ALBEDO Ether10.Genius is a multitechnology Ethernet tester to install and troubleshoot telecom services based on 10GbE, GbE, SyncE, PTP, Jitter, Wander, E1, IEEE C37.94, Datacom, VF and one-way delay with GPS.

Ether10.Genius

This is the world' smaller 10G double port test set that has been designed to deploy and troubleshoot brand new and legacy networks this is why includes so many interfaces that are supplied on the first day but you only pay what you need.

1. General

1.1 Interfaces

- Port A - B: 2 x SFP / SFP+, 2 x RJ45 connectors
- Port C - D: balanced RJ45 120 Ω, unbalanced BNC 75 Ω
- Datacom Port: DTE / DCE
- Analogue voice frequency Port

1.2 Operation Modes

	TCP/IP	Ethernet	E1	C37.94	Datacom
End-point	YES	YES	YES	YES	YES
Monitor	YES	YES	YES		YES
Pass-through	YES	YES	YES		
Loop-back	YES	YES	YES		
Mux-Demux			YES		
Analogue			YES		

2. Ethernet Phy

2.1 Interfaces

- SFP / SFP+ ports: 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-SW, 10GBASE-LW, 10GBASE-EW, 1000BASE-T, 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX, 100BASE-FX, 100BASE-TX, 10BASE-T
- RJ-45 ports: 10BASE-T, 100BASE-TX, 1000BASE-T
- On / Off laser control
- Insertion of code errors

Auto-Negotiation
- Bit rate: 10 Mbit/s, 100 Mbit/s, 1 Gbit/s, 10 Gbit/s
- Master and Slave roles in the 1000BASE-T
- Disable auto-negotiation, force line settings

Power over Ethernet (PoE)
- Interfaces: 10BASE-T, 100BASE-T, 1000BASE-TX
- PoE pass-through in transparent mode

2.2 10G WAN Interfaces Sublayer (WIS)

- According to IEEE 802.3-2012
- Path / Line / Section Overhead, STS Path / Section Trace
- Analysis: LOS, BIP-N(S), SEF / LOF, BIP-N(L), AIS-L, BIP-N(P), LOP-P, AIS-P, REI-L, RDI-L, REI-P, ERDI-P
- Representation of received pointer value

2.3 Time References

- Internal time ref < ±3.0 ppm (Optionally < ±0.1 ppm)
- Ethernet through Port A & B
- 2048 Mbit/s, 2048 MHz, 1544 Mbit/s, 1544 MHz Port C
- 10 MHz, 2 Mbit/s, 2 MHz, 1.5 Mbit/s, 1.5 MHz Datacom Port
- 1 PPS / TOD synchronization
- GNSS: GPS/GLONASS

2.4 Synchronous Ethernet

Interfaces
- SFP / SFP+ ports: 10GBASE-SR, 10GBASE-LR, 10GBASE-ER, 10GBASE-SW, 10GBASE-LW, 10GBASE-EW, 1000BASE-T, 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX, 1000BASE-BX, 100BASE-TX
- RJ-45 ports: 100BASE-TX, 1000BASE-T

Timing
- Internal, external or recovered clock in Ethernet interfaces
- Freq offset generation up to ±125 ppm (res. 0.001 ppm)
- Line freq (MHz), offset (ppm), drift (ppm/s)

Syncronization
- Frequency offset generation of ±120 ppm
- Sinusoidal wander generation
- ESMC, SSM, QL: generation, decoding, forwarding

3. Ethernet MAC

- Formats: DIX, IEEE 802.3, IEEE 802.1Q, IEEE 802.1ad
- Jumbo frames up to 10 kB
- Sour / Dest MAC address setting
- Type / Length Setting
- Enable / Disable VLAN and Q-in-Q modes
- VLAN VID / User Priority setting
- S-VLAN VID, DEI, PCP, C-VLAN VID, User Priority
- FCS errors insertion

4. IP

4.1 IPv4

- Sour / Dest IPv4 address setting
- Dest. MAC address by hand or ARP
- DSCP CoS labels, TTL and transport protocol
- IP checksum errors insertion

4.2 Protocols

- ARP
- DHCP
- DNS
- Ping
- Traceroute

4.3 MPLS

- MPLS generation / analysis
- Double label stack support
- TTL exp, label fields

C O N F I D E N T I A L

5. Traffic Generator

Generation over 8 independent streams

5.1 Bandwidth Profile

Operation Modes
- Continuous
- Periodic
- Ramp
- Random

5.2 Test Patterns and Payloads

- Layer 1 BER: HF, LF, MF, Long/Short continuous random, PRBS 2^{31}-1, A-seed, B-seed, mixed-frequency
- Layer 2-4: PRBS 2^{11}-1, PRBS 2^{15}-1, PRBS 2^{20}-1, PRBS 2^{23}-1, PRBS 2^{31}-1 along with their inverted versions, user (32 bits). These patters apply to stream 1 only
- SLA payload
- All zeros
- Insertion of TSE: single, rate, random

6. Filters

- Up to 8 simultaneous filters to be be applied to the traffic
- Selection by Ethernet, IP, TCP/UDP fields
- Generic filter by using 16 bit mask and arbitrary offset

6.1 Ethernet Selection

- MAC Addr: Source and Destination
- Type / Length value with selection mask
- C-VID and S-VID with selection mask
- Service and Customer priority codepoint

6.2 MPLS Selection

- Top and Bottom MPLS headers
- Label value
- Exp field

6.3 IPv4 Selection

- IPv4 Source and Destination address
- IPv4 Protocol
- DSCP fields

6.4 IPv6 Selection

- IPv6 Source and Destination address
- IPv6 flow label
- DSCP
- Next Header

6.5 UDP Selection

- Port: single value or or ranges of values

7. PHY Results

7.1 Frequency / Time Tests

- TIE, MTIE, TDEV on 1544 kHz, 2048 kHz, 10 MHz and 1 pps interfaces
- Includes both numeric and graphical repesentation of wander metrics
- TE and max |TE| measurement (mod. 1 sec) in 1 pps interface

7.2 Cable Tests

- Optical power (over compatible SFP/SFP+)
- Inactive links: Open/short, distance to fault
- 10/100 Mbit/s links: current local port MDI/MDI-X status
- 1000 Mbit/s links: current, polarities, skew

7.3 Auto-Negotiation

- Bit rate and duplex mode
- Master / Slave role indication (1000BASE-T)

7.4 Synchronous Ethernet

- Frequency (MHz), offset (ppm), drift (ppm/s)
- TIE / MTIE / TDEV
- Decoding of the QL transported in SSM

8. Frame Analysis

- Modes: One-way (port A - A), two-way (port A - B)
- Separate statistics for Port A / B, Tx / Rx, Filter

8.1 Ethernet Statistics

- Counts: Ethernet, VLAN, IEEE 802.1ad frames, Q-in-Q, Control, Pause, IEEE 1588-2008

- Frames: unicast, multicast, broadcast
- FCS errors, Undersized, Oversized, Fragments, Jabbers
- Size: < 64, 65-127, 128-255, 256-511, 512-1023, 1024-1518, 1519-1522, 1523-1526 and 1527-MTU bytes

8.2 MPLS Statistics

- MPLS stack size: max, min

8.3 IP Statistics

- Packet counts: IPv4 packets, IPv6 packets
- Packet counts: unicast, multicast and broadcast
- UDP packets, ICMP packets
- IPv4 checksum errors, IPv6 checksum errors
- IEEE 1588-2008 packets

8.4 Bandwidth Statistics

Current, max, min, avrg (Tx / Rx, Port A / B)
- Unicast, multicast and broadcast counts
- IP and UDP statistics

8.5 SLA Statistics

- Delay (FTD): current, min, max, mean
- Delay variation (FDV or jitter): current, min, max, mean
- Reordering: Out-of-order, Duplicated count and ratio
- Loss (FLR): count, ratio
- Availability: SES count, PEU, PEA

8.6 BER

- Count, seconds, ratio and pattern loss secs at layer 1-4

8.7 Network Exploration

- Top talkers: 25 most popular MAC / IPv4 / IPv6 addr
- Top C-VID and S-VID: 25+25 most popular tags
- Atomatic setup of 8 filtering blocks

9. PTP (IEEE 1588)

9.1 Operation

- Generation / Decoding of PTP - IEEE 1588-2008
- Operation as Ordinary Clock
- Master / Slave operations, ability to force Slave role
- Transparent operation in pass-through mode with Packet delay equalization
- Encapsulations: PTP over UDP / IPv4, PTP over Ethernet

9.2 Protocol state

- Port state, best master clock, master identity
- Grandmaster: identity, BMC priorities, clock class, accuracy, clock variance, time source

9.3 Time Erro tests

- TE and max |TE| measurement on PTP

9.4 PTP Wander test

- Measurements: TIE, MTIE, TDEV

9.5 PDV metrics

- Floor delay packet population, ratio/percentage/count
- Count (FPC), Rate (FPR), Percent (FPP).
- Configurable Pass / Fail theshold

9.6 Asymmetric Delay

- Between PTP master clock and client clocks

9.7 Counts & statistics

- Sync, Delay request, Delay response
- Peer delay request, Peer delay response, Follow up, Peer delay response follow up,
- Announce, Signaling, Management
- Sync delay: current, max, min, avg, st-dev, range
- Sync delay variation: current, max, avg
- Sync inter arrival time: min, max, avg, current
- Delay request: current, max, min, avg, st-dev, range
- Round trip delay: current, mean
- Correction field: current, max, avg

10. Automatic Tests

- Automatic RFC 2544 / Y.1564 tests in one/two ways mode

10.1 Port Loopback
- Layer 1-4 loopback with Filtering conditions
- MPLS loop control
- Loop controls for broadcast and ICMP

10.2 RFC 2544
- Throughput, Frame-loss, Latency, Back-to-back, Recovery
- Asymmetric RFC based on Ethernet and IP RMP

10.3 Y.1564
- Ethernet service activation
- Eight / four services (colour / not) CIR, EIR, max, throughput
- FTD, FDV, FLR, availability objectives
- **Test Phases**
- Phase 1: steps, step duration
- Phase 2: duration, bandwidth profile (deterministic, random)

11. E1 - G.703

11.1 Line
- Impedance: nominal, PMP 20 / 25 / 30 dB, high (>1000 Ω)
- Output freq offset within ±25,000 ppm
- Line codes: HDB3, AMI
- Input Level: From 0 dB to -45 dB
- Pulse mask compliance: ITU-T G.703
- Jitter compliance: ITU-T G.823

11.2 Frame
- Unframed, G.704 / CRC / CAS / CRC + CAS
- Generation of custom NFAS spare bits
- CAS A, B, C, D bit generation for each voice channel
- Generation of CAS multiframe spare bits

11.3 Test Patterns and Signals
- PRBS 9, PRBS 11, PRBS 15 , PRBS 20, PRBS 23 , PRBS 9 inverted, PRBS 11 inverted, PRBS 15 inverted, PRBS 20 inverted, PRBS 23 inverted, all 0, all 1
- User configurable 32 bit word
- Tone (from 10 Hz to 4000 Hz, from +6 dBm to -60 dBm)
- External signal: Analogue, 64 kbit/s, datacom interface

11.4 Analysis
- Line attenuation (dB), freq (Hz), freq dev (ppm), rtd (μs)
- One-way Delay synchornized with GNSS (GPS/GLONASS)
- Defects: LOS, LOF, AIS, RAI, CRC-LOM, CAS-LOM, MAIS, MRAI, LSS, All 0, All 1
- Anomalies: Code, FAS, CRC, REBE, MFAS, TSE, Slip
- Live and history LEDs for all Defects and Anomalies
- G.821: ES, SES, UAS, DM (Pass / Fail)
- G.826: ES, SES, UAS, BBE (Pass / Fail)
- M.2100: ES, SES, UAS, BBE (Pass / Fail)
- G.711 map analysis: max/min/avg code, TS level, freq
- CAS A, B, C, D bit analysis
- Drop to output: Analogue, 64 kbit/s codir, datacom

11.5 Event Insertion
- Physical: AIS, LOS
- Frame: FAS error, CRC error, MFAS error, REBE, LOF, MAIS, CAS-LOM, RAI, MRAI, CRC-LOM
- Pattern: TSE, Slip, LSS, All 0, All 1
- Modes: Single, rate, continuous, burst, M out of N

11.6 Jitter and Wander Generation
- Modulation waveform: sinusoidal
- Frequency range: 1 μHz to 100 kHz
- Resolution: 0.1 Hz (jitter), 1 μHz (wander)
- Amplitude: 0−1000 Uipp. max depends on modudalion freq
- Modulation resolution: 1 mUIpp or $1/10^4$ configured value
- Modulation amplitude accuracy: better than 0.172
- Smooth amplitude in jitter range (10 Hz − 100 kHz)
- Intrinsic jitter < 10 mUIpp

11.7 Jitter Analysis Function
- Closed loop phase method (Ref. not required)
- Range: 0.1 Hz to 100 kHz (lock time 10 s), 1 Hz to 100 kHz (locking time 1 s), 10 Hz to 100 kHz (locking time < 1 s)
- Amplitude: 0 to 1000 UIpp (1 mUIpp resolution)
- Accuracy: better than ITU-T 0.172

- Results: peak to peak, RMS, max, hits detection, count
- Jitter measurement observation time: 1 s, 10 s, 60 s
- Filters: LP(< 100 kHz), LP+HP1 (20Hz<f<100kHz), LP+HP2 (18 kHz<f<100 kHz), LP+RMS (12kHz<f<100kHz)

11.8 Wander Analysis Function
- Open loop measurement method (ref. required)
- Modulation frequency range: 1 μHz to 10 Hz
- Wander sampling frequency: 50 Hz
- Modulation amplitude: 0 to ±2 s (single range)
- Modulation amplitude accuracy: 2 ns
- Instantaneous: TIE, frequency offset, frequency drift
- Built in, real time analysis: TIE, MTIE, TDEV
- Statistics range: 10^2, 10^3, 10^4, 10^5, 10^6s

11.9 Pulse Mask Analysis
- Operation modes: eye diagram or continuous run
- Width, rise time, fall time, level, overshoot, undershoot
- Pass / Fail for compliance with ITU-T G.703 E1 mask

12. IEEE C37.94

12.1 Operation Modes
- Unframed or framed operation
- Clock: Recovered or Internal
- End point or terminal mode
- Results with pass / fail indications

12.2 C37.94 Testing
- Follows specifications of IEEE C.37.94 section 7
- Bit Rate generation in steps of nx64 kbs up to 768 kbs
- BER, ITU-T G.821 performance test
- Event detection, insertion
- Defects: LOS, AIS, LOF, RDI, LSS, All 0, All 1
- Anomalies: FAS, TSE, Slip
- Round Trip Delay (ms)
- One-way Delay synchornized with GPS
- Frequency (Hz), deviation (ppm), max deviation
- Optical power meter

12.3 SFP
- SFP 850 nm, Multimode, 2048 kbit/s, 1500 meters
- SFP 1310 nm, Monomode, 2048 kbit/s, 10 km

13. G.703 nx64

13.1 Connector
- Balanced (RJ-45) 120 Ω

13.2 Features
- Bit rate N x 64 kbit/s (N from 1 to 4)
- Test pattern generation, analysis over co-directional
- Defect insertion, analysis: LOS, AIS, LSS, All 0, All 1
- Anomaly insertion, analysis: TSE, Slip

14. Analogue Test
- Tone Generation (from 10 to 4000 Hz, from 0 to -60 dBm)
- Level, frequency
- ITU-T G.711 analysis: max code, min code, avg code

15. Frame Relay Monitoring

15.1 Interfaces
- X.21/V.11 from 50 bit/s to 2048 kbit/s
- V.35 from 50 bit/s to 2048 kbit/s
- V.36 (RS-449) from 50 bit/s to 2048 kbit/s
- EIA-530 / EIA-530A from 50 bit/s to 2048 kbit/s

15.2 Settings
- DLCI

15.3 Events
- Long frames, short frames
- Alignment errors
- FCS errors
- Frame abort count

15.4 Statistics
- Bandwidth statistics
- Max, min frame size

- Frames with FECN, BECN, DE
- Active DLCI list
- LMI frame count

16. Data Communications

16.1 Connectors
- Smart Serial Universal datacom connector for DTE / DCE

16.2 Interfaces
- V.24/V.28 asynchronous (RS-232) from 50 bit/s to 128 kbit/s
- V.24/V.28 synchronous (RS-232) from 50 bit/s to 128 kbit/s
- X.21/V.11 from 50 bit/s to 2048 kbit/s
- V.35 from 50 bit/s to 2048 kbit/s
- V.36 (RS-449) from 50 bit/s to 2048 kbit/s
- EIA-530 from 50 bit/s to 2048 kbit/s

16.3 Tests
- Operation: DTE / DCE emulation, FDX monitor
- Test pattern generation, analysis over a datacom
- Logic analyser capability
- Defects: LOC, AIS, LSS, All 0, All 1
- Anomalies: TSE, Slip
- Analogue: Line attenuation (dB), freq (Hz), deviation (ppm)
- One-way Delay synchornized with GPS

17. Platform

17.1 Ergonomics
- Size 223 x 144 x 65 mm
- Weight: 1.2 kg (with rubber boot, one battery pack)
- 4.3 inch TFT colour screen (480 x 272 pixels)

17.2 Graphical User Interface
- GUI controlled by Touch-screen, Keyboard or Mouse
- Direct configuration and management in graphical mode
- User interface by touch-screen, keyboard and mouse
- Full remote control with VNC
- Configuration up/down through Internet, USB and SNMP
- Local management with CLI
- Full remote control: SNMP, SSH, VNC

17.3 Results
- Local storage in txt and pdf files
- File transfer to SD card and USB port
- File management through web interface and SNMP

17.4 Board
- 2 x USB ports
- 1 x RJ45 port
- 2 x LEDs
- Software upgrade through USB port

17.5 Batteries
- Li Ion Polymer
- Up to 22 hours of operation in E1 (with two packs)
- Up to 8 hours of operation in 10G Ethernet (with two packs)

17.6 Operational Ranges
- IP rating: 54
- Operational range: -10ºC to +50ºC
- Storage range: -20ºC to +70ºC
- Operation humidity: 5% - 95%

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