ALBEDO Ether.Sync is a field tester that supports absolutely all Ethernet standards and functionalities you need to install, commission and troubleshoot telecom services based on GbE, SyncE, PTP, Jitter and Wander.

Datasheet

ALBEDO Ether.Sync

As a Gigabit Ethernet analyzer, Ether.Sync suppords the advanced eSAM (ITU-T Y.1564), RFC 2544 and L1-L4 BER testing necessary for bringing into service and maintenance tasks. As a synchronization tester, Ether.Sync constitutes a valuable tool for IEEE 1588 / PTP and Synchronous Ethernet network evaluation and diagnostic.

1. GENERAL

- Operation over two Gigabit Ethernet physical interfaces based either on SFPs or RJ45 connectors.
- Traffic generation and analysis features up to 1 Gb/s (1.5 millions of frames, if frame size is set to 64 bytes).

2. OPERATION MODES

- *L1 Endpoint operation*: The equipment generates PCS codes and L1 BER measurement patterns
- *Ethernet Endpoint operation*: The equipment generates and receives Ethernet PCS codes and Ethernet frames.
- *IP Endpoint operation*: The equipment generates and receives IPv4 datagrams.
- *Through operation*: Traffic is forwarded between port A and port B.

3. ETHERNET PHY

- Supported interfaces (SFP): *10BASE-T*, *100BASE-TX*, *100BASE-FX*, *1000BASE-T*, *1000BASE-SX*, *1000BASE-LX*, *1000BASE-ZX*.
- Supported interfaces (RJ-45 ports): *10BASE-T*, *100BASE-TX*, *1000BASE-T*.
- On/off laser control for optical interfaces.

3.1 Auto-Negotiation

- Negotiation of bit rate. Allow 10 Mb/s, allow 100 Mb/s, allow 1000 Mb/s.
- Negotiation of *Master* and *Slave* roles in the 1000BASE-T interface.
- Ability to disable auto-negotiation and force line settings.

3.2 Power over Ethernet

- PoE (IEEE 802.3af-2003) and PoE+ (IEEE 802.3at-2009) detection.
- PoE interfaces: 10BASE-T, 100BASE-T and 1000BASE-TX through attached RJ-45 ports A and B.
- PoE pass-through when the equipment is configured in transparent (through) operation mode.

4. SYNCHRONOUS ETHERNET

- Supported interfaces: 100BASE-TX and 1000BASE-T through the attached RJ-45 ports. 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX and 1000BASE-BX through external SFP

4.1 Operation

- Analysis of synchronous Ethernet signal in Ethernet endpoint, IP Endpoint and Through modes, generation of synchronous Ethernet signal in Ethernet endpoint and IP Endpoint modes. Transparent synchronous Ethernet pass-through in Through mode.
- Configuration of internal, external or recovered clock in Ethernet interfaces.
- Fixed freq. offset generation on transmitted signals with maximum value of ±125 ppm (resolution 0.001 ppm) as per ITU-T O.174 (11/2009) 8.2.1.

4.2 Analysis

- Measurement of the line frequency (MHz), frequency offset (ppm) and frequency drift (ppm/s) as specified in ITU-T O.174 (11/2009) clause 10.

5. CLOCK REFERENCES

- Internal time reference better than ±2.0 ppm. Optional internal reference better than ±0.2 ppm.
- Ethernet input through Port A or Port B over any valid electrical / optical synchronous Ethernet interface.

Table 1. *Clock reference input levels*

Type	Pulse	Mode	Level (Max)	Level (Min)	Duty cycle
1544 kHz 2048 kHz	Square Senoidal	Endpoint	5 Vpp	500 mVpp	40-60%
		Monitor	0.5 Vpp	100 mVpp	40-60%
1544 kb/s 2048 kb/s	AMI HDB3	Endpoint	G.703	-12 dB (line)	40-60%
		Monitor	-20 dB		40-60%
10 MHz	Square Senoidal	Endpoint	5 Vpp	1 Vpp	45-55%
		Monitor	1 Vpp	100 mVpp	45-55%

- 10 MHz, 2048 Mb/s, 2048 MHz, 1544 Mb/s, 1544 MHz input through Port C (balanced or unbalanced) or through DTE port (balanced interface, RJ-48 connector adapter).

- One-pulse-per-second (1 pps) synchronization input through DTE port (balanced interface, RJ-48 connector adapter).
- 2048 kHz reference output through Port C (balanced or unbalanced), 1 pps through DTE port (balanced interface, RJ-48 connector adapter).

6. ETHERNET MAC

- Frame formats: *DIX, IEEE 802.1Q, IEEE 802.1ad.*
- Support for Jumbo frames with MTU up to 10 kB.
- Setting of *source* and *destination MAC addresses*. Destination addresses can be configured as a single value or as a range.
- Setting of the *Type / Length* value.
- Configuration of the *VID* and *priority codepoint* in VLAN modes.
- In Q-in-Q / IEEE 802.1ad modes, configuration of the S-VLAN *VID*, *DEI* and *priority codepoint*. Configuration of the C-VLAN *VID* and priority *codepoint*.
- Configuration of the *frame size*.

7. MPLS

- MPLS generation and analysis in *IP Endpoint* mode. MPLS analysis in *IP through* mode.
- Support of a single and double label stack (*Top* and *Bottom* labels). Label formatting follows RFC 3032
- Configuration of the TTL, traffic class and label value for *Top* and *Bottom* MPLS headers

8. IPV4

- Configuration of *source* and *destination IPv4 addresses*. Destination addresses can be configured as a single value or as a range.
- Configuration of *DSCP* CoS labels, *TTL* and *transport protocol*.
- If transport protocol is UDP, support of UDP frame with *source* and *destination port* configuration.

9. TRAFFIC GENERATOR

- Generation over 8 independent streams. Each stream has its own specific bandwidth profile and payload / pattern configuration.

9.1 Bandwidth Profiles

- Generation modes: *Continuous, Periodic burst, Ramp* and *Random*.

9.2 Test Patterns and Payloads

- Layer 2-4 BER test patterns: *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 and user (32 bits). These patters apply to stream 1 only.
- Test payload for SLA tests.
- *All zeros* test pattern.
- NCITS TR-25-1999 RPAT, JPAT and RPAT for L1 BER tests.
- IEEE 802.3, Annex 36A HFPAT, LFPAT, MFPAT, LCRPAT, SCRPAT for L1 BER tests

10. EVENT INSERTION

- Insertion of TSE, FCS errors, Undersized frames and IPv4 checksum errors,
- Insertion modes: *Single, Burst, Rate* and *Random*.

11. FILTER

- Up to 8 simultaneous filters can be applied to the traffic.
- The equipment supports a generic filter which can select frames by using a *16 bit mask* and an arbitrary *offset* defined by the user.

11.1 Ethernet Selection

- By *source* and *destination MAC addresses*. Selection of MAC address sets with masks
- By *Type / Length* value with selection mask.
- By *C-VID* and *S-VID* with selection mask.
- By *service* and *customer priority codepoint* value with selection mask.

11.2 MPLS Selection

- Separated filters to account for the top and bottom MPLS headers.
- Filtering by label value
- Filtering by traffic class

11.3 IPv4 Selection

- Selection by I*Pv4 source* or *destination* address. It is possible to select address sets by using masks.
- Selection by *protocol*.
- Selection by *DSCP value*.

11.4 IPv6 Selection

- Selection by IPv6 source or destination address (or both at the same time). It is possible to select address sets by using masks
- Selection by IPv6 flow label
- Selection based on the next header field value
- Selection by DSCP value

11.5 UDP Selection

- Selection by *UDP port*. Either as a single value or a ranges

12. PHY RESULTS

12.1 Cable Tests

- *Optical power* measurement (transmitted and received power) over compatible SFP transceivers.
- Inactive links: *Open/short fault indication* and *distance to fault* in metres (accuracy: 1 m, range 100 m).
- Active links: current local port *MDI / MDIX* status, .cable wiring (straight, crossed), polarity (positive, negative) pair skew (1000BASE-T only), crosstalk.

12.2 Auto-Negotiation

- *Bit rate* and *duplex mode*.
- Master / slave role in 1000BASE-T interfaces.

12.3 SFP

- *SFP presence*, current *interface*, *vendor*, and *part number*.

12.4 Power over Ethernet

- Type of PoE: PoE (IEEE 802.3af), PoE+ (IEEE 802.3at), none
- PoE voltage between pairs 1-2 / 3-6 and 4-5 / 7-8 in endpoint test. Voltage and current in pairs 1-2 / 3-6 and 4-5 / 7-8 in through mode

13. FRAME ANALYSIS

- Support of *local one-way* (port A-port B) and *two-way* (port A-port A) test modes.
- Separate traffic statistics for Port A and B.

13.1 Ethernet Statistics

- Frame counts: *Ethernet, VLAN, IEEE 802.1ad frames, Q-in-Q frames, control frames, pause frames*.
- Frame counts: *unicast, multicast* and *broadcast*.
- Basic error analysis: *FCS errors, undersized frames, oversized frames, jabbers*.

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

- Frame size counts: *64 or less*, *65-127*, *128-255*, *256-511*, *512-1023*, *1024-1518*, *1519-1522*, *1523-1526* and *1527-MTU* bytes.

13.2 MPLS Statistics

- MPLS stack length: minimum, maximum.

13.3 IP Statistics

- Packet counts: *IPv4 packets, IPv6 packets*.
- Packet counts: *unicast*, *multicast* and *broadcast*.
- *UDP packets*, *ICMP packets*.
- *IPv4 errors*, *IPv6 errors.*
- *UDP* errors.

13.4 Bandwidth Statistics

- Ethernet traffic statistics expressed in bits per second, frames per second and a percentage of the nominal channel capacity.
- *Unicast*, *multicast* and *broadcast* traffic figures expressed in frames per second units.
- IPv4 and IPv6 statistics (frames per second, bits per second and percentage).
- UDP traffic (frames per second, bits per second and percentage).

13.5 SLA Statistics

- Multistream SLA analysis.
- Delay statistics: ITU-T Y.1563 *FTD* (current, minimum, maximum, and mean values).
- Delay variation statistics: ITU-T Y.1563 *FTD* (standard deviation), ITU-T Y.1563 *FDV* (peak), RFC1889 / RFC 3393 *jitter* (current, maximum and mean values).
- Frame loss: ITU-T Y.1563 *FLR*.
- Duplicated packets, out -of -order packets (RFC 5236)
- Availability statistics: SES and ITU-T Y.1563 *PEU.*

13.6 BER

- *Bit error count*, *seconds with errors*, *bit error ratio* (BER).
- *Pattern losses*, *pattern loss seconds.*

13.7 Network Exploration

- *Top talkers* statistics: Displays the 16 most common source MAC / IPv4 / IPv6 addresses.
- *Top VID* (IEEE 802.1Q) or *C-VID* (IEEE 802.1ad): Displays the 25 most common VID / C-VID tags.

14. AUTOMATIC TESTS

- The equipment supports automatic normalized tests defined in IETF RFC 2544 and ITU-T Y.1564 (eSAM).
- Support of *local one-way* (port A - port B) and *two-way* (port A - port A) tests.
- Support of Ethernet and IP test modes.

14.1 IETF RFC 2544 Test

- Support of RFC-2544 *throughput*, *frame-loss*, *latency*, *back-to-back* and *recovery time* tests.

14.2 eSAM Test

- Testing of up to eight services (non-colour aware mode) or up to four services (colour aware mode).
- Configuration of the *CIR* and *EIR* for each service.
- Configuration tests (CIR, EIR and policing) with *FTD*, *FDV*, *FLR* results for each service.
- Performance test with *FTD*, *FDV*, *FLR* and *availability* results for all services.

15. PORT LOOPBACK

- Layer 1-4 loopback.

- Loop frames matching current filtering conditions or loop all frames in layer 2-4 loopbacks.
- Loop controls for broadcast and ICMP frames

16. PING AND TRACE-ROUTE

- Generation of on demand *ICMP echo request* (RFC 792) messages with custom destination IP address, packet length and packet generation interval.
- Analysis of *ICMP echo reply* (RFC 792) messages with measurement of round trip time and lost packets.
- Analysis of *ICMP Time-To-Live Exceeded* and *ICMP Port unreachable* replies received in the trace-route test.

17. PTP / IEEE 1588

- Operation: IEEE 1588-2008 transparent, non-intrusive monitoring in Ethernet Endpoint, IP endpoint and Through modes.
- Support of hardware-assisted decoding of Precision Time Protocol (PTP) as defined in IEEE 1588-2008
- Encapsulations: PTP over UDP over IPv4 as defined in IEEE 1588-2008 Annex D, PTP over IEEE 802.3 / Ethernet defined in IEEE 1588-2008 Annex F

17.1 Results

- Presentation of peer clock details: Master identity, Grandmaster identity, Grandmaster priority 1, Grandmaster priority 2, Grandmaster clock class, Grandmaster clock accuracy, Grandmaster clock variance, Grandmaster time source.
- TX and RX PTP frame counts classified by frame type.
- Sync Inter Arrival Delay (IAD) analysis: average and current.
- Sync Packet Total Delay (PTD): standard deviation, range.
- Sync Packet Delay Variation (PDV): current, maximum, average.
- Frequency offset between the master and the local clock (ppm).

18. PROTOCOLS

- *ARP* (IETF RFC 826).
- *DNS* (IETF RFC 1034, RFC 1035).
- *DHCP* (client side) (IETF RFC 2131).
- *Trace-route* application using UDP.

19. USER INTERFACE

- Direct configuration and management in graphical mode using the keyboard and display of the instrument.
- Remote access for configuration and management in graphical mode from remote IP site thought the patform Ethernet interfacel.
- File management and download through web interface.

20. PLATFORM

- Operation time with batteries (LiPO): 8 - 10 hours.
- Battery recharge time (LiPO): 4 hours.
- Operational range: -10ºC to +50ºC.
- Operation humidity: 10% - 90%.
- IP rating: 54.
- Configuration and report storage and export through attached USB port.
- NTP synchronization for the system time.
- TFT colour screen (480 x 272 pixels).
- Dimensions: 223 mm x 144 mm x 65 mm.
- Weight: 1.2 kg (with rubber boot).