ALBEDO Telecom
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The AT-2048 is the ultimate E1 tester designed for field engineers that are installing, commissioning and troubleshooting E1 links, Synchonization Networks, and Datacom circuits. You will enjoy top performance, high accuracy and a good price.

ALBEDO AT-2048

Datasheet

Updated on 3/9/20

CONFIDENTIAL

1. General

- Dual port E1 generation and analysis.
- Runs advanced synchronization tests in E1 interfaces.
- Includes support data communications, G.703 co-directional / contra-directional and voice frequency generation and analysis
- Runs two-way latency tests.

2. Operation modes

- *E1 Endpoint*: Emulation of a E1 network termination point including both transmission and reception.
- *E1 Monitor*: Analysis of E1 inputs without generating any test signal.
- *E1 MUX / DEMUX:* Enables E1 and data communications at the same time to test TDM multiplexers and demultiplexers.
- *Datacom Endpoint*: Emulation of a data communications DTE or DCE.
- *Datacom Monitor*: Transparent, passive monitoring of a DTE to DCE connection.
- *G.703 E0 Endpoint*: Generation and analysis over G.703 co-directional, contra-directional and centralized interfaces.
- *Voice Frequency:* Generation and analysis of analog signals in the telephone band (300 ~ 3400 Hz).

3. Clock

- Internal time reference better than ±2.0 ppm.

4. Clock Reference Inputs

- 2048 kb/s, 2048 kHz.

5. E1 Generation / Analysis

5.1 Connectors

- Unbalanced (BNC) 75 Ω.
- 2 x Balanced (RJ-48) 120 Ω.

5.2 Line

- Configurable input impedance: nominal line impedance, PMP 20 dB, PMP 25 dB, PMP 30 dB, high impedance (> 1000 Ω).
- Custom transmission clock: recovered or synthesized
- Configurable output frequency offset within ±25,000 ppm around the nominal frequency.
- Line codes: HDB3, AMI.
- Input Level: From 0 dB to -45 dBm.
- Pulse mask compliance: ITU-T G.703.
- Jitter compliance: ITU-T G.823.

5.3 Frame

- 2 Mb/s unframed, ITU-T G.704, ITU-T G.704 CRC, ITU-T G.704 CAS, ITU-T G.704 CRC + CAS.
- *Nx64* kb/s generation and analysis in contiguous and non-contiguous time slots.
- Generation of custom NFAS spare bits (ITU-T G.704 frame with CRC-4 multi-frame).
- CAS A, B, C, D bit generation for each voice channel. Generation of CAS multi-frame spare bits (ITU-T G.704 frame with CAS multi-frame).
- Custom *Synchronization Status Message* (SSM) generation.

5.4 Line Analysis

- Line attenuation (dB).
- Frequency (Hz), frequency deviation (ppm).
- Custom pass / fail indications

5.5 Frame and Pattern Analysis

- Defects: LOS, LOF, AIS, RDI, CRC-LOM, CAS-LOM, MAIS, MRDI, LSS, All 0, All 1, Slip.
- Anomalies: Code, FAS error, CRC error, REBE, MFAS error, TSE, TSBE.
- ITU-T G.821 performance: ES, SES, UAS, DM. ITU-T G.821 results include pass / fail indications.
- ITU-T G.826 performance: ES, SES, UAS, BBE (near and far end statistics). ITU-T G.826 results include pass / fail indications.
- ITU-T M.2100 performance: ES, SES, UAS, BBE (near and far end statistics). ITU-T M.2100 results include pass / fail indications.
- Channel map and time slot analysis: time slot value in hexadecimal and binary formats, time slot level and frequency computed following the ITU-T G.711 A law.
- FAS / NFAS word analysis.
- CAS A, B, C, D bit analysis.
- Synchronization Status Message (SSM) decoding and analysis.

5.6 Event Insertion

- Physical: Code, AIS, LOS.
- Frame: FAS error, CRC error, MFAS error, REBE, LOF, MAIS, CAS-LOM, RDI, MRDI, CRC-LOM.
- Pattern: TSE, Slip, LSS, All 0, All 1.
- Insertion modes: Single (anomalies), rate (anomalies), continuous (defects), M-single (defects), MN-repetitive (defects).

6. Data Communications

- Operation: DTE emulation, DCE emulation and full duplex monitor.

6.1 Connectors

- Smart Serial universal data communications connector for the DTE and DCE (all interfaces).

6.2 Interfaces

- V.24 / V.28 asynchronous from 50 b/s to 128 kb/s.
- V.24 / V.28 synchronous from 50 b/s to 128 kb/s.
- X.21 / V.11 asynchronous from 50 b/s to 128 kb/s.
- X.21 / V.11 synchronous from 50 b/s to 2048 kb/s.
- V.35 from 50 b/s to 2048 kb/s.
- V.36 (RS-449) from 50 b/s to 2048 kb/s.
- EIA-530 from 50 b/s to 2048 kb/s.
- EIA-530A from 50 b/s to 2048 kb/s.

6.3 Line

- Clock circuit selection (TC or TTC) in V.24 / V.28 synchronous, V.35, V.36, EIA-530 and EIA-530a interfaces.
- Configurable output frequency offset within ±25,000 ppm around the nominal frequency.
- Data bits, stop bits, parity and inter-word gap configuration in V.24 and X.21 / V.11 asynchronous interfaces
- Line Analysis
- Frequency (Hz), frequency deviation (ppm).
- Received character count (V.24 asynchronous)
- Logic analyser capability for data, clock and control circuits with custom setting of control circuits.
- Clock and Pattern Analysis
- ITU-T G.821 performance: ES, SES, UAS, DM. ITU-T G.821 results include pass / fail indications.
- Defect insertion and analysis: LOC, AIS, LSS, All 0, All 1.
- Anomaly insertion and analysis: TSE, Slip.

7. E0 Generation and analysis

- G.703 co-directional, contra-directional and centralized interface operating 48 kb/s, 56 kb/s, 64 kb/s, 72 kb/s, 128 kb/s, 144 kb/s, 192 kb/s, 256 kb/s.
- Custom transmission clock: recovered or synthesized.
- Configurable output frequency offset within ±25,000 ppm around the nominal frequency.

7.1 Line Analysis

- Frequency (Hz), frequency deviation (ppm).

8. Pattern Analysis

- ITU-T G.821 performance: ES, SES, UAS, DM. ITU-T G.821 results include pass / fail indications.
- Defect insertion and analysis: LOS, AIS, LSS, 0s, 1s.
- Anomaly insertion and analysis: TSE, Slip.

9. Patterns and Signals

- *PRBS 6*, *PRBS 7*, *PRBS 9* (ITU-T O.150, O.153), *PRBS 11* (ITU-T O.150, O.152, O.153), *PRBS 15* (ITU-T O.150, O.151), *PRBS 20* (ITU-T O.150, O.153), *PRBS 23* (ITU-T O.150, O.151), *PRBS 6 inverted*, *PRBS 7 inverted*, *PRBS 9 inverted*, *PRBS 11 inverted*, *PRBS 15 inverted*, *PRBS 20 inverted*, *PRBS 23 inverted*, *QRSS*, *QRSS inverted*, *QBF / FOX*, *all 0*, *all 1*.
- User configurable 32 bit word.
- Tone (from 10 Hz to 4000 Hz, from +6 dBm to -60 dBm) (E1 interface only).

10. Voice Frequency Test

- Tone generation and analysis function. Configurable level between -60 dBm and +3 dBm in steps of 0.1 dB. Configurable frequency between 2 Hz and 4000 Hz in steps of 1 Hz.
- Measurement of *Signal level (dBm)*, *Noise level (dBm)*, *Signal Frequency (Hz)*
- Sensitivity: -60 dBm (signal and noise measurements).
- ITU-T G.711 analysis: maximum code, minimum code, average code.
- Frequency sweep test with up to 8 user configurable frequencies with custom gain / loss threshold for each of them.

11. Pulse Mask Analysis

- Interfaces: E1
- Operation modes: Eye diagram or continuous run.
- Display of positive, negative and positive / negative pulse.
- Measurement of pulse width, rise time, fall time, level, overshoot and undershoot (positive and negative pulses).
- Pass / fail indication for compliance with ITU-T G.703 2048 kb/s mask.

12. Jitter and Wander Generation

- Interfaces: E1.
- Modulation waveform: sinusoidal.
- Modulation frequency range: 1 μHz to 100 kHz.
- Modulation frequency resolution: 0.1 Hz (jitter), 1 μHz (wander).
- Modulation amplitude: 0 ~ 1000 UIpp. Maximum depends on modulation frequency as specified in ITU-T O.171 and O.172.
- Modulation amplitude resolution: 1 mUIpp or $1/10^4$ of the configured value.
- Smooth amplitude changes in jitter range (10 Hz ~ 100 kHz).
- Intrinsic jitter < 10 mUIpp.

13. Jitter Analysis

- Interfaces: E1.
- Closed loop phase measurement method.
- Modulation frequency range: 0.1 Hz to 100 kHz (locking time 10 s), 1 Hz to 100 kHz (locking time 1 s), 10 Hz to 100 kHz (locking time < 1 s).
- Modulation amplitude: 0 to 1000 UIpp (single range). Maximum amplitude depends on modulation frequency as specified in ITU-T O.171 and O.172.
- Modulation amplitude resolution: 1 mUIpp.
- Measurement accuracy: better than ITU-T O.172.
- Jitter measurement results: peak to peak jitter, RMS jitter, maximum jitter, hits detection and count (user selectable threshold).
- Jitter measurement observation time: 1 s, 10 s, 60 s.
- E1 measurement filters (ITU-T G.703): LP (f < 100 kHz), LP+HP1 (20 Hz < f < 100 kHz), LP+HP2 (18 kHz < f < 100 kHz), LP+RMS (12 kHz < f < 100 kHz).

14. Wander Analysis

- Interfaces: E1.
- Open loop measurement method.
- 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.
- Statistics range: 10^2, 10^3, 10^4, 10^5, 10^6 s.
- Frequency offset, frequency drift with maximum records.
- Built in real time TIE, MTIE, TDEV (ITU-T G.810)
- MTIE and TDEV resolution: 100 ps.
- Custom MTIE and TDEV pass / fail indication based on standard masks.

15. Latency

- Interfaces: E1, data communications, G.703 co-directional, G.703 contra-directional, G.703 centralized.
- Results: round trip delay with minimum and maximum records.
- Custom pass / fail indications.

16. Port Loopback

- Interfaces: E1.
- Independent loopback control for each port.

17. Platform

- Size: 223 x 144 x 65 mm.
- Weight: 1.0 kg (with rubber boot, onebattery packs).
- Screen: 4.3 inch, TFT color (480 x 272 pixels).
- USB type A port, according USB standard 2.0, DC output: +5 V / 0.5 A (max).
- RS-232 / V.24 console port for maintenance tasks.

18. Power Specifications

- Operation time with batteries (LiPO, double pack): 24 hours.
- DC input, 12 V (nominal), 15 V (maximum) / 4A (maximum).
- External AC power adapter 100 - 240 V ~50 / 60 Hz, 1.6 A. Output 12 V DC, 4 A.
- AC power grid fluctuations < ±10% of the nominal voltage
- Over-voltage category II

19. User Interface

- Graphical user interface controlled by touch-screen, keyboard or mouse.
- Web based report and configuration file management.
- Full remote control: SNMP or VNC.
- Multi-language interface: English, Spanish, Polish, French, Chinese, Russian, Chinese, Portuguese.

20. Results

- Storage in TXT and PDF file formats.
- File transfer to SD card and USB port.
- File management through web interface and SNMP.
- Configuration and report storage and export through attached USB port.

21. Operational Ranges

- Operational range: -10ºC to +50ºC.
- Storage range: -20ºC to +70ºC.
- Operation humidity: 5% - 95%.
- Height: Up to 3000 m above the sea level.
- Pollution degree II❑