



2008 Global Test & Measurement  
Emerging Company of the Year Award



## VePAL MX120

### Dual Port Handheld Ethernet Test Set

#### Next Generation of Metro and Carrier Ethernet Testing

VeEX™ VePAL MX120 Metro Expert is the next generation of Metro and Carrier Ethernet field test equipment for Ethernet Networks carrying Voice, Data and Video. The MX120 is part of the MX100 product family.

### Platform Highlights

- Intuitive presentation of measurements with test graphics
- High resolution color touch-screen viewable in any lighting conditions fitted with protective cover
- Robust, handheld chassis packed with powerful and flexible features for demanding environments and test conditions
- Optimized for field engineers or technicians installing and maintaining Ethernet networks enabling triple play services
- Ethernet connection for back office applications, workforce management and triple play service verification
- User defined test profiles and thresholds enable fast, efficient and consistent turn-up of services
- USB memory stick and FTP upload support for test result storage/file transfer
- Maintain instrument software, manage test configurations, process measurement results and generate customer test reports using the included ReVeal™ PC software
- Extend field testing time using interchangeable LiIon battery pack/s. Greater battery autonomy provided in standby mode
- Advanced IP connection tests; Ping, trace route, ARP Wiz, web browser, and FTP upload/download
- Optional NetWiz cable diagnosis with network statistics
- Optional VoIP call emulation and MOS performance analysis
- Optional WiFi Wiz site survey with internet connection test

### Key Features

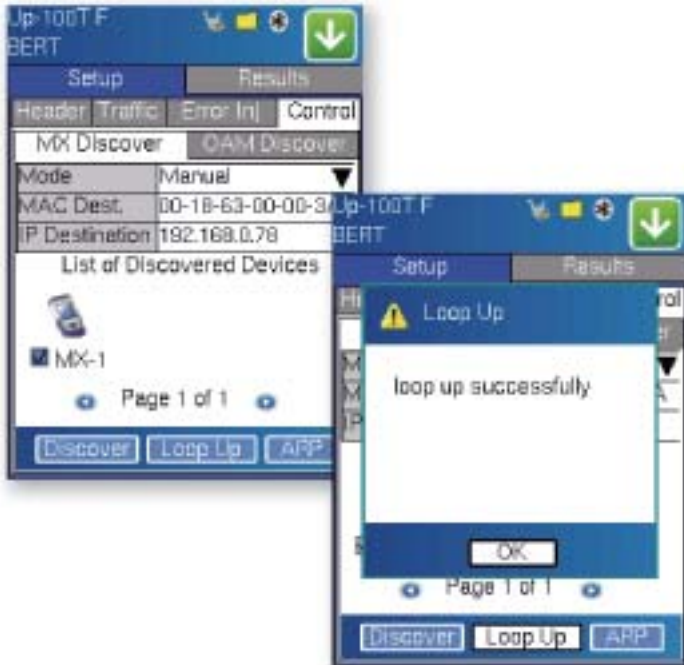
- Two 1000Base-X SFP ports and Two 10/100/1000T RJ45 ports for dual port testing
- All-in-one Ethernet, Gigabit Ethernet, and Fibre Channel testing
- Full Ethernet testing features on each operating port. Ideal for lab testing and field testing environments
- Throughput, latency, frame loss, and back-to-back measurements per the industry-standard RFC 2544 tests
- Unframed BER testing to validate error free fiber connections
- Ethernet BER testing at layer 1, layer 2, and layer 3, with or without VLAN and MPLS tags
- Fibre Channel FC-1 and FC-2 BER testing with buffer-to-buffer credit and FC-2 header configuration
- Multiple stream generation and analysis for QoS verification of multiple services such as triple play
- Q-in-Q (VLAN stacking) capability, with up to three VLAN tags
- MPLS stacking capability, with up to three MPLS labels
- Intelligent device discovery mode; discover other MX100s on the network for quick and easy loopback control configuration
- IEEE 802.3ah OAM device discovery and loopback control support
- Smart Loop mode for layer 1, layer 2, and layer 3
- VLAN scan feature and traffic monitor for VLAN configuration verification and top bandwidth users visibility
- Remote control capability through the ReVeal PC software

Metro Expert

## Product Features

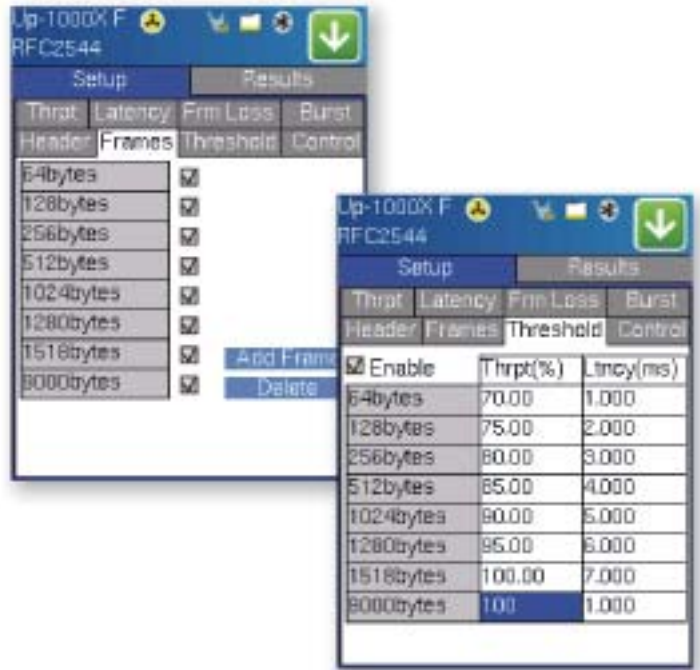
### Intelligent Network/Device Discovery\*\*

Easily discover and select another MX120 or MX10 on the network under test for loopback testing applications. The local device will control the operation of the far end device, in either loopback or peer-to-peer mode (or symmetrical or asymmetrical traffic generation mode). This feature greatly simplifies field testing since there is no need for a second technician to be at the far end configuring the test partner device.



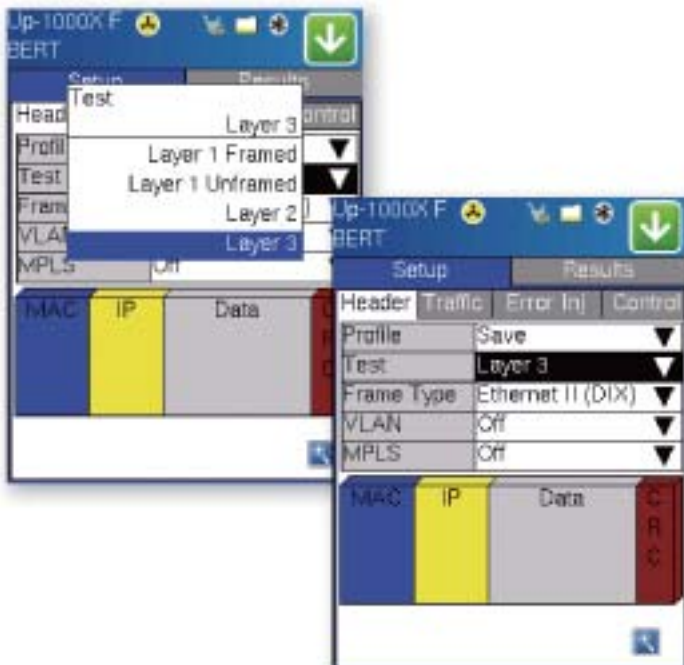
### RFC2544 Compliance Testing

Perform the RFC 2544 automated test suite at all recommended frame sizes including user configurable frame sizes and up to full line rate. The test suite can also be performed with the far end test partner in loopback mode or peer-to-peer mode – the latter allowing for symmetrical/asymmetrical testing. Thresholds may be configured for accurate SLA assurance and verification. The automated tests supported are throughput, latency, frame Loss, and back-to-back frames.



### BERT

Layer 1, layer 2, and layer 3 BER testing is supported. The BER test can be configured to use either regular PRBS test patterns, stress patterns (specifically for Gigabit Ethernet) or user defined test patterns to simulate various conditions. All patterns are encapsulated into an Ethernet frame to verify bit-per-bit performance of an Ethernet circuit.



### Multiple Streams Generation

Up to 8 traffic streams can be independently configured with CoS (VLAN priority) and QoS (TOS/DSCP) prioritization. This traffic feature, simulates multiple service conditions (e.g. Triple Play), and facilitates end-to-end QoS performance verification.



## Q-in-Q

For Metro and Carrier Ethernet applications VLAN stacking or Q-in-Q is supported. This feature makes provision for carrier/service provider assigned VLAN, but also retains the VLAN of customer traffic.



## Smart Loopbacks

Three modes are available for looping back test traffic; layer 1, layer 2, and layer 3 mode. At layer 1 all incoming traffic is looped back unaltered. For layer 2, all incoming unicast traffic is looped back with the MAC source and destination addresses swapped. For layer 3, all incoming unicast traffic is looped back with MAC and IP source and destination addresses swapped.

## Pass Through Monitor Mode

Pass through mode monitoring consists of passing traffic through the unit's two 1000Base-X ports or the two 10/100/1000T ports. Pass through mode is ideal for troubleshooting the boundary between the customer network and the carrier/service provider network.

## IEEE 802.3ah OAM Support

Ethernet in the first mile (EFM) OAM discovery and loopback controls are supported. This feature allows for the discovery of IEEE 802.3ah OAM-enabled devices and the ability to loopback these devices.

## Delay and Jitter Measurements

Frame Delay and Frame Delay Variation - Jitter measurements are performed on the test traffic during BER Tests or Throughput Tests.

## IP Verification

Several IP features to verify end-to-end connectivity or connectivity up to the ISP and throughput performance are available. These include, Ping, Trace Route, Web Download, and FTP upload/download.

## IPTV Troubleshooting

Video over IP performance metrics are evaluated on both the 10/100/1000BaseT and 1000Base-X interfaces. These measurements verify the performance and quality of the IP video traffic across the triple play network. All measurements are performed at the IP layer.

## VLAN Scan and Traffic Monitor

Scan up to 4k VLAN IDs for switch configuration verification. Verify which VLAN IDs are the top bandwidth users and monitor up to 8 live traffic streams (in terminated mode).

## Fibre Channel Testing\*\*

The Fibre Channel Test Suite option for the MX120 Metro Expert allows for the testing of 1.0625 Gbps and 2.125 Gbps Fibre Channel point-to-point topology networks. Refer to the Fibre Channel Test Suite data sheet for more details.

## Cable Diagnostics\*\*

Cable diagnostics include MDI/MDIX detection, cable fault detection, distance to fault, pair skew (10/100/1000T only), and polarity (10/100/1000T only).

## Applications

### End-to-End Performance Testing

Irrespective of the Ethernet service being installed, it is always necessary to verify that the network can handle the allocated bandwidth required by the customer. Service Level Agreements (SLA) require Service Providers to measure network throughput and other performance characteristics to ensure that bandwidth associated with the types of service conform to customer expectations.



Figure 1. End-to-End Performance Testing

## BER Testing

One traffic stream is transmitted across the network under test. Bit-per-bit error checking is performed on the received traffic. Service disruption measurements as well as CRC error checking are also performed. The BER test can be performed with a physical loop (or plug) at the far end (for a layer 1 circuit), or a second test unit in Smart Loop mode or in Peer-to-Peer mode.



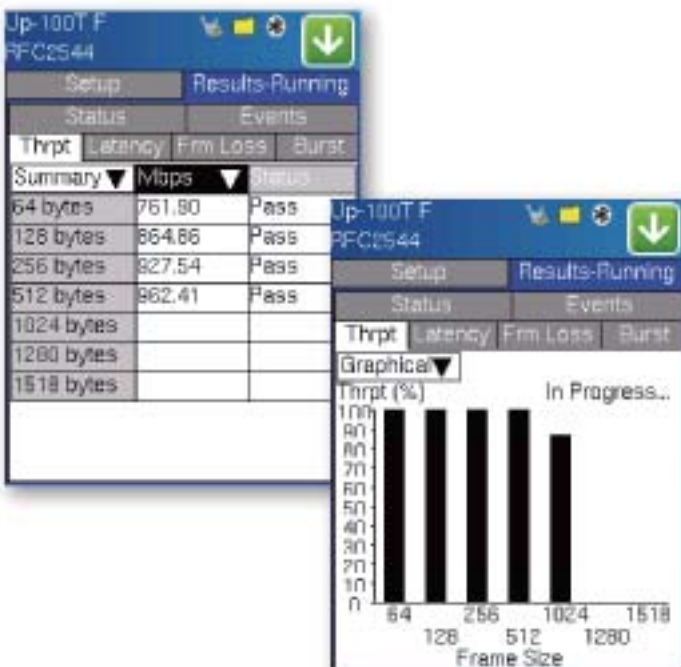
## Multiple Streams Generation–Throughput Test

Up to 8 independently configured streams with CoS (VLAN priority) and QoS (TOS/DSCP) settings may be configured for end-to-end QoS verification. Data rate, frame loss, delay, and CRC error checking are performed on each individual stream. The multiple stream throughput test may be performed with a second test unit at the far end in Smart Loop mode or Peer-to-Peer mode.



## RFC 2544

A single destination stream is configured with up to 9 different frame sizes for the four recommended tests: throughput, latency, frame loss, and back-to-back. Threshold values and maximum bandwidth settings are user configurable; this allows for fine SLA verification control. The RFC 2544 test suite can be performed with a second test unit at the far end in Smart Loop mode or Peer-to-Peer mode for asymmetric testing.



## Network Troubleshooting

Service providers constantly face the hard challenge of troubleshooting poor or unsatisfactory network performance. In these circumstances for example, the service provider must determine whether the poor performance is associated with its own or the customer network. Network monitoring tools like VLAN scan and traffic monitoring, Pass through mode and the NetWiz feature play an important role in this troubleshooting process. Long term monitoring of bandwidth utilization and errors is possible with pass through mode and an overall assessment of the integrity of the network is possible with the NetWiz feature.



Figure 2. VLAN Scan and Monitor Mode

## Dual Port Testing

MX120 users can reduce test equipment costs by conducting lab bench testing or certain field testing with one instrument. With simultaneous operation of two ports (any combination of 1000Base-X or 10/100/1000T ports) customers can test a variety of lab and field environment test scenarios.

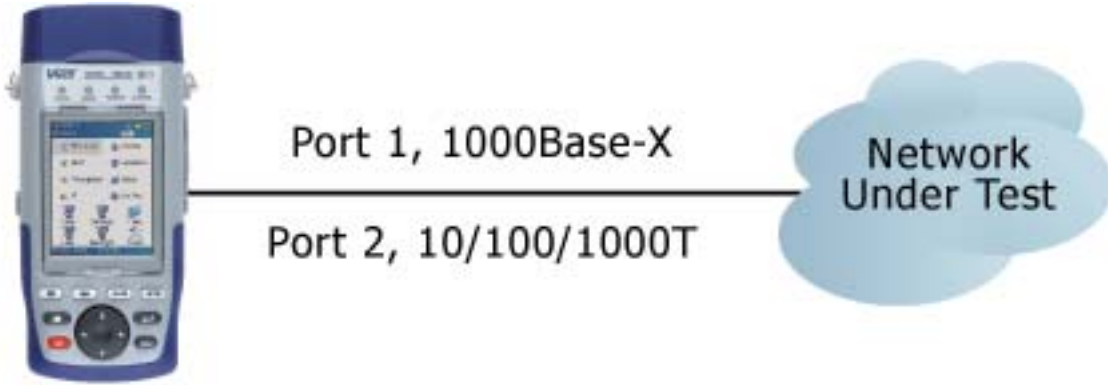


Figure 3. Dual Port Testing

## IP Connectivity

Internet connection services require that the IP connectivity be verified up to the Public Internet. For a routed network, verifying end-to-end connectivity is also important prior to testing the throughput performance. IP connectivity can be established by performing a Ping test, trace route, and echo response. Other tests to verify throughput performance include Web Access or FTP/Web.

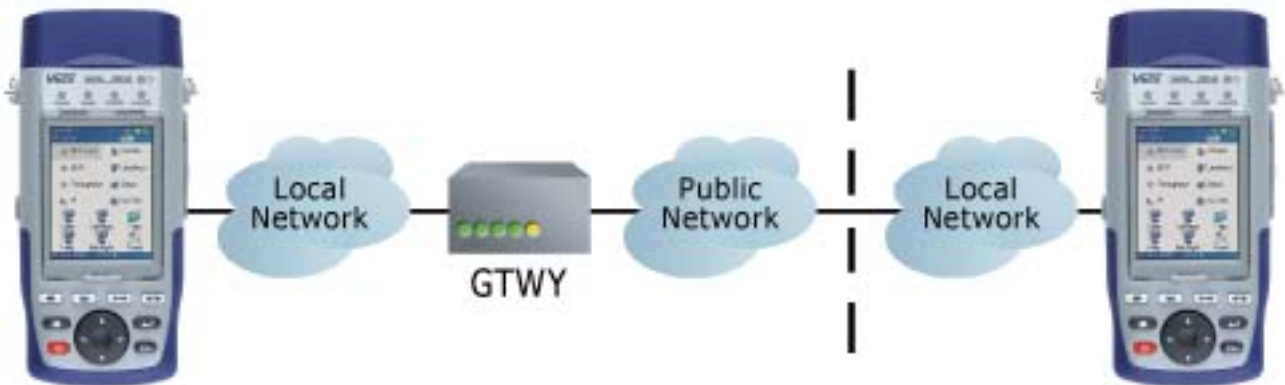


Figure 4. IP and End-to-End Connectivity

## Advanced IP testing

Complete IP verification is possible using either of the Ethernet and Gigabit Ethernet test ports; 10/100T, 10/100/1000T, and 1000Base-X. Considering that all Triple Play services are IP centric, a powerful and comprehensive set of IP test capabilities is no longer considered a luxury or a "nice to have" feature. Technicians need to verify network connection during installation and/or service restoration, and thus rely on features such as Ping test, Trace Route, ARP, Web browser, and FTP upload/download to get the system "up and running".

## IPTV service verification

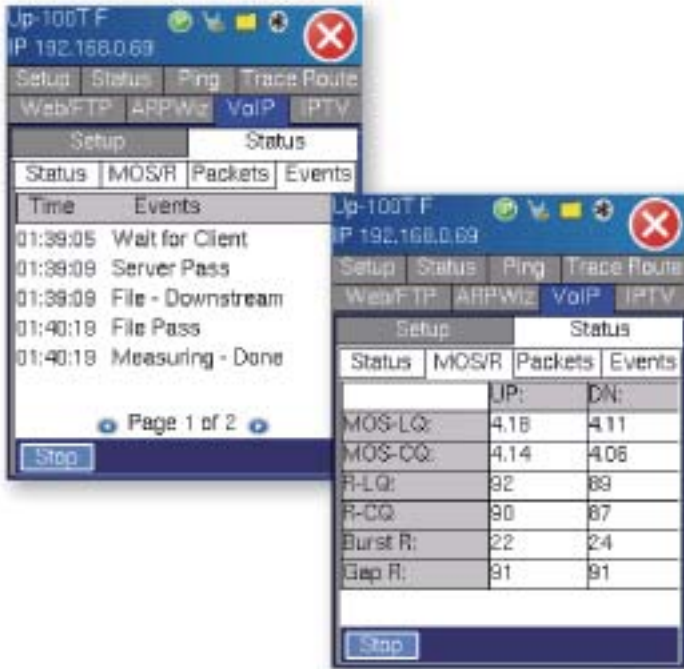
Designed and optimized for technicians turning up IP video service. Set Top Box emulation (STB) includes registration, IGMP and RTSP signaling for Broadcast and Video on Demand (VOD) applications. Transport stream analysis encompasses data/video/audio bit rates and Program Identification (PID) mapping. Packet jitter and loss, IGMP latency (channel zapping), PCR statistics and Viewer function complete the Video Quality of Service (QoS) application suite.



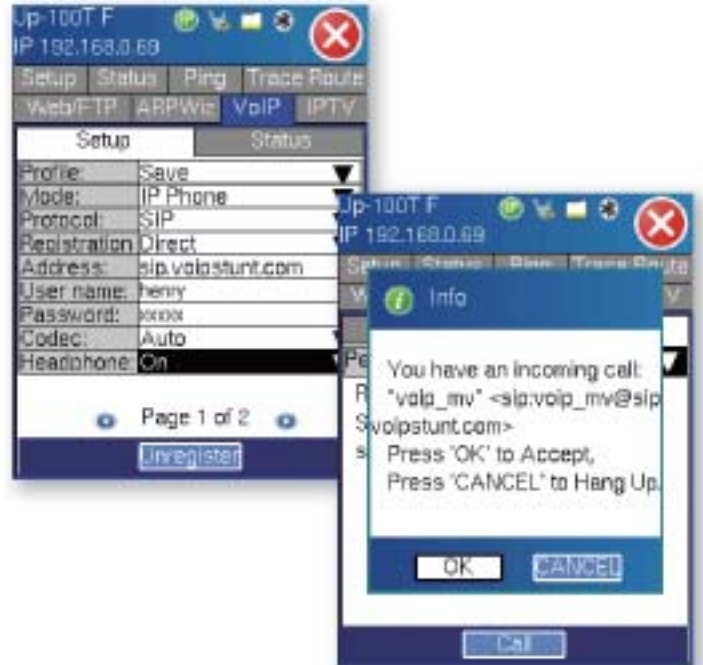
## Voice over IP testing

Take advantage of the two separate software options offering different test methods to verify and provision your VoIP network. Testing can be performed over any of the Ethernet or Gigabit Ethernet test ports; 10/100T, 10/100/1000T, and 1000Base-X.

**The VoIP Expert** generates industry standard wave files to verify MOS and R-Factor values of upstream and downstream paths and includes QOS measurements like packet jitter, packet loss, and delay.



**The VoIP Call Expert** emulates an IP phone and can place and receive calls using SIP or H.323 protocols. Comprehensive Codec support and call destination options verify voice encoding and translation provisioning. Real time evaluation of subjective voice quality (MOS and R-factor) is made possible using the patented Telchemy test method which has been integrated into all VePAL test sets.



## Net Wiz

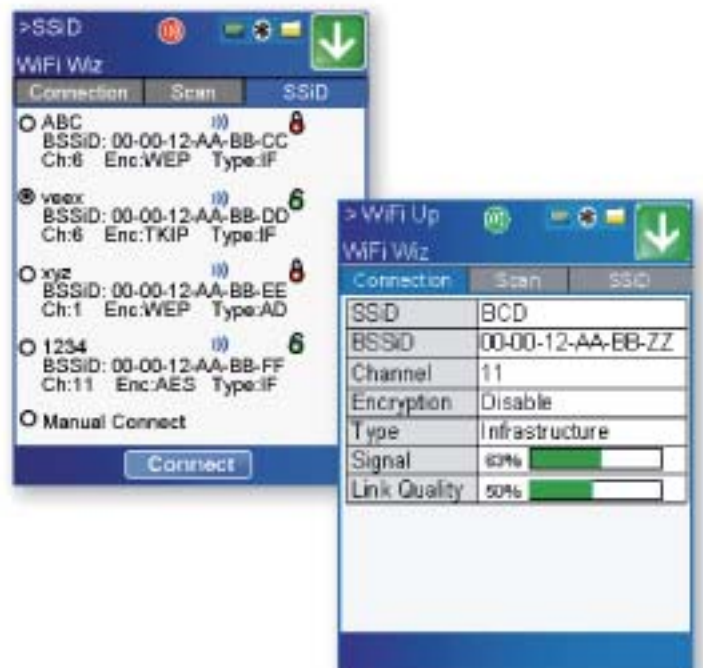
Ethernet network installation simplified using this basic, yet powerful feature. A built-in TDR identifies distance to short, distance to open, wire cross, and other anomalies associated with CAT-5 structured cabling. "Sniff" the network using the one-touch discovery feature - Identify routers, gateways, printers, PCs and other devices connected to the network within seconds.



## WiFi Wiz

All VePAL products adopt a USB WiFi adaptor to make 802.11 b/g Wireless installations a simple task. Scan for existing and available networks or perform signal strength and quality measurements to determine the best location for a new Wireless Access Point.

The IP Ping capability finally ensures the wireless network is properly installed and configured.



# Specifications

## Electrical Ethernet Interfaces

Two 10/100/1000Base-T Ports  
RJ45 connector  
IEEE 802.3 compliant

## Optical Ethernet Interfaces

Two 1000Base-X SFP Ports  
SFP, LC connector

### 1000Base-SX

Wavelength, 850nm  
TX level: -9 to -3 dBm  
RX level sensitivity: -20 dBm  
Max reach: 550m  
TX bit rate: 1.25 Gbps, 1.0625 Gbps, and 2.125 Gbps  
RX bit rate: 1.25 Gbps, 1.0625 Gbps, and 2.125 Gbps  
Jitter Compliance: IEEE 802.3  
Ethernet Classification: IEEE 802.3  
Eye Safety: Class 1

### 1000Base-LX

Wavelength, 1310nm  
TX level: -9.5 to -3 dBm  
RX sensitivity: -22 dBm  
Max reach: 10 km  
TX bit rate: 1.25 Gbps, 1.0625 Gbps, and 2.125 Gbps  
RX bit rate: 1.25 Gbps, 1.0625 Gbps, and 2.125 Gbps  
Jitter Compliance: IEEE 802.3  
Ethernet Classification: IEEE 802.3  
Eye Safety: Class 1

### 1000Base-ZX

Wavelength, 1550nm  
TX level: 0 to +5 dBm  
RX sensitivity: -22 dBm  
Max reach: 80 km  
TX bit rate: 1.25 Gbps, 1.0625 Gbps, and 2.125 Gbps  
RX bit rate: 1.25 Gbps, 1.0625 Gbps, and 2.125 Gbps  
Eye Safety: Class 1

## Ethernet Features

Auto Negotiation  
Full and Half Duplex  
Flow Control

## Modes of Operation

Terminated  
Monitor  
Pass through  
Loopback

## Traffic Generation

IEEE 802.3 and Ethernet II (DIX) frames

Configurable MAC, Ethernet Type, VLAN, MPLS, and IP fields  
Constant, Ramp, and Burst traffic profiles with configurable bandwidth % utilization  
Jumbo Frame Support  
Fixed, multiple, and random frame size generation  
Traffic prioritization via the VLAN priority field, MPLS CoS field and the IP TOS/DSCP fields

## RFC2544 Compliance Testing

Automated tests with configurable threshold values and maximum transmit bandwidth settings  
Throughput, Latency, Frame Loss, and Back-to-back (or Burst) tests  
Frame sizes: 64, 128, 256, 512, 1024, 1280, and 1518 Bytes including 2 user configurable frames

## Bit Error Rate Testing

Patterns: PRBS 2<sup>31</sup>-1, PRBS 2<sup>23</sup>-1, PRBS 2<sup>20</sup>-1, PRBS 2<sup>15</sup>-1, PRBS 2<sup>11</sup>-1, CRPAT (Layer 1 only), CSPAT (Layer 1 only), CRTPAT (Layer 1 only), Normal and inverted patterns  
Error Injection: Bit, CRC, Symbol, IP Checksum  
One configurable stream with one fixed frame size

## Traffic Filters\*\*

Up to eight traffic filters can be configured with MAC, VLAN, and IP fields for Monitor and Loopback modes

## Multiple Streams Throughput Testing

Up to 8 independent traffic streams with configurable MAC, VLAN, MPLS, and IP fields including traffic prioritization via the VLAN tag priority field and the IP header TOS/DSCP field  
% of bandwidth allocation is configurable for each stream  
Different traffic profiles (constant, ramp, or bursty) may be configured for different streams  
Different frame sizes are user configurable per stream

## VLAN and MPLS Tags

Up to 3 VLAN and MPLS tags may be added to each configurable traffic stream

## Smart Loop

Layer 1 loopback: loops back all incoming traffic  
Layer 2 and Layer 3 loopback: loops back all incoming unicast traffic and drops all incoming multicast and broadcast traffic

## Key Measurements

Error Measurements: Bit, CRC, symbol, IP checksum, jabber frames, runt frames, collisions, late collisions  
Alarm Detection: LOS, pattern loss, service disruption  
Frame/Packet Statistics: Multicast, broadcast, unicast, pause frames, frame size distribution, bandwidth utilization, frame rate, line rate, data rate, frame loss, frame delay variation

## Advance IP Test Suite

Ping, trace route, ARP wiz, FTP/Web tests  
These tests are available via the chassis 10/100-T port and the MX100's 10/100/1000T and 1000Base-X ports

## VoIP Expert

Provides VoIP Metrics: MOS and R-factor measurements

Packet Statistics: packet loss, jitter, delay

## VoIP Call Expert

VoIP Call setup with VoIP USB adaptor

Supports SIP and H.323 Protocol

Codec: G.711U, G.711A, Auto

## WiFi Wiz

Supports 802.11 b/g, SSID and mode (Infrastructure/Ad Hoc) detection, signal strength and link quality measurements, site survey, and IP connectivity verification

## Net Wiz

Available on the 10/100-T chassis port and the MX100 10/100/1000T port

Detect distance to open/short, wire cross, impedance mismatch

Network device discovery with auto ping verification to the discovered devices

## IPTV Expert

Provides true STB emulation

Supports IGMP/RTSP signaling, MPEG2/4, H.264 encoding, RTP/VC1/MPEG-TS transport streams

Packet Statistics: packet loss, jitter, delay, PID mapping, Video/Audio rates

Channel zapping for quick and complete installation check

## General Specifications

Size	210 x 100 x 55 mm (H x W x D) (8.25 x 3.75 x 2.25 in)
Weight	Less than 1 kg (less than 2.2 lbs)
Battery	Lilon smart battery 2400 mAh 10.8VDC
AC Adapter	Input: 100-240 VAC, 50-60 Hz Output: 15VDC, 3.5A
Operating Temperature	-10°C to 50°C (14°F to 122°F)
Storage Temperature	-20°C to 70°C (-4°F to 158°F)
Humidity	5% to 95% non-condensing
Display	3.5" QVGA 320x240 full color touch screen
Ruggedness	Survives 1.5 m (5 ft) drop to concrete on all sides
Water-resistance rain	Water resistant - may be used in heavy rain
Interfaces	USB 2.0 Host and Client, RJ45 10/100T Ethernet, Bluetooth 2.0
(optional)	
Languages	Multiple languages can be supported

## Ordering Information

Z03-00-002P VePAL MX120, Handheld Ethernet Test Set

### Interfaces/Test Options

499-05-011	MX100 1000Base-T (enable 1000T copper interface rate, no additional item required)
499-05-012	MX100 1000Base-X (enable optical interface on chassis, requires separated SFP)
499-05-013	MX100 Multi Stream Test
499-05-014	MX100 MPLS Tags
499-05-015	MX100 Jitter Measurements
499-05-034	MX120 Fibre Channel Test Suite (Requires Z66-00-008P)
499-05-035	MX120 Dual Port Testing (Applies to Ethernet/GigE only)
499-05-058	MX100 MAC Flooding
499-05-059	MX100 Asymmetric Testing
499-05-093	MX100 VLAN Flooding
Z66-00-008P	MX120 Fibre Channel HW (Required for FC Test Suite)

### SFP Transceiver Options

301-01-001G	850 nm SFP (requires option 499-05-012)
301-01-002G	1310 nm SFP (requires option 499-05-012)
301-01-003G	1550 nm SFP (requires option 499-05-012)

### Additional Options

499-05-001	Web Browser (require advanced IP option)
499-05-002	NetWiz
499-05-003	Remote Control
499-05-007	VoIP Expert
499-05-008	IPTV Expert
Z88-00-001G	WiFi Wiz, incl. USB WiFi Adaptor
Z88-00-001P	VoIP Call Expert, incl. VoIP USB Adaptor & Earplug
Z88-00-005G	Advanced IP, incl. Ethernet Cable

### Recommended Accessories

F05-00-001G	LC-LC-M Patch Cord
F05-00-002G	LC-LC-S Patch Cord
F05-00-003G	LC-SC-M Patch Cord
F05-00-004G	LC-SC-S Patch Cord

### Replacement Items

405-02-001G	Screen Protector
A01-00-001G	AC Adaptor
A02-00-001G	Car Adaptor
B02-03-001G	Battery Pack
C01-00-001G	Carrying Case (Basic)
C02-00-002G	Carrying Pouch
C03-00-001G	Shoulder Strap
F02-00-001G	Ethernet Cable RJ45 to RJ45 2 m (6 ft)
F04-00-001G	Power Cord - US 2 m (6 ft)
F04-00-002G	Power Cord - EU 2 m (6 ft)
F04-00-003G	Power Cord - UK 2 m (6 ft)
Z77-00-001G	Stylus (pack of 5)



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