VePAL TX130M+

DSn/PDH and Ethernet Test Set for Legacy and Synchronized Packet Networks

VeEX™ VePAL TX130M+ is a full-featured Mobile Backhaul test solution supporting legacy PDH/DSn, Carrier Ethernet technologies, and Synchronized Packet networks.

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
- Ethernet port and 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 support and FTP upload capability for test result storage and file transfer respectively
- Maintain instrument software, manage test configurations, process measurement results and generate customer test reports using included ReVeal™ PC software
- Extend field testing time using interchangeable LiIon battery pack/s
- Perform remote testing and monitoring using the remote control option via standard Ethernet interface

Ethernet Features

- Supports 10/100/1000Base-T Copper Ethernet interface
- Supports 1000Base-X & 100FX Optical Ethernet interface
- Supports BERT, Throughput, Loopback, RFC2544

SyncE/IEEE 1588v2

- Fully integrated solution for synchronized packet networks
- Supports IEEE 1588v2/PTP and SyncE/ITU-T G.8261 standards
- Master Clock and Slave clock emulation
- IEEE 1588v2/PTP protocol monitoring and decoding
- IEEE 1588v2/PTP PDV analysis
- Clock recovery and translation from SyncE or IEEE 1588v2/PTP to E1 or DS1 port
- Wander measurement of SyncE clock
- Dual PDH/DSn & Ethernet testing with synchronized clocking

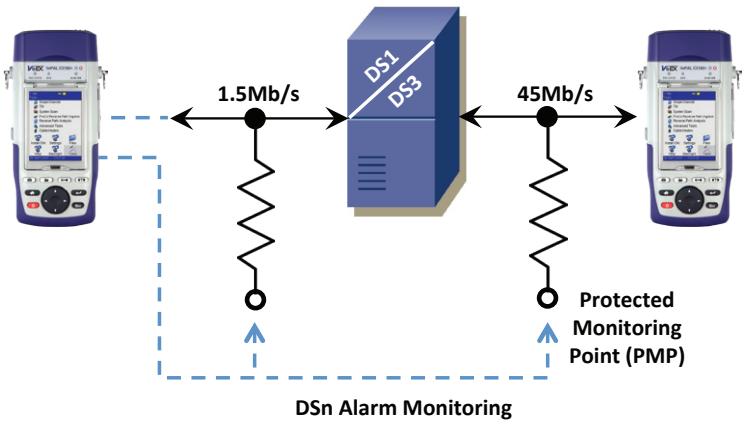
PDH/DSn Features

- Supports DS1, DS3, E1, E2, and E3 bit rates
- Dual Rx BERT on DS1, DS3 and E1 ports
- Full rate DS1, E1 & fractional Nx56 kbps or Nx64 kbps
- Non intrusive Pulse Mask Analysis
- Bit Error and Performance Analysis per ITU/Bellcore standards
- Histogram and Event Analysis for errors and alarms
- VF drop/insert via headset
- VF tone generation and measurement
- ISDN PRI (ANSI and ETSI) call set up and analysis
- Jitter Measurement
- Wander Measurement on E1 & SyncE recovered clock
- Transmit Frequency Offset to stress clock recovery circuits

PDH/DSn

Transmission Testing

The TX130M+ is perfectly suited for both in-service and out-of-service measurements on PDH/DSn legacy TDM networks. Out-of-service testing usually applies to the installation, commissioning and the "bringing into service" measurements needed to qualify a digital transmission link using industry standard test patterns and methods. In-service testing is an important, ongoing maintenance task - field technicians can monitor PCM signals for errors, alarms, level, frequency and pulse shape to prevent service degradation. The transmitter and receiver can be configured independently to perform MUX tests and round trip delay measurements are possible at various points across the network using any of the test interfaces.



Ethernet

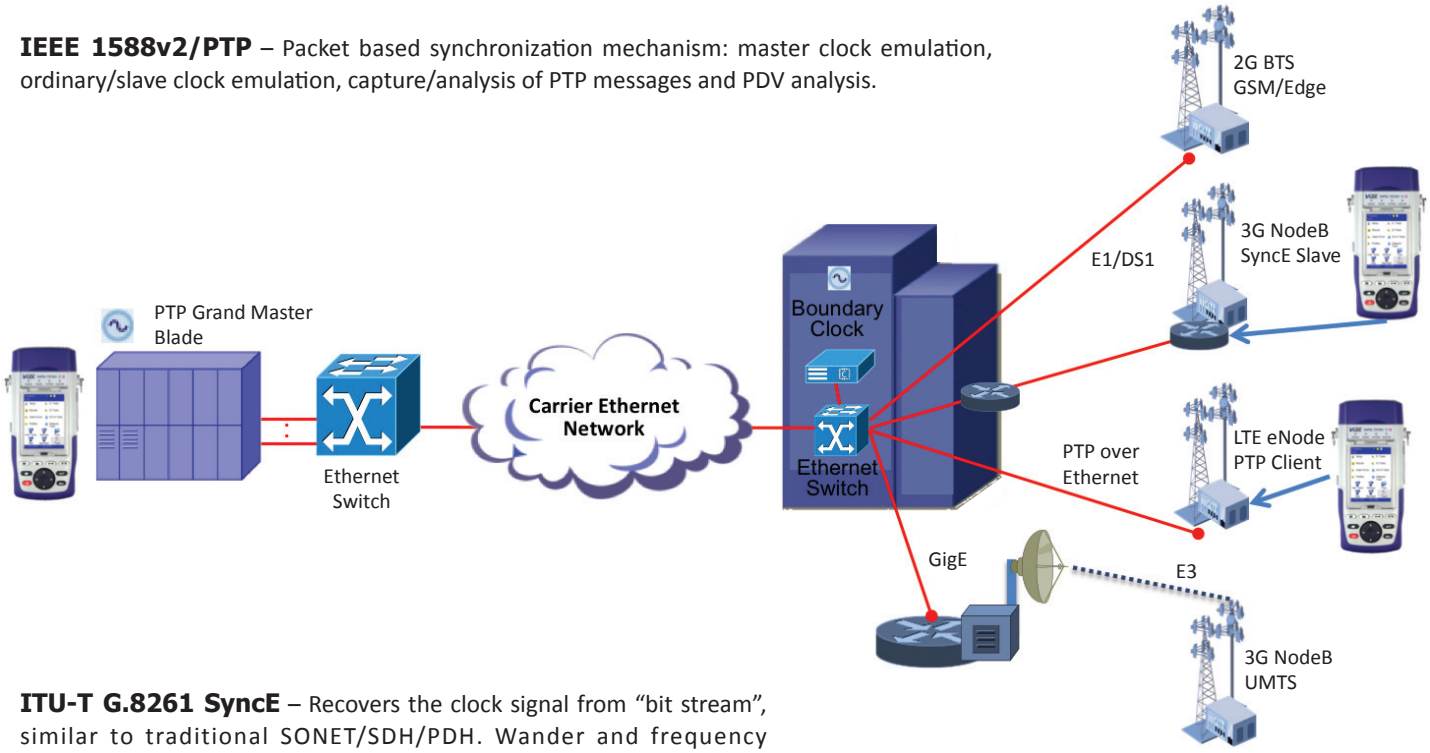
End-to-End Performance Testing

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

Synchronized Network

Synchronized Packet Network and Mobile Backhaul Testing – Mobile operators confronted with the explosive growth of data-centric services driven by 3G and LTE Smartphone applications, are urgently upgrading and migrating traditional TDM backhaul networks to Ethernet/IP packet-based technologies. The TX130M+ tester equipped with a hybrid of interfaces and applications is perfectly equipped to test both PDH/DSn and IP transport over copper and fiber backhaul connections across the Radio Access Network (RAN).

IEEE 1588v2/PTP – Packet based synchronization mechanism: master clock emulation, ordinary/slave clock emulation, capture/analysis of PTP messages and PDV analysis.



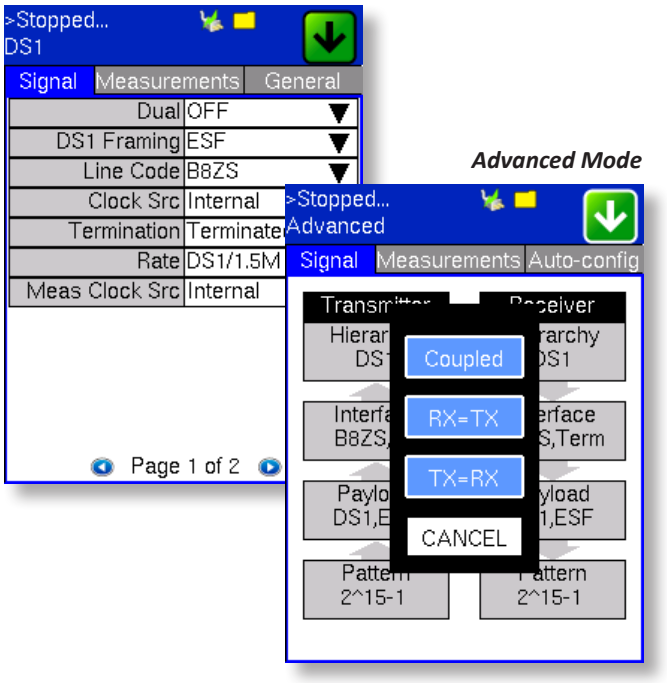
ITU-T G.8261 SyncE – Recovers the clock signal from "bit stream", similar to traditional SONET/SDH/PDH. Wander and frequency measurement of the recovered clock.

PDH/DSn Features

Quick and Easy Graphical Setup

Complex daily tasks are common in today's network environment, so technicians need a tester that is easy to configure and which doesn't require extensive product training beforehand.

The test interface, signal structure, and test pattern setups are structured logically ensuring quick and efficient configuration. An intuitive graphical menu and a list of shortcuts provides fast access to commonly used DSn or PDH test functions boosting productivity.

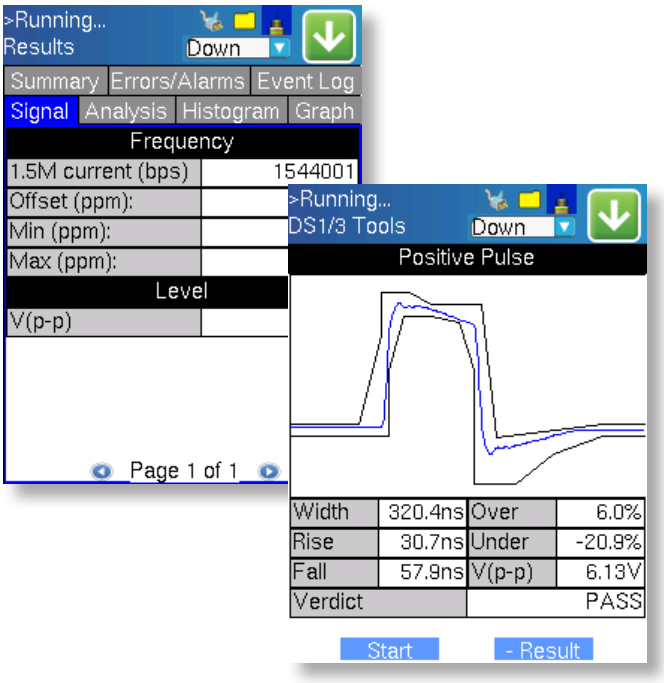


Physical Layer Testing

Prior to performing digital measurements, technicians should confirm analog parameters fall within prescribed limits.

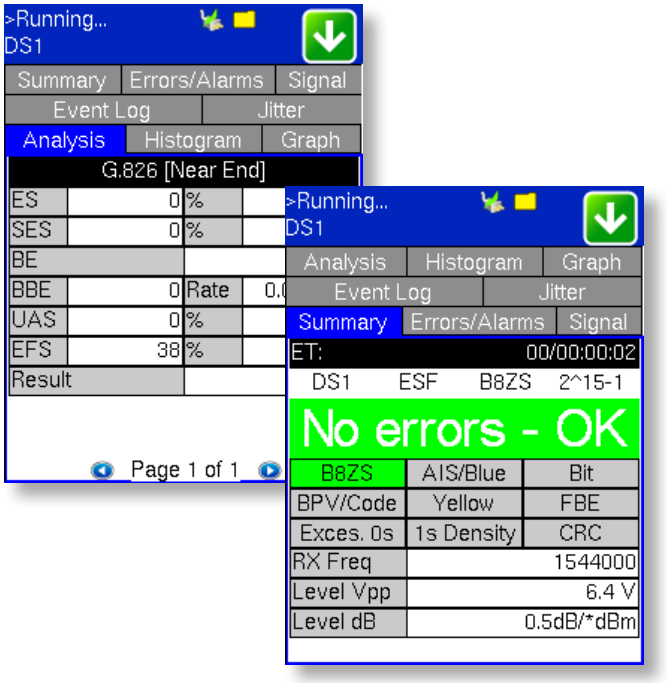
Clock tolerances for each signal hierarchy defined by ITU-T and ANSI recommendations can easily be verified.

Incorrect pulse shape is a result of excessive cable length, impedance mismatch, or poor transmitter design. The G.703 pulse mask option quickly identifies related problems.



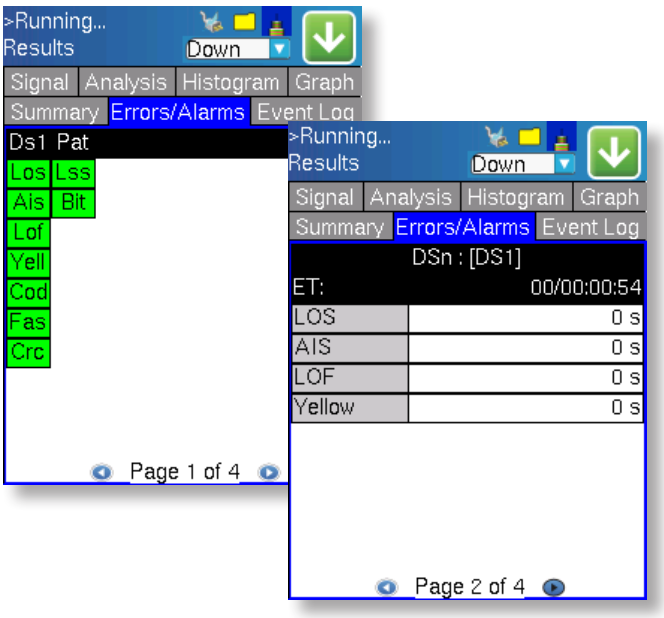
Performance Analysis Summary

The summary screen displays Pass/Fail criteria for each major parameter. A large color coded message informs or alerts the technician of the circuit's status. The Analysis tab reports test performance per ANSI, Bellcore or ITU-T recommendations.



Errors and Alarms

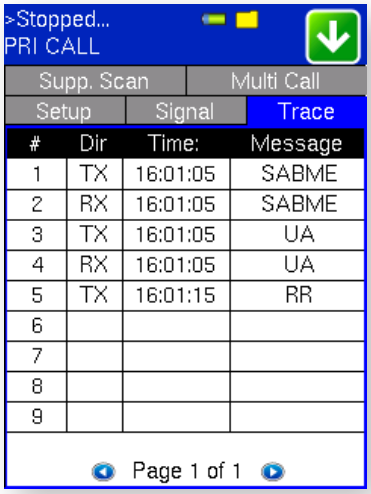
BER testing is commonly used to verify continuity across a digital link, to check for faults, and for performing acceptance tests. Equipped with an extensive range of test patterns including the ability to inject errors in the pattern, framing and alarm bits, the TX130M+ quickly evaluates circuits and examines error responses. Anomalies (errors) and defects (alarms) are clearly displayed and recorded for each network segment, and are logged for further analysis.



ISDN Testing

The ISDN option provides key functionality necessary for testing and troubleshooting DS1 or E1 Primary Rate connections. Operating in TE or NT modes, the unit is able to setup and receive ISDN calls with user-defined parameters including call control protocol, called number and related facilities.

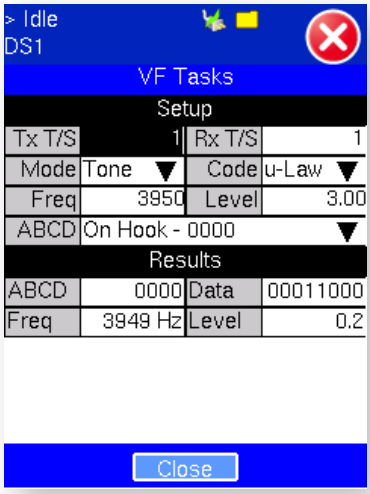
Protocol functions feature detailed signaling statistics, message monitoring and decode, and complete result presentation. With these capabilities, analysis of international and national ISDN, and other access protocols is possible.



VF Testing

The Voice Frequency (VF) option is a basic diagnostic tool to install, verify and troubleshoot voice circuits. Digital to analog conversion tests are performed by inserting/measuring tones with user defined frequency and level on selected sub-rate channels.

A microphone/headset adaptor enables Talk/listen capability on a selected timeslot whilst a powerful function allows VF decoding at all DSn/PDH rates.



Jitter Measurements

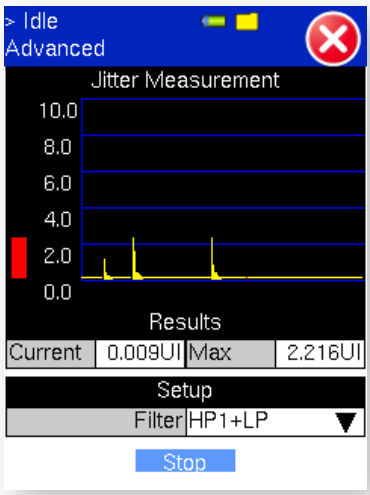
Data integrity in plesiochronous networks depends largely on the phase stability of clock and data signals, therefore excessive jitter can cause network outages. Because BER testing is the common method to diagnose network problems in the field, results often mislead the technician because only the effect of a problem and not the actual cause is reported. Ultimately, this makes fault identification more difficult, time consuming, and expensive.

The jitter software option of the TX130M+ uses advanced digital measurement techniques for measuring intrinsic jitter, allowing technicians to easily determine when jitter is the source of errors.

Jitter Metrics

Output jitter performance mandated by ITU-T and Telcordia standards is evaluated by measuring the recovered clock of the incoming signal (DS1, DS3, E1, E3) traversing the network.

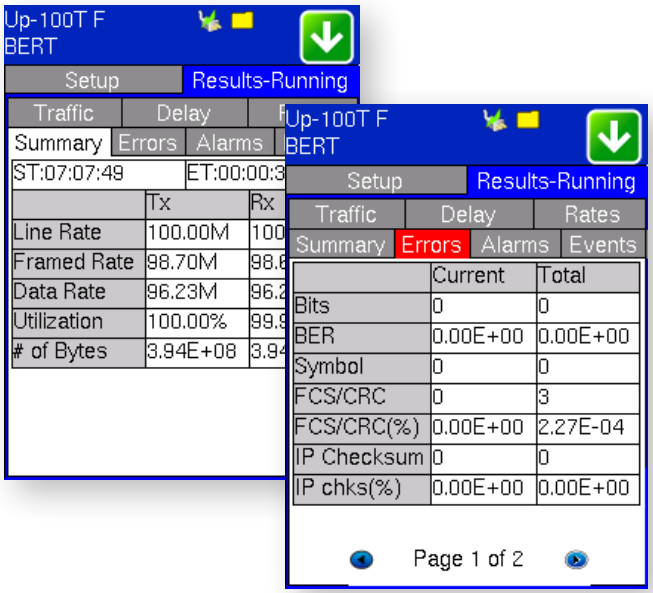
While the test duration is not defined in the mentioned standards, a measurement period time of 1 minute is recommended. Specified in unit intervals (UI), the maximum Peak-to-Peak Jitter is the most important parameter because Max values are indicative of performance, as these extremes generally cause errors. While jitter is defined as any phase variations above 10Hz, the incoming signal must be filtered in order to measure jitter – the user is therefore able to select between Wide band and High band filters to adjust the measurement bandwidth as required.



Ethernet Features

BERT

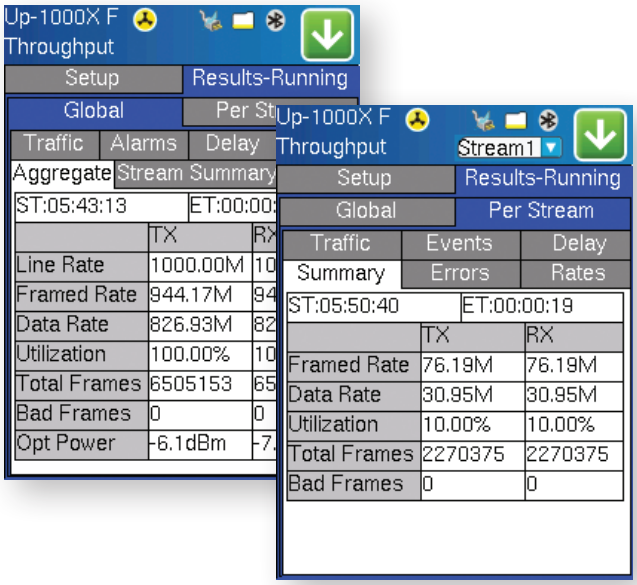
Layer 1, 2, 3, and Layer 4 BER testing is supported. The BER test can be configured to use regular PRBS test patterns, stress patterns or user defined test patterns to simulate various conditions. All patterns are encapsulated into an Ethernet frame to verify bit-per-bit performance of circuit under test.



One traffic stream is transmitted across the network under test and bit-per-bit error checking is then 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 or intelligent loopback device in Smart Loop or in Peer-to-Peer mode , for example, a low cost VeEX MLX100 loopback device.

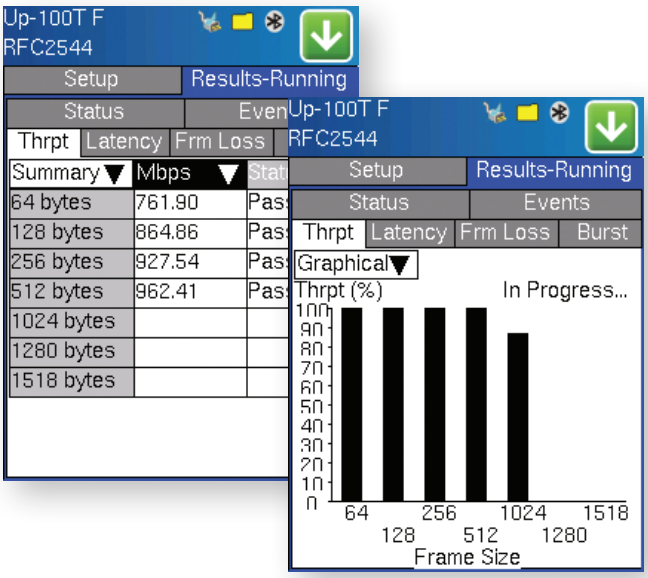
Multiple Streams Generation - Throughput Test

Up to eight 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. 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.



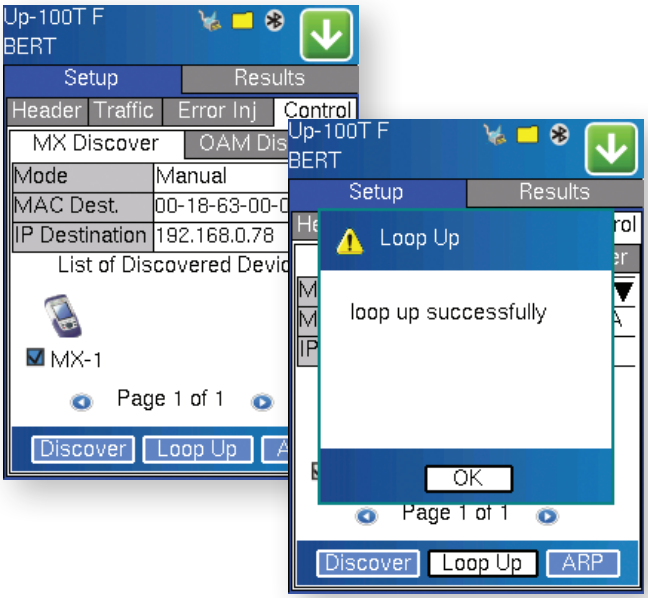
RFC2544 Compliance Testing

Performs the RFC2544 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.



Intelligent Network/Device Discovery

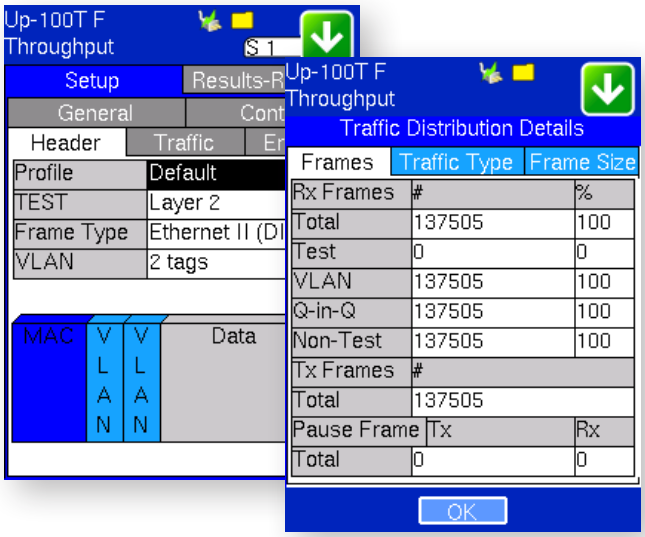
Easily discover and select another TX130M+, MX100+ tester or MLX100 on the network under test for loopback testing applications. The local device will control the operation of the far end device, in either loopback or peer-to-peer mode. This feature greatly simplifies field testing since there is no need for a second technician to be at the far end configuring the test partner device.



Ethernet Features *cont'd*

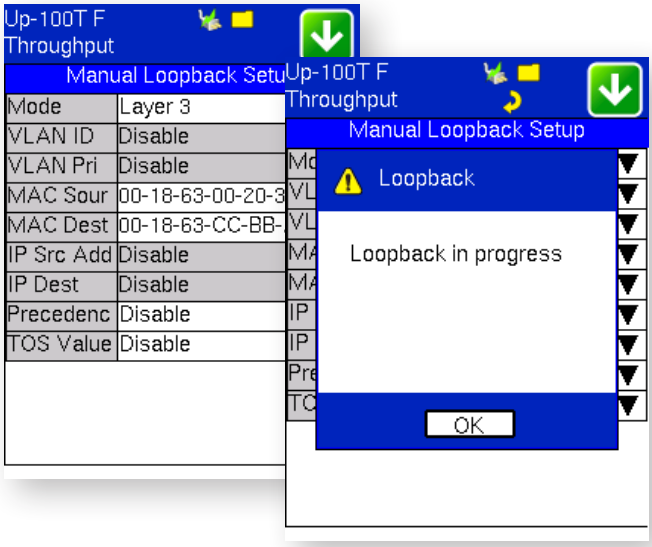
Q-in-Q (VLAN stacking)

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



Smart Loopbacks

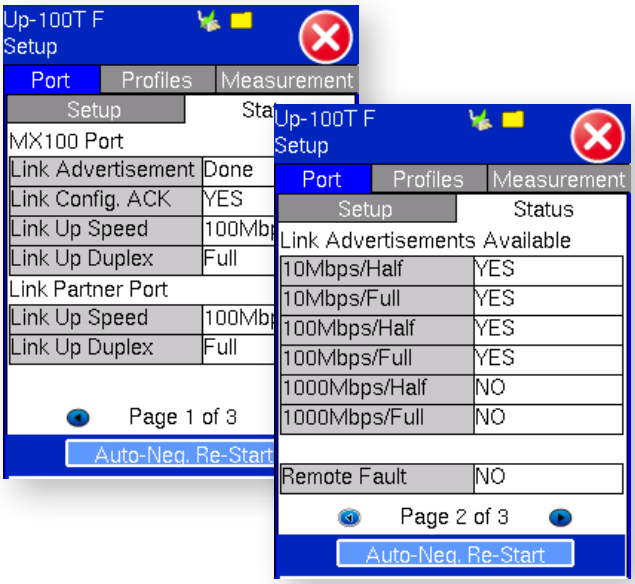
Four modes are available for looping back test traffic. At Layer 1, all incoming traffic is looped back unaltered. For Layer 2, all incoming unicast traffic is looped back with the MAC source and destination addresses swapped. For Layer 3, all incoming unicast traffic is looped back with the MAC and IP source and destination addresses swapped, and for Layer 4, all incoming unicast traffic is looped back with the MAC, IP, and UDP/TCP ports swapped.



Test Port Status

Auto-negotiation is a function that enables Fast Ethernet devices to automatically exchange information over a link about speed and duplex abilities. A common cause of performance issues on 10/100T Ethernet links occurs when one port on the link operates at half-duplex while the other port operates at full-duplex.

The port status feature of the TX130M+ reports the auto-negotiation and link advertisement parameters of both test set and link partner, which helps to reduce many link performance-related support calls.



MPLS Measurements

Multiple Protocol Label Switching (MPLS) is a technology that allows for a more efficient routing of Ethernet/IP packets via the use of MPLS routers in the network. MPLS labels reside between the MAC (Layer 2) and IP layers (Layer 3). Up to three MPLS tags can be configured in the traffic stream with user configurable Label, CoS, and TTL fields.

Delay and Jitter Measurements

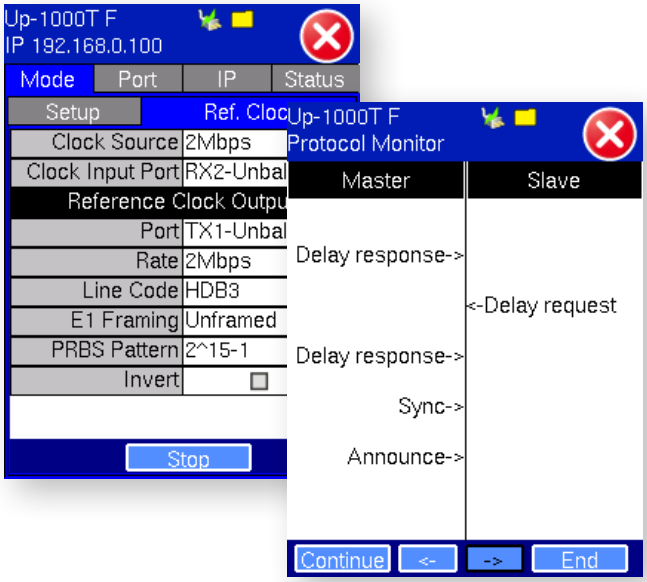
Frame delay and Jitter measurements are supported. Jitter measurements are based on RFC3393 which describes the industry recognized Inter Packet Delay Variation (IPDV) method. Jitter measurements are performed on the test traffic during BER tests or throughput tests.

Synchronized Network Features

IEEE 1588v2/PTP Master Clock Emulation Mode

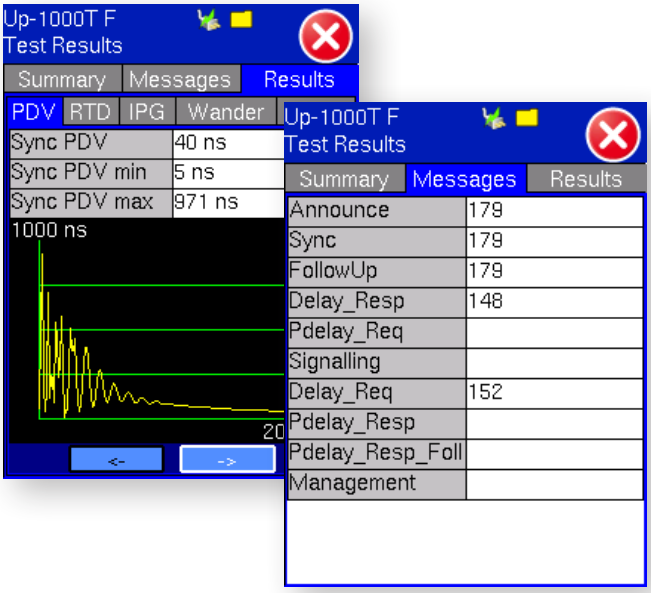
Master Clock emulation allows network synchronization properties to be verified prior to service delivery or during routine maintenance tasks. Using the internal precision clock or an external 1.544Mbps, 2.048Mbps, 1.544MHz, 2.048MHz, 10MHz, 25MHz or 125MHz signal as the reference clock, the unit generates the PTP messages needed by a Slave device to synchronize.

The reference clock can further be applied to an outgoing 1.544Mbps or 2.048Mbps signal via balanced RJ45 or bantam interfaces or alternatively a 1.544Mbps, 2.048Mbps, 10MHz, 25MHz, or 125MHz signal can be generated on the unbalanced BNC port for other synchronization requirements. In this mode, the unit can be programmed to generate PTP messages at different rates to reduce or introduce network congestion.



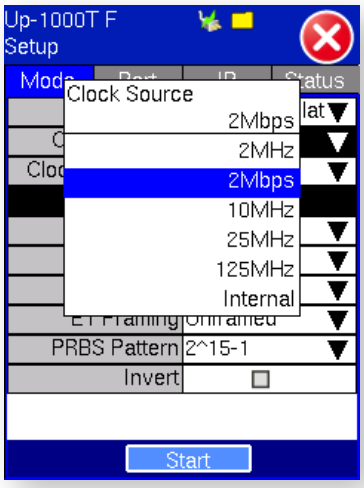
IEEE 1588v2/PTP Slave Clock Emulation Mode

Emulates a Slave Clock device where synchronized clock is extracted using the PTP procedure. The extracted clock can be applied to an outgoing 1.544Mbps or 2.048Mbps signal on the DS1/E1 balanced test port or a 1.544Mbps, 2.048Mbps, 10MHz, 25MHz or 125MHz reference signal can be made available on the unbalanced BNC port. After an IP layer connection is achieved, clock identities are exchanged between the test unit and the far end Master clock device. The PTP messages can be monitored and decoded. In the Summary tab, an overview of the Total, CRC, lost, error, out of order and duplicated messages are displayed. The Message tab provides a concise record of all PTP message related items, while the Results tab provides detailed statistics and values for Packet Delay Variation (PDV), Round Trip Delay (RTD) and Inter-Packet Gap (IPG) along with frequency, max frequency and min frequency are measured.



ITU-T G.8261 SyncE Master Clock Emulation Mode

The reference clock can be based on the internal precision clock or from an external clock source at 1.544Mbps, 2.048Mbps, 1.544MHz, 2.048MHz, 10MHz, 25MHz or 125MHz rate. The output reference clock can be synchronized to 1.544Mbps or 2.048Mbps and provided at the DS1/E1 port or a 1.544MHz, 2.048MHz, 10MHz, 25MHz, and 125MHz clock signal can be made available on the unbalanced BNC port.



ITU-T G.8261 SyncE Slave Clock Emulation Mode

Extracts clock information from the incoming Ethernet signal at the 10/100/1000-T, 100-FX or 1000-X interface. The recovered reference clock can be applied to a 1.544Mbps or 2.048Mbps signal at the DS1/E1 port or a 1.544MHz, 2.048MHz, 10MHz, 25MHz, or 125MHz clock signal can be made available on the unbalanced BNC port. Clock and Wander are measured against a precise and stable 2.048Mbps clock.

ITU-T G.8261 SyncE/IEEE 1588v2/PTP "SYNC" Mode

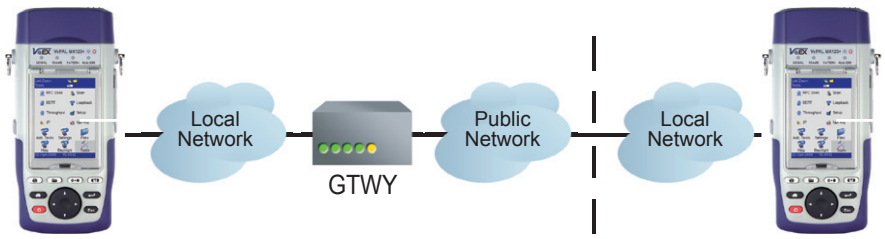
This unique SYNC mode allows the clocks on both PDH/DSn and Ethernet interfaces to be synchronized, so that simultaneous BERT measurements can be performed. This integrated approach eliminates complex setups typical of using multiple testers and drastically reduces testing time of hybrid Synchronized Packet and legacy TDM services.

IP Testing

Used initially only for Local Area Network (LAN) connectivity within the enterprise, the Internet Protocol (IP) has quickly grown to be the de-facto standard for multi-service network transport.

For Telco and IT technicians, it's no longer enough to validate equipment at the physical interface or connection protocol level only, so IP testing has become a routine task during service installation and restoration.

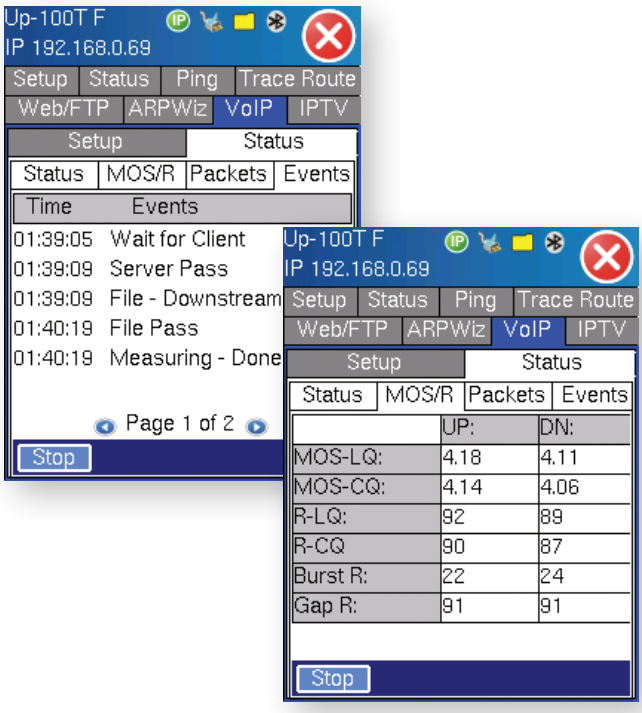
The TX130M+ supports an array of IP test functions over the 10/100/1000BaseT, 100-FX and 1000-X port including Ping, Trace Route and Triple Play measurement tasks. Web browsing, FTP throughput, and VoIP tests can be performed at various points in the network to ensure customer satisfaction.



VoIP Testing

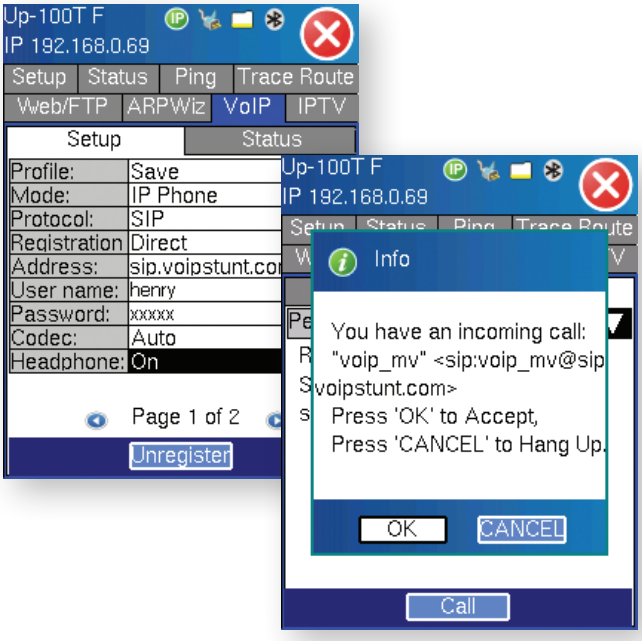
Take advantage of the three software options offering different test methods to verify and provision your VoIP network. Testing can be performed over any of the Ethernet test ports.

VoIP Check – Simulates a VoIP call to the nearest router and measures the round trip MOS score and related VoIP parameters.



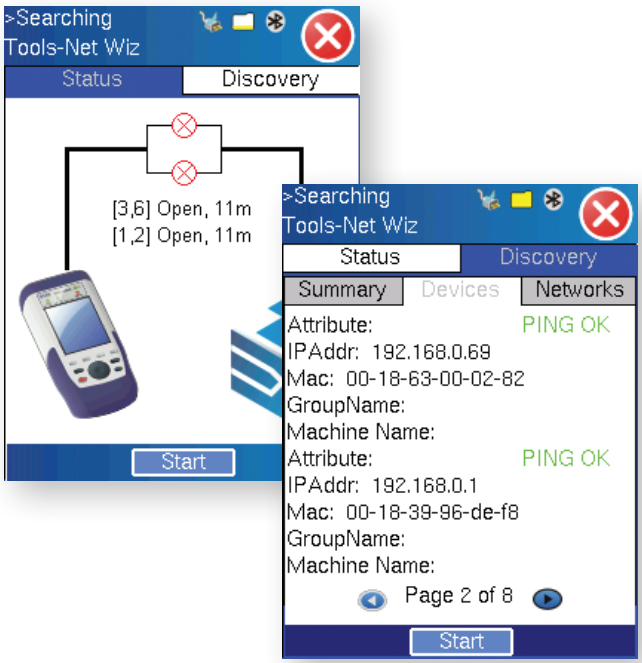
VoIP Expert – Generates industry standard wave files to verify MOS and R-Factor values of upstream and downstream paths and includes QoS measurements such as packet jitter, packet loss, and delay. Compatible with all VeEX testers including VX1000 VoIP server software.

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 is made possible using the Telchemy test method.



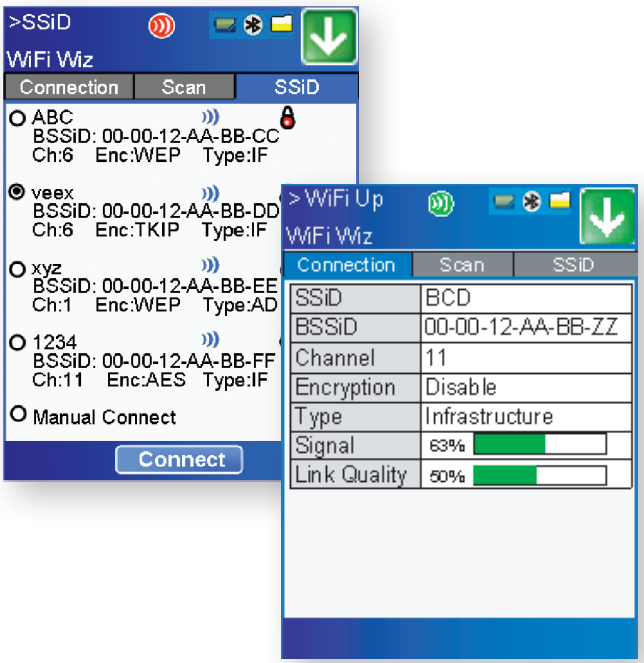
Net Wiz

Ethernet network installation is 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.



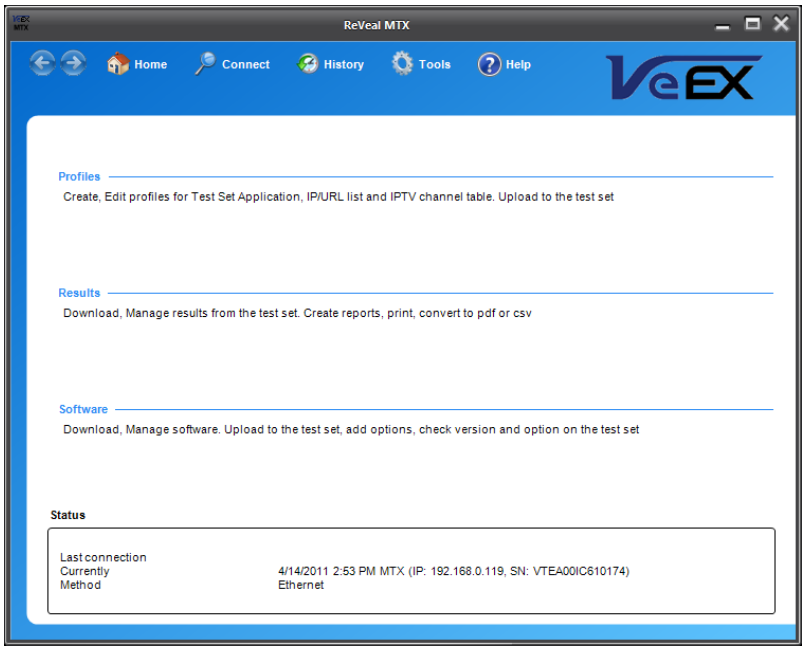
WiFi Wiz

All VePAL products adopt a USB WiFi adaptor to make 802.11 b/g/n wireless installations a simple task. Scan for available networks or perform signal strength and quality measurements to determine the best location for a new wireless access point. The IP Ping capability ensures the wireless network is properly installed and configured. A full suite of IP testing features is supported.



ReVeal MTX PC Tool

A software package shipped standard with each test set. Test and other installation profiles can be created and edited on a PC for upload to the test set via LAN connection. Test results can be downloaded and saved to a PC, where test data management and report generation can be performed. Users are able to check and upgrade their test sets without having to return the unit to the supplier, thus reducing downtime.



DSn/PDH

Electrical Interfaces

Dual Bantam (100Ω balanced) or dual RJ-45 (100/120Ω balanced)
Rates and line code
- 1.544 Mbps AMI & B8ZS
- 2.048 Mbps HDB3 & AMI

BNC (75Ω unbalanced) (2 Rx and 1Tx)
Rates and line code
- 2.048 Mbps HDB3 & AMI
- 44.736 Mbps B3ZS
- 8.448 Mbps HDB3
- 34.368 Mbps HDB3

Compliant to ITU-T G.703, G.823, G.824, G.772 and ANSI T1.102 recommendations where applicable
Clock recovery (pulling range) per ITU-T G.703
Receiver Sensitivity
For 1.544 Mbps (DS1)
- Terminate: ≤ 6dB (cable loss)
- Monitor (PMP): ≤ 26dB (20dB resistive, 6dB cable loss)
- Bridge: ≤ 6dB (cable loss)

For 44.736 Mbps (DS3)
- Terminate: ≤ 12dB (cable loss)
- Monitor (PMP): ≤ 26dB (20dB resistive, 6dB cable loss)

For 2.048 Mbps (E1)
- Terminate: ≤ 6dB (cable loss)
- Monitor (PMP): ≤ 26dB (20dB resistive, 6dB cable loss)
- Bridge mode: ≤ 6dB (cable loss)

For 8.448 Mbps (E2)
- Terminate: ≤ 6dB (cable loss)
- Monitor (PMP): ≤ 26dB (20dB resistive, 6dB cable loss)

For 34.368 Mbps (E3)
- Terminate: ≤ 6dB (cable loss)
- Monitor (PMP): ≤ 26dB (20dB resistive, 6dB cable loss)

Clock Synchronization

Internal: ± 3.5 ppm stability per ITU-T G.812
Recovered: from the incoming signal
External reference via RX2 balanced and unbalanced
- Signal: 1.544 Mbps, 2.048 Mbps

External reference via RX2 unbalanced
- Signal: 1.544 MHz, 2.048 MHz

Tx Frequency Offset
- Up to 50 ppm in steps of 0.1 ppm for DS1, E2, E3, and DS3
- Up to 25,000 ppm in steps of 0.1 ppm for E1 interface

Functions

Signal Structure

1.544 Mbps (DS1)
- Unframed or Framed SF (D4), ESF per ANSI and Telcordia standards where applicable
- Test signal in N x 64 kbps, N x 56 kbps where N=1 to 24

2.048 Mbps (E1)
- Unframed or Framed with/without CRC per ITU-T G.704 (PCM30, PCM30C, PCM31, PCM31C)
- Test signal in N/M x 64 kbps where N=1 to 30

8.448 Mbps (E2)
- Unframed or Framed according to ITU-T G.742

34.368 Mbps (E3)
- Unframed or Framed according to ITU-T G.751

44.736 Mbps (DS3)
- Unframed or Framed M13 and C-Bit Parity

Patterns

The following test patterns can be generated
- PRBS: 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{31}-1: normal or inverted
- Fixed: 0000, 1111, 1010, 1000 and 1100
- 10 User programmable words up to 32 bits each

Errors

Insertion
- 1.544 Mbps (DS1): Code, FAS, Bit, Frame, CRC
- 2.048 Mbps (E1): Code, FAS, CRC, EBIT, Bit errors
- 8.448 Mbps (E2): Code, FAS
- 34.368 Mbps (E3): Code, FAS
- 44.736 Mbps (DS3): Code, FAS, MFAS, P/C-Parity, Bit errors
- Single or continuous rate (1 x 10^{-3} to 5 x 10^{-9})

Measurement
- 1.544 Mbps (DS1): Code, FAS, Bit, Frame, CRC
- 2.048 Mbps (E1): Code, FAS, CRC, EBIT and Bit errors
- 8.448 Mbps (E2): Code, FAS, Bit errors
- 34.368 Mbps (E3): Code, FAS, Bit errors
- 44.736 Mbps (DS3): Code, FAS, MFAS, P/C-Parity, Bit errors

Alarms

Generation
- 1.544 Mbps (DS1): AIS, yellow, idle, LOS, LOF
- 2.048 Mbps (E1): LOS, AIS, LOF, LOMF, RDI
- 8.448 Mbps (E2): LOS, AIS, LOF, RDI
- 34.368 Mbps (E3): LOS, AIS, LOF, RDI
- 44.736 Mbps (DS3): LOS, LOF, OOF, AIS, Parity
- Continuous or timed

Measurement
- 1.544 Mbps (DS1): LOS, AIS, LOF, AIS, yellow, idle and LSS
- 44.736 Mbps (DS3): LOS, AIS, LOF, Parity and LSS
- E1, E2, E3: LOS, AIS, LOF, OOF, RDI and LSS (where applicable)

Measurement Functions

Test Results

Error count, ES, %ES, SES, %SES, UAS, %UAS, EFS, %EFS, AS, %AS, and rate for all events: errors and alarms

Performance Analysis

Measurements according to:
- ITU-T G.821: ES, EFS, SES and UAS with HRP 1% to 100%
- ITU-T G.826: EB, BBE, ES, EFS, SES, UAS; HRP of 1% to 100%
- In Service Measurement (ISM) using FAS, CRC or Code (DS1 or E1)
- Out of Service measurement (OOS) using bit errors (Test Sequence Error)
- ITU-T M.2100: ES, EFS, SES, UAS with HRP 1% to 100%
- User defined thresholds for Maintenance (MTCE) and Bringing into Service (BIS) objectives including In-service measurements on both near and far ends of path using TSE

Other Functions

Auto Configuration: Auto detection of line coding, framing, test pattern
Frequency Measurement (Unit/Resolution): Hz & ppm/1Hz
Round Trip Delay (Range/Resolution): 1µS to 10 seconds/ 1µs or 1 U.I.
Event Logging: Date and time stamped events in tabular format
Histograms: Display of Errors and Alarms versus time
LED Indicators: Fixed LEDs for signal and error/alarm
E1 APS (Triggers): AIS, LOS, LOF

Ethernet

Electrical and Optical Interfaces

Single RJ45 10/100/1000 Base-T Port
Single SFP 100FX/1000 Base-X Port
IEEE 802.3 compliant

Ethernet Features

Auto Negotiation
Full and Half Duplex
Flow Control

Modes of Operation

Terminate, Monitor, Loopback

Traffic Generation

IEEE 802.3 and Ethernet II (DIX) frames
Configurable MAC, Ethernet Type, VLAN, MPLS, IP, and UDP header fields
Constant, Ramp, and Burst traffic profiles with configurable bandwidth % utilization
Jumbo Frame Support (10,000 bytes)
Fixed and uniform frame size generation
Traffic prioritization via VLAN priority field, MPLS CoS field and the IP TOS/DSCP fields
Up to 3 VLAN and MPLS tags can be added to each user configured traffic stream

RFC2544 Compliance Testing

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

Bit Error Rate Testing

PRBS Patterns: 2^{31}-1, 2^{23}-1, 2^{20}-1, 2^{15}-1, 2^{11}-1; normal and inverted
Layer 1 Framed: CRPAT, CSPAT, CJPAT
Error Injection: Bit, CRC, Symbol, IP Checksum
One configurable stream with one fixed frame size

Multiple Streams Throughput Testing

Up to eight 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 may be configured for different streams
Different frame sizes are user configurable per stream

Smart Loop

Layer 1 loopback: loops back all incoming traffic
Layer 2, 3 and 4 loopback: loops back all incoming unicast traffic and drops all incoming multicast and broadcast traffic

Key Measurements

LED indicators for signal and error/alarm
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/jitter (per RFC3393)

Synchronization

Modes of Operation

Master clock emulation
Slave clock emulation
Master clock sync
Slave clock sync

IEEE 1588v2/PTP

Event Messages
- Sync
- Delay Request
- Pdelay Request/Response: to measure link delay between two clock ports

General Messages
- Announce
- Follow Up
- Delay response
- Pdelay Response follow-up
- Management Signaling

Measurements
- PDV (Packet Delay Variation)
- RTD (Round Trip Delay)
- IPG (Inter-Packet Gap)
- Asymmetrical variation
- Message statistics: Event, General, CRC error, Loss, Duplicate, Out of Order, and Unidentified
- PTP message capture and decode
- Frequency measurement

ITU-T G.8261/Sync-E

Wander measurement on the recovered clock

Synchronized Clock Interface

Input
- RX-2 Balanced: 1.544 Mbps or 2.048 Mbps
- RX-2 Unbalanced (BNC, 75Ω): 1.544 Mbps, 2.048 Mbps, 1.544MHz, 2.048MHz, 10MHz, 25MHz, 125MHz

Output
- RX-2 Balanced: 1.544 Mbps or 2.048 Mbps
- RX-2 Unbalanced (BNC, 75Ω): 1.544 Mbps, 2.048 Mbps, 1.544MHz, 2.048MHz, 10MHz, 25MHz, 125MHz

Options

Pulse Mask Analysis

DS3/DS1

- Bit rates: 1.544 Mbps (DS1) and 44.736 Mbps (DS3)
- Conformance Masks: ITU-T G.703, ANSI T1.102, T1.403, T1.404 where applicable

PDH

- Bit rates: 2.048 Mbps (E1) and 34.368 Mbps (E3)
- Conformance Mask: ITU-T G.703

Mode: Non-Intrusive
Display: Pulse shape with Conformance mask verification
Parameters: Width, Rise/Fall time, Overshoot/Undershoot

VF Measurement

VF drop/insert via Headset
ABCD bits monitor & transmit in selected timeslot channel
Programmable ABCD states for IDLE, SEIZE, USER for E1 and ON-Hook, OFF-Hook, WINK, USER for DS1
Tone generation: 1Hz, 1 dB resolution

- Frequency (Hz): 50 to 3950 Hz
- Level (dBm): +3 to -60 dBmV

ISDN PRI Testing

NT and TE emulation
Place/receive voice and data calls
Via Headset for B-channel talk/listen
Protocols

- DS1: National ISDN, AT&T Custom, and Northern Telecom DMS compatible
- E1: ETSI (Euro-ISDN)

D-channel monitor with full decode: Layer 2 (Q.921) and Layer 3 (Q.931)
Supports multirate N x 64k data call
Supplementary Services Test: Automatically tests the provisioning of the following: CLIP, CLIR, COLP, CFU, CFB, CFNR, SUB, MSN, DDI, HOLD, UUS, TP, AOC-S, AOCD, AOCE, MCID, CUG

Jitter Measurement

Test rates: DS1, DS3, E1, E3
Range: Per ITU-T 0.171
PASS/FAIL Threshold: Per ITU-T G.823

Wander Measurement

Test rate: E1
Measurements: +TIE, -TIE, MTIE and current MTIE

IP Testing

Ping, Trace Route, ARP, FTP/Web tests, Web Browser

VoIP Testing

VoIP Check

- Simulates VoIP call to the nearest router
- Round Trip MOS score

VoIP Expert

- MOS and R-factor measurement
- Packet Statistics: packet loss, jitter, delay

VoIP Call Expert

- VoIP call setup with VoIP USB adaptor
- Supports SIP and H.323 protocols
- Codec: G.711U, G.711A, Optional G.723, G.729
- MOS and R-factor measurement
- Packet Statistics: packet loss, jitter, delay

NetWiz

Available on 10/100/1000Base-T test port
Detect distance to open/short, wire cross, impedance mismatch
Network device discovery; Auto Ping verification
TDR accuracy: ± 3 meters

WiFi Wiz

USB Wi-Fi adapter 802.11b, 802.11g, 802.11n
Access Points scan signal level and link quality measurement
WEP/WPA1/WPA2 encryption
IP Connectivity test (Ping, trace route, Web/FTP test, Web browser, VoIP) (requires additional options)

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 lb)
Battery	LiIon smart battery, 2600 mAh 10.8VDC Battery operating time: 2-6 hours, application dependent
AC Adaptor	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 color touch-screen
Ruggedness	Survives 1.5 m (5 ft) drop to concrete on all sides
Interfaces	USB 2.0, RJ45 10/100-T Ethernet
Languages	Multiple languages supported

Ordering Information

Z04-00-011P	VePAL TX130M+ Handheld PDH/DSn & Ethernet Test Set – Built-in 10/100/1000Base-T/RJ45 and 100FX/1000Base-X/SFP test ports – 10/100-T testing included – 1000-T, 100-FX, 1000-X and SFPs are optional

PDH/DSn Hardware Options

(must select one)

Z66-00-071P	E1/DS1 Hardware (RJ45 Interface) with E1 Testing (499-05-155) software included
Z66-00-072P	E1/DS1 Hardware (Bantam Interface) with DS1 Testing (499-05-143) software included
Z66-00-073P	E3/DS3 Hardware (RJ45 Interface) with E1/E3 Testing (499-05-155/147) software included
Z66-00-074P	E3/DS3 Hardware (Bantam Interface) with DS1/DS3 Testing (499-05-143/145) software included
Z66-00-075P	Ethernet Hardware only with 10/100T interfaces enabled (PDH/DSn Hardware not installed)

PDH/DSn Software Options

(requires PDH/DSn Hardware option: Z66-00-071P/Z66-00-072P or Z66-00-073P/Z66-00-074P)

499-05-105	TX130M+ E1 Wander Measurement
499-05-142	2Mbps Pulse Mask Analysis
499-05-143	DS1 Testing (1.5Mbps)
499-05-144	1.5Mbps Pulse Mask Analysis
499-05-145	DS3 Testing (45Mbps)
499-05-146	DS3 Pulse Mask Analysis (45Mbps)
499-05-147	E3 Testing (34Mbps)
499-05-148	E3 Pulse Mask Analysis (34Mbps)
499-05-149	DS1/E1 Jitter Measurement
499-05-152	DS3/E3 Jitter Measurement
499-05-155	E1 Testing (2Mbps)
499-05-176	E1 APS
Z88-00-008G	ISDN PRI (ANSI, ETSI) Call Setup, incl. Earpiece
Z88-00-009G	VF Measurements, incl. Earpiece

Ethernet Software Options

499-05-014	MPLS Tags
499-05-015	Jitter Measurements
499-05-058	MAC Flooding
499-05-059	Asymmetric Testing
499-05-093	VLAN Flooding
499-05-106	1000-T Ethernet BERT, Throughput, RFC2544
499-05-113	100-FX, 1000-X Ethernet BERT, Throughput, RFC2544
499-05-114	Multi Stream Test

SyncE Hardware Option

(requires PDH/DSn Hardware option: Z66-00-071P/Z66-00-072P or Z66-00-073P/Z66-00-074P)

Z66-00-020G	SyncE Master and Slave Emulation

SyncE and IEEE 1588v2 Software Options

(requires PDH/DSn Hardware option: Z66-00-071P/Z66-00-072P or Z66-00-073P/Z66-00-074P)

499-05-179	IEEE 1588v2 IPv4 Slave Clock Emulation
499-05-180	IEEE 1588v2 IPv4 Master Clock Emulation
499-05-181	SyncE Wander measurement
499-05-182*	IPv6 IEEE 1588v2
499-05-183	IEEE 1588v2 Protocol Decode
499-05-184	IEEE 1588v2 Measurements (PDV, etc.)

Additional Options

(via USB or 10/100Base-T Management Ports)

499-05-003	Remote Control
499-05-175	USB Bluetooth Dialing and File Transfer Support (USB Bluetooth adaptor not included)
Z88-00-001G	WiFi Wiz, incl. USB WiFi Adaptor

(via 10/100/1000Base-T or 100-FX/1000Base-X Ports)

499-05-001	Web Browser (requires Advanced IP option)
499-05-002	NetWiz
499-05-095	VoIP G.723 Codec
499-05-096	VoIP G.729 Codec
499-05-102	VoIP Check
Z33-00-001	VoIP Expert, incl. VoIP Check option
Z88-00-001P	VoIP Call Expert, incl. VoIP USB Adaptor & Earpiece
Z88-00-005G	Advanced IP, incl. Ethernet Cable

Recommended Accessories

301-01-001G	850nm SX (550m) SFP - 1GE, 1G/2G FC
301-01-002G	1310nm LX (10km) SFP - 1GE, 1G/2G FC
301-01-003G	1550nm ZX (90km) SFP - 1GE, 1G/2G FC
301-01-013G	1310nm 100FX MM (2km) SFP - 100Mbps
301-01-014G	1310nm 100FX SM (15km) SFP - 100Mbps
A02-00-001G	Car Adaptor
B02-06-002G	Extended Battery Pack
C02-00-002G	Carrying Pouch for V100 w/Standard Battery Pack
D09-00-009	TX130M+ Test Report
F02-00-009G	RJ48 to 3-Pin Banana Test Cable, 2 m
F02-00-010G	BNC to BNC Test Cable, 2 m
F02-00-011G	Bantam to Bantam Test Cable, 2 m
F02-00-022G	RJ48 to Bantam Test Cable, 2 m
F02-00-023G	RJ48 to RJ48 Test Cable, 2 m
F02-00-027G	RJ48 to 4 Alligator Clip Test Cable, 2 m
Z77-00-006G	LCD Protective Film (Pack of 5)
Z99-99-007G	USB Bluetooth Adaptor

**Check with factory for availability.*

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