Ether10.Genius **Rubidium** power

in Test we Trust

ALBEDO Ether10.Genius is a multi-technology tester equipped with all the features you need to install and maintain telecom networks based on 10Gigabit Ethernet, Gigabit Ethernet, 1000/100/10BASE-T, SyncE, T1, E1, Datacom, PTP and C37.94.

The instrument is suitable for measuring legacy and next-gen networks because it has the most common access, backhaul and synchronization interfaces. Field engineers do not need to carry any more several testers or multiple modules to turn up and monitor telecom infrastructures.

Cloud testing

Ether10.Genius is equipped with all of the features you may need or imagine such including BER, RFC2544, eSAM, Multistream, MPLS, Jitter, Wander, etc. to permit the verification of the transmission layer in those terms of performance and quality required to support audio, video or critical data applications.

Built-in **Rubidium / GPS** clock

The integrated GPS/GLONASS receiver allows easy connection and use while fast acquisitions and excellent accuracy minimizing the time impairments of external devices. This an ideal solution to synchronize thanks to top performance in holdover mode while top accuracy in a real hand-held battery operated IP tester.

Mobile telecom

Operators have different synchronization requirements. Some of them running 3G may still maintain legacy E1 solely for syntonization. Those focused on LTE, see the impending need for distributing phase-synchronization and also want to avoid having to install GPS receivers at every single cell site. Alternatives are SyncE and PTP that simplify the architecture and can be turned-up with ALBEDO testers.

"Ideal tool to install LTE / Mobile backhaul by means of Master/Slave PTP emulation TE, Wander, PDV test at all interfaces from 10GbE to T1"

Power Utilities

Power utility companies must protect high voltage lines and monitor them constantly. Communication between power substations using the standard C37.94 is fundamental order to ensure correct operation while controlling every single alarm and failure. With Ether10.Genius a fully integrated test is possible.

ALBEDO
Telecom

10 Gigabit Ethernet

Users of Ether10.Genius can relay on the instantaneous traffic generation to set up and modify any IP/Ethernet header.

Traffic Scan and Discovering

The unit can quickly scan the network traffic to select those flows to be tested.

BER

Layer 1, 2, and 3 BER testing is supported and can be configured either with generic PRBS test patterns, specific patterns each Ethernet standard, either user test patterns to simulate traffic conditions.

Improved RFC

The RFC 2544 verifies the performance of the network testing throughput, frame loss, latency, jitter and burst, that can be executed as symmetric and asymmetric. The unit can also be setup in loop back mode or peer-to-peer mode.

Multistream

Ether10.Genius permits up to 8 traffic streams that are configured with proper CoS and QoS. The flows facilitate the simulation of realistic traffic conditions such as Internet, VoIP, IPTV.

e-SAM test

This Ethernet service activation test methodology for turning up, installing and troubleshooting Ethernet-based services allowing the complete validation of Ethernet service-level agreement (SLA) in a single test executed in two phases:

- *Service Configuration,* confirms the end-to-end set-up while quickly checking the Information Rate (IR), Frame Delay Variation (FDV), Frame Loss Ratio (FLR), Frame Loss Ratio at the Service Acceptance Criteria (FLRSAC).
- *Service Performance,* transmits all configured traffic streams at the CIR confirming all traffic is able to transverse the network under full load while checking IR, FDV, FLR and availability.

Q-in-Q

This tester has the ability to test QoS by means of the VLAN CoS bits used for VLAN stacking by carriers and operators.

IP Services test

Often it is required to test IP features to verify end-to-end connectivity by means of Ping and Trace Route with ICMP echo request and analysis fully supported.

LTE / 4G / 5G turn-up

LTE operators have to face with a number of technologies including 10GE and GbE at transmission layer, PTP and SyncE at synchronization plane, Datacom at routing layer, and eventually T1 or E1 to support legacy services.

Synchronization

LTE networks are demanding of accurate frequency and phase time references, particularly those architectures that consider small cells where the frequency re-utilization is a key factor of performance. The tester can set up the synchronization network by means of a comprehensive set of features while accepting external clock ref., recovering clock from incoming data, or using the built-in Rubidium disciplined with GPS.

SyncE

Complete analysis and generation of the signal, SSM and SSM protocols can be captured and decoded.

PTP Tests

During the installation of PTP connectivity problems may occur between the master and slave units. When troubleshooting these links, the tester can be used in Terminate mode to capture PTP messaging on both the transmit and receive test ports up to 1 Gbit/s. In this mode the tester simultaneously generates, receives, and captures PTP messages on the circuit under test. Users can quickly identify higher layer protocol issues that may be associated with PTP messages and/or provisioning.

Jitter & Wander

Both measurements are executed in real time without the need of external devices. Jitter measurement are specific for T1/E1 while Wander are for T1, E1, SyncE and PTP.

T1, E1 and Datacom

Ether10.Genius provides a scalable test solution for T1, E1 and datacom that includes full set of physical layer tests for balanced / unbalanced circuits including BERT, VF, signal level, round trip delay and one-way-delay with GPS.

C37.94 test

Field engineers can use this tester to turn up new C37.94 deployments, or to troubleshoot teleprotection relays and multiplexer by means features such as bit error rate testing (BERT), G.821, events analysis/generation, optical power meter one-way / round-trip delay, etc. to facilitate engineers to verify protection system that prevent outages in a power substations.
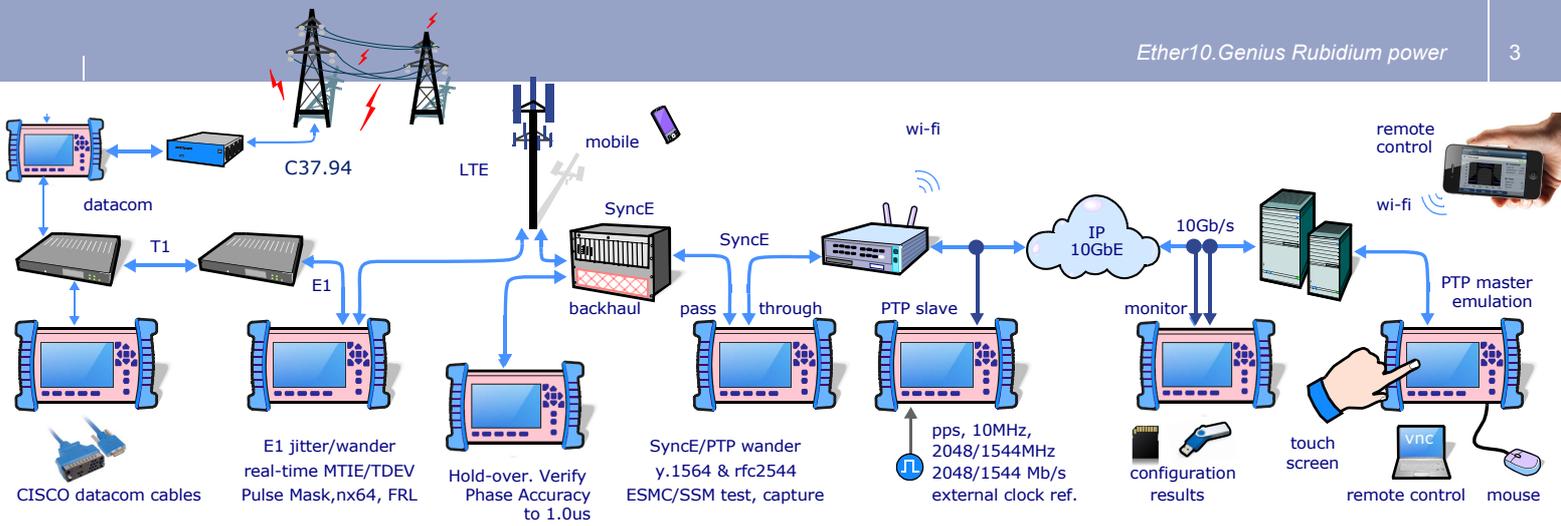
One-way delay

This test is very useful in several business including Telecom and Power utilities. One-way Delay saves hours of troubleshooting by detecting asymmetric traffic delays. Accuracies 10 times greater than most common SLA can be attained, network providers to differentiate their offering and allowing network planners to understand the delay tolerances affecting their applications

Interestingly this model has an optional GPS/GLONASS receiver that improves the accuracy of the external receivers. It means that is ideal for one-way tests.

datacom — C37.94 — LTE — mobile — wi-fi — remote control — wi-fi
T1 — E1 — SyncE — SyncE — IP 10GbE — 10Gb/s — PTP master emulation

CISCO datacom cables | E1 jitter/wander real-time MTIE/TDEV Pulse Mask,nx64, FRL | Hold-over. Verify Phase Accuracy to 1.0us | backhaul | pass through | PTP slave — pps, 10MHz, 2048/1544MHz 2048/1544 Mb/s external clock ref. | SyncE/PTP wander y.1564 & rfc2544 ESMC/SSM test, capture | monitor — configuration results | touch screen — remote control — mouse

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Testing the complexity

Double-port field unit

ALBEDO Ether10.Genius is a small field tool built in a rugged case that makes it a secure tool in harsh environments and only weights 1kg.The unit is supplied with all the interfaces then any option can be activated with a simple code. For technicians responsible of the installation, commissioning and maintenance of communication infrastructures this test set provides valuable insight and simplifies complex issues by illustrating the full network picture. Experts will quickly characterize those network resources that are in a good shape and which ones require immediate intervention.

KEY FEATURES

- Built-in Rubidium, OCXO, GPS/GLONASS clock
- PPT master/slave emulation
- Wander T1, E1, PTP, SyncE
- 1PPS mesurement
- TE max |TE|, Constant and dynamic TE components
- ESMC / SSM full support
- Y.1564 (e-SAM) FTD, 2-way FDV, FDV, 2-way FTD, FLR SES, PEU and PEA
- Y.1731 QoS statistics
- (A)Symm Y.1564, RFC-2544
- Wander analisys /generation
- Multistreams tests
- MPLS support
- Scan MAC/IP/VLAN/Q-in-Q
- T1, E1, Jitter & Pulse mask
- VNC, LAN or Wi.Fi control
- C37.94 BER, Delay, Defects
- One-way & round trip delay

The value of innovation

Engineers often have to repeat the same test several times, for them this instrument provides the facilities to execute automatic script that can be distributed by email, while the results are saved on disks. The unit also support SNMP then it can store configuration, management and result information through a MIB that can be queried via SNMP agents or a Console.

Graphical User Interface

The GUI is easy to learn while the engineer may navigate using the touch-screen, keyboard or a mouse. It is also possible to control remotely by means of VNC to grant full access to the unit using the same layout, but password controlled access, to configure, execute, and get results directly using an ad-hoc wi-fi or a LAN using a public/private IP address.

Packets, Circuits & Clocks

Everything is covered by Ether10.Genius a multitechnology tester to install and troubleshoot telecom services based on 10GbE, GbE, SyncE, PTP, Jitter, Wander, T1, E1, IEEE C37.94, Datacom, VF and one-way delay with GPS because it has been designed to deploy and troubleshoot brand new and legacy networks.
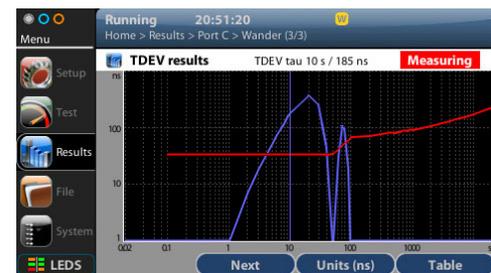
What else you need? ❏

INTERNAL RUBIDIUM

- Freerun (No GPS): Output freq. accuracy on shipment (24 h. warm up): ±5.0e-11
- GPS Locked: Time/Phase Accuracy to UTC: ±20 ns at 1σ after 24 h lock
- Hold-over accuracy (after 24h locked) frequency 1.5e-11/24h time: ±100ns/2h ±1.0 µs/24h

BENEFITS

- Quality hold-over
- All-in-one solution
- No modules = no problems
- 100% hardware included
- Field tester extra rugged
- Up to 22h. on batteries
- GUI by touchscreen, mouse
- Best price - Top featured

Ethernet Testing	
Interfaces	• SFP / SFP+ : 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBA SE-SW, 10GBASE-LW, 10GBASE-EW, 1000BASE-T, 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX, 1000BAS E-BX, 100BASE-FX, 100BASE-TX, 10BASE-T WAN Interface Sublayer (WIS), 2xRJ-45; PoE detection/ transparency • Autonegotiation: Bit rate at 10, 100, 1000 and 10000 Mbit/s, Disable autonegotiation and direct set up • EtherType II (DIX v.2), IEEE 802.3, IEEE 802.1Q, IEEE 802.1ad; IEEE 802.2—LLC1, IEEE 802.3—SNAP; IPv4 (RFC791), IPv6 RFC2460)
Generation (8 streams)	• Traffic generation and analysis features up to 10 Gb/s, equivalent to 15 millions of frames, if frame size is set to 64 bytes. • MAC address: Source / Destination, Default / User defined, Single / Range • VLAN: Single VLAN support, Q-in-Q stacking, VID, DEI, S-VLAN, C-VLAN, and Priority codepoint • Type / Length: Generation/Analysis, Jumbo frames with MTU up to 10 kB • Bandwidth Profile: Constant, in bit/s and frames/s, Periodic Burst, in high/low traffic, Ramp, in high/low traffic, Poisson • Loopback: L1to L4 layers, filtering conditions, broadcast and ICMP frames control • Layer 1 BER: HF, LF, MF, Long/Short continuous random, PRBS 231-1, A-seed, B-seed, mixed-frequency • Layer 2-4: PRBS 211-1, PRBS 215-1, PRBS 220-1, PRBS 223-1, PRBS 231-1 along with their inverted versions, user (32 bits) • SLA payload; All zeros; Insertion of TSE: single, rate, random • RTD and VF tone generation
Filters for Statistics (up to 8 simultaneously)	• Ethernet Selection: MAC address, Type/Length, C-VID, S-VID, CoS and Priority with selection mask • IPv4 and IPv6 Selection: address, protocol, DSCP, Flow (v6): single value or range. UDP Selection: port: single value or range
Traffic Statistics	• Top 16 talkers: Sour/Dest MAC / IPv4 / IPv6 addresses, VID (VLAN), C-VID (Q_in_Q), S-VID (MPLS) • Ethernet Frame Counts (RFC 2819): VLAN, Q-in-Q, Priority, Control, Pause, BPDUs • Tx/Rx Uni-Multi-Broadcast, Errors, Undersized, Oversized, Fragments, Jabbers, Runts, (Late) Collisions, Sizes, MPLS stack length • Bandwidth Statistics: (in bit/s, frame/s, %) Rate, Max, Min, Aver, Occupancy, Unicast, Multicast, Broadcast • IPv4 & IPv6 counts: (in bit/s, frame/s, %) Unicast, Multicast, Broadcast, Errors, TCP, UDP, ICMP
Results	• Twisted Cable: MDI/MDI-X status, Open, Cable Length Test, Short, Polarities, Pair Skew. PoE: voltage and current • SFP: Presence current interface, Vendor, Part number, Optical power (over compatible SFP) • Frame Delay (FTD) Y.1563: Min/Max/Med/Mean; Delay Variation (FDV) RFC1889: Peak; Jitter Curr/Max/Min/Mean • Frame Loss (FLR) Y.1563, Duplicated: Out-of-Order packets (RFC 5236) • Availability: SES and Y.1563 PEU; BER: Count, seconds with errors, Pattern losses, pattern loss seconds
RFC-2544 & Y.1564	• RFC 2544: Throughput, Latency, Frame Loss, Back-to-back, Recovery • eSAM: test up to 8 non-color or 4 color aware services. Configuration: CIR, EIR, max. throughput for each service • Tests (CIR, EIR and policing) with FTD, FDV, FLR and availability • Performance test with FTD, FDV, FLR and availability results for all services
ICMP	• RFC 792: IP ping / Traceroute, Generation of ICMP echo request: Dest. IP address, Packet length, Generation interval • Analysis of ICMP echo reply: Round trip time, Lost packets, Time-To-Live Exceeded, Port unreachable

SyncE and PTP testing	
Synchronous Ethernet	• Clock Ref.: built-in Rubidium and GPS, OCXO, internal (<2.0 ppm); external (10 MHz, 2048/1544 Mb/s, 2048/1544 MHz, 1 pps) • Line Analysis: frequency (MHz), offset (ppm), drift (ppm/s) [clause 10]; Offset Generation: ±125 ppm (0.001 ppm) as per ITU-T O.174 • Wander generation [ITU-T O.174 section 8.4] and MTIE / TDEV measurement [ITU-T O.172 clause 10] • SyncE Generation / Decoding ESMC and SSM [ITU-T G.8264]
PTP / IEEE 1588(v2)	• Precision Time Protocol (PTP): Master & Grandmaster id., Priority 1-2, Class, Accuracy, Variance, Time source • PTP over UDP encapsulation, PTP Generation / Analysis / Emulation; hardware-assisted Decoding; End-point and Through modes • Counts: Sync Inter Arrival Delay (IAD) Avg/Curr; Packet Total Delay (PTD): Std Dev/Range; Packet Delay Variation (PDV): Cur/Max/Avg • TE and max.|TE|measurement on PTP. Constant and dynamic TE components. Frequency offset master vs. local clock (ppm)

T1, E1 & Datacom testing	
Interfaces	• Port A: Unbalanced (BNC) 75 Ω and balanced (RJ-45) 120 Ω; Balanced (Bantam) 100 Ω and balanced (RJ-48) 100 Ω • Port B: Balanced (RJ-45) 120 Ω Balanced (Bantam) 100 Ω (AT-1544 only) and balanced (RJ-48) 100 Ω • Port C: Unbalanced (BNC) 75 Ω Analogue voice frequency audio port • Additional balanced secondary T1, E1 port 0 to -6dB, nominal and PMP -20dB • Bit Rate: 1.544 / 2.048 Mbit/s ± 3ppm. Codes: HDB3 / AMI • 4 x SMA: Clock Source: Internal Timing: 1.544MHz, 2.048 MHz ± 25000 ppm; External Timing; Recovery from Rx Timing (Loop Timing)
BERT	• Unframed: FAS / FAS+CRC4. PCM30: FAS+CAS / FAS+CRC • Standard, non-standard PRBS, and user patterns. Transmit Error Rate • Force Single Error: Bit, Frame, CRC, and BPV (Bipolar Violation); Alarms, Errors Count; G.826, G.821, and M.2100
Datacom	• Smart Serial 26p DTE / DCE ports. DTE, DCE emulation and monitor • V.11/X.24, V.24/V.28, V.24/V.35, V.24/V.11 (V.36/RS449), EIA530 and EIA-530A. Codirectional according G.703 • Rate: 50, 60 bit/s, 1.2, 2.4, 4.8, 8, 9.6, 16, 19.2, 32, 48, 72, 128, 144, 192, 1544 kbit/ Nx56 kbit/s; Nx64 kbit/s, up to 10 Mbit/s
Jitter & Wander	• Overpass O.172: Jitter level, tolerance, transfer and Event detection. 100% digital based generation and analyzer • Wander Generation and Measurements (TIE, MTIE, TDEV). Wander results from 20 to 100 000s
Pulse Mask	• Pulse mask compliance: ANSI T1.102-1999, ITU-T G.703; PASS / FAIL function with Persistent Graphic Display scope • Nominal 2.37V for Coaxial Pair 75 Ohm, Nominal 3.00V for Symmetrical Pair 120 Ohm
C37.94	• Test Rate: N x 64 kbit/s; Frame/Unframed BER; ITU-T G.821: ES, SES, UAS, DM. Results with pass / fail indications • Frequency (Hz), Deviation (ppm), Max deviation; Round Trip Delay (ms), One-way Delay synchornized with GPS • Defects: LOC, AIS, LOF, RDI, LSS, All 0, All 1; Anomalies: FAS, TSE, Slip. Optical Power Meter

Ergonomics	
Hand-held Instrument	• Touchscreen 480x272 TFT, Soft LEDS, 223x144x65mm, IP-54; 1 kg, Mouse, USB, Ethernet ports; SNMP, VNC support • Rechargeable Batteries continuous working up to 24 hs; Operating 0ºC ~ 50º C Storage -20ºC ~ 70ºC;

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