4.6
Rx Accuracy (ppm)	Half and Full	Half and Full	Full
Duplex Mode	√	√	√
Auto-Negotiation, Flow Control and MDI/X Compliance	IEEE 802.3	IEEE 802.3u	IEEE 802.3ab

SFP - LC Connector Class 1 Laser	Optical Interface				
	100Base-FX 1310	100Base-LX 1310	1000Base-SX 850 MM	1000Base-LX 1310 SM	1000Base-ZX 1550 SM
Wavelength (nm)	-20 ~ -15	-15 ~ -8	-9.5 ~ -4	-9.5 ~ -4	-2 ~ +3
Tx Level (dBm)	-31	-28	-21 ~ 0	-25.5 ~ -3	-24 ~ -3
Rx Sensitivity Level (dBm)	2	15	0.55	10	80
Maximum Distance (km)	0.125	0.125	1.25	1.25	1.25
Tx/Rx Bit Rate (Gbps)	1280 ~ 1380	1260 ~ 1360	770 ~ 860	1270 ~ 1360	1540 ~ 1570
Tx Operational Wavelength Range (nm)	±4.6	±4.6	±4.6	±4.6	±4.6
Frequency Accuracy (ppm)	±2	±2	±2	±2	±2
Optical Power Accuracy (dBm)	LED	FP	VCSEL	FP	DFB
Laser Type	√	√	√	√	√
Auto-Negotiation and Flow Control Compliance	ANSI X3.166	IEEE 802.3	IEEE 802.3z	IEEE 802.3z	



Ordering Information

Model	Description
EX-280	Four 10/100/1000Base-T and four 100Base-X/1000Base-X ports Gigabit Ethernet probe. Includes AC adapter, user's manual, carrying case and one-year warranty in hardware, software and battery. Ethernet smart tap with filter on eight ports.
NA2	Two-prong power cord for use in North America, Latin America and Asia
NA3	Three-prong power cord for use in North America, Latin America and Asia
EU	Two-prong power cord for use in Europe
UK	Three-prong power cord for use in United Kingdom
Options	
TS1	Single-port time stamp to ingress packets in 100 nanoseconds resolution.
TS2	Dual-port time stamp to ingress packets in 100 nanoseconds resolution.
CH1	Single-channel Ethernet Service testing with Throughput/BERT, RFC2544, Loopback, Monitoring and Y.1564
CH2	Dual-channel Ethernet Service testing with Throughput/BERT, RFC2544, Loopback, Monitoring and Y.1564
NID1	One Network/Client interface group with Demarcation, Traffic Engineering, QoS Policy Management, Service Awareness and Filter
NID2	Two Network/Client interface group with Demarcation, Traffic Engineering, QoS Policy Management, Service Awareness and Filter
PTN	Packet Transport Network option includes PBB-TE and MPLS-TP feature set
IPv6	IPv6 test suite
SW1	One-year extension of software maintenance and update after standard warranty
SW2	Two-year extension of software maintenance and update after standard warranty
Accessories	
PA-2R1U	19" rack mount kit fits two EX-280 units
PA-1000SX	Optical SFP transceiver module, 850 nm, MM, LC, 1.25 Gbps, 500 m reach
PA-1000LX	Optical SFP transceiver module, 1310 nm, SM, LC, 1.25 Gbps, 10 km reach
PA-1000ZX	Optical SFP transceiver module, 1550 nm, SM, LC, 1.25 Gbps, 80 km reach
PA-100FX	Optical SFP transceiver module, 1310 nm, MM, LC, 125 Mbps, 2 km reach
PA-100LX	Optical SFP transceiver module, 1310 nm, SM, LC, 125 Mbps, 30 km reach
PA-MLCLC6	Optical patch cord, LC-LC duplex, MMF, 62.5/125 µm, 6 ft.
PA-SLCLC6	Optical patch cord, LC-LC duplex, SMF, 6 ft.
PA-CAT5E	CAT5e cable, 100 Ω, RJ-45(M)-RJ45(M), 6 ft.



10-ports Gigabit Smart-NID-TAP

- ▼ Configuration
 - ▼ System
 - Information
 - IP
 - IPv6
 - NTP
 - Log
 - ▼ Performance Test
 - Loopback
 - DERT
 - RFC2544
 - Y.1564
 - Statistics
 - ▼ Port
 - Port
 - ▼ Port Access
 - Rate Limiters
 - Access Control List
 - ▼ Security
 - Password
 - Auth Method
 - SSH
 - HTTPS
 - Address Management
 - SNMP
 - ▼ Monitor
 - Sniffer

Port Configuration

Port	Link	Speed		Flow Control			Maximum Frame Size	Excessive Collision Mode	Power Control
		Current	Configured	Current Rx	Current Tx	Configured			
Mgmt	● Up	10Gbit	Auto	×	×	☐	9600	Discard	Enabled
1	● Down	Auto	Auto	×	×	☐	9600	Discard	Enabled
2	● Down	Auto	Auto	×	×	☐	9600	Discard	Enabled
3	● Up	10Gbit	Auto	×	×	☐	9600	Discard	Enabled
4	● Up	10Gbit	Auto	×	×	☐	9600	Discard	Enabled
5	● Up	10Gbit	Auto	×	×	☐	9600	Discard	Disabled
6	● Up	10Gbit	Auto	×	×	☐	9600	Discard	Disabled
7	● Down	Auto	Auto	×	×	☐	9600	Discard	Disabled
8	● Down	Auto	Auto	×	×	☐	9600	Discard	Disabled
CH1	● Up	10Gbit	Auto	×	×	☐	9600	Discard	Enabled
CH2	● Down	Auto	Auto	×	×	☐	9600	Discard	Enabled

Save Reset



denk-stein:net
MEASUREMENT TECHNOLOGY

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