AT-One: T1, E1 and Datacom tester

ALBEDO Telecom is delighted to present the AT.One, the ultimate and world’s most comprehensive BER analyzer / generator simultaneously for T1, E1, Datacom, Jitter, Wander, Pulse mask, Frame Relay, VF, and more. The AT.One is truly rugged and is ideal for field engineers installing and maintaining E1 and Datacom circuits. Designed with the latest technology in 2016 is light, fast, friendly and comprehensive. It is the envy of our American and European competitors that dream to have such up-to-date unit for a legacy -but widely used- technology. Ideal for field engineers installing, commissioning and troubleshooting T1 links, E1 links, Synchronization Networks, and Datacom circuits.

1. General
1.1 Interfaces
Port A
- Balanced (Bantam) 100 Ω and balanced (RJ-48) 120 Ω
- Unbalanced (BNC) 75 Ω and balanced (RJ-48) 120 Ω

Port B
- Balanced (Bantam) 100 Ω and balanced (RJ-48) 120 Ω
- Balanced (RJ-48) 120 Ω

Others
- Datacom Port: 2 x Smart Serial for DTE / DCE
- Analogue voice frequency audio Port

1.2 Operation Modes

<table>
<thead>
<tr>
<th></th>
<th>DS1/T1</th>
<th>E1</th>
<th>Datacom</th>
</tr>
</thead>
<tbody>
<tr>
<td>End-point</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Monitor</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Pass-through</td>
<td>YES</td>
<td>YES</td>
<td></td>
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<tr>
<td>Loop-back</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>Mux-Demux</td>
<td>YES</td>
<td>YES</td>
<td></td>
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<tr>
<td>Analogue</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

1.3 Clock References
- Internal clock reference better than ±2.0 ppm
- Recovered clock
- External reference clock: 2048 kHz, 1544 kHz, 2048 kHz, 1544 kHz through Port B (balanced interface, RJ-48 or bantam connector)
- Configurable input gain: 0 dB, -20 dB

2. ANSI T1.102 / T1 interface
2.1 Line
- Configurable impedance: nominal, PMP 20 / 25 / 30 dB, high > 1000 Ω
- Cable delay equalization up to a 6 dB attenuation.
- Configurable output freq. offset ±25,000 ppm
- Line codes: B8ZS, AMI
- Input Level: From 0 dB to -45 dB
- Pulse mask compliance: ANSI T1.102-1999, ITU G.703

2.2 Frame
- 1544 kb/s unframed, SF (D4) and ESF in accordance with ANSI T1.403-1999 and ITU-T G.704.
- CAS A, B, C, D bit generation for each voice channel
- Pattern: TSE, Slip, LSS, All 0, All 1
- Insertion modes: Single (anomalies), rate (anomalies), continuous (defects), burst of M (defects), M out of N (defects).

3. ITU-T G.703 / E1
3.1 Line
- Configurable impedance: nominal, PMP 20 / 25 / 30 dB, high (> 1000 Ω)
- Configurable output freq. offset ±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

3.2 Frame
- Generation of NFAS spare bits (ITU-T G.704 with CRC-4 multiframe)
- CAS A, B, C, D bit generation for each voice channel.
- Generation of CAS spare bits (ITU-T G.704 with CAS multiframe)

3.3 Event Insertion
- Physical: AIS, LOS
- Frame: FAS error, CRC error, LOF, RAI
- Pattern: TSE, Slip, LSS, All 0, All 1
- Modes:
  - Anomalies: single, rate
  - Defects: continuous, burst of M, M out of N

This Datasheet that contains a specification which are representative and accurate of the product. However, are subject to change without notice.
4. T1/E1 analysis

4.1 Test Patterns and Signals
- PRBS 6, PRBS 9, PRBS 11, PRBS 15, PRBS 20, PRBS 23, PRBS 6 inv, PRBS 9 inv, PRBS 11 inv, PRBS 15 inv, PRBS 20 inv, PRBS 23 inv, all 0, all 1
- User configurable 32 bit word
- Tone (from 10 Hz to 4 kHz, from +6 dBm to -60 dBm)
- External signal insertion: analogue and datacom interfaces

4.2 Events Detection and Performance testing
- G.711 occupation and analysis: max/min/avg code, level, frequency
- CAS A, B, C, D bit analysis
- Drop to external output: Analogue, 64 kb/s codic, datacom

Analogue
- Line attenuation (dB), freq. (Hz), freq. dev. (ppm)

Latency
- Round Trip Delay test (RTD)

Defects
- E1: LOS, LOF, AIS, RAI, CRC-LOM, CAS-LOM, MAIS, MRAI, LSS, All 0, All 1
- T1: LOS, LOF, AIS, RAI, LSS, All 0, All 1

Anomalies
- E1: Code, FAS error, CRC error, REBE, MFAS error, TSE, Slip
- T1: Code, FAS error, CRC error, TSE, Slip

Performance
- G.821: ES, SES, UAS, BBE with pass / fail indications
- G.826: ES, SES, UAS, BBE (near & far-end) with pass / fail
- M.2100: ES, SES, UAS, BBE (near & far-end) with pass / fail

4.3 Jitter Analysis
- Closed loop phase measurement method. Reference freq. not required
- Modulation range: 1 to 100 kHz (locking time 10 s), 1 to 100 kHz (lock time 1 s), 10 to 100 kHz (locking time < 1 s)
- Amplitude: 0 to 1000 Upp (max. depends on modulation freq.)
- Resolution: 1 mUpp or 1/10 of configured value
- Accuracy: better than ITU-T 0.172

Jitter Results
- Peak to peak RMS, jitter (resettable), hits, and count
- Observation time: 1, 10, 60 secs.

Filters E1
- 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)

Filters T1
- LP (f < 40 kHz)
- LP + HP1 (10 Hz < f < 40 kHz)
- LP + HP2 (8 kHz < f < 100 kHz)

4.4 Wander Analysis
- Open loop method
- Range: 1 μHz to 10 Hz
- Sampling: 50 Hz
- Amplitude: ±2 Hz (single range)
- Accuracy: ±2 μHz

Results
- Built-in and real time
- Instantaneous: TIE, freq. offset, freq. drift

Statistics results: TIE, MTIE, TDEV
- Statistics range: 10^2, 10^3, 10^4, 10^5, 10^6 s

4.5 Jitter / Wander Generation
- Waveform: sinusoidal
- Range: 1 μHz to 100 kHz
- Resolution: 0.1 Hz (jitter), 1 Hz (wander)
- Amplitude: 0.01 to 100 Upp, max depends on modulation freq
- Resolution: 1 mUpp or 1/10^3 of configured value
- Accuracy: better than 0.172

Intrinsic jitter < 10 μUpp

4.6 Pulse Mask Analysis
- Operation modes: Eye diagram or continuous run
- Width, rise / fall time, level, overshoot / undershoot (+/- pulses)
- Pass / Fail
- Compliance with ITU-T G.703 E1 mask

5. ITU-T G.703 / E0

5.1 Connector
- Balanced (RI-45) 120 Ω.

5.2 Features
- Bit rate N x 64 kb/s (N from 1 to 4)
- Test pattern generation and analysis over co-directional interfaces
- Defect insertion and analysis: LOS, AIS, LSS, All 0, All 1
- Anomaly insertion and analysis: TSE, Slip
- G.821 performance

Delay
- Round Trip Delay test (RTD)
- One-Way Delay (OWD) test assisted with GPS / GLONASS

6. Data Communications

6.1 Connectors
- Smart Serial Universal for DTE / DCE (CISCO standard)

6.2 Interfaces
- V.24/V.28 (RS-232) sync/asynchronous from 50 to 128 kb/s
- X.21/V.11 from 50 to 2048 kb/s
- V.35 from 50 to 2048 kb/s
- V.36 (RS-449) from 50 to 2048 kb/s
- EIA-530 from 50 to 2048 kb/s
- EIA-530A from 50 to 2048 kb/s

6.3 Tests
- Operation
- DTE / DCE emulation
- Complete full duplex monitoring
- Test pattern generation and analysis over datacom interfaces
- BER and ITU-T G.821 performance
- Logic analyzer capability
- Defects detect/insert: LOC, AIS, LSS, All 0, All 1
- Anomalies detect/insert: TSE, Slip
- Line attenuation (dB), frequency (Hz), deviation (ppm)
- Latency: Round Trip Delay test (RTD)
- One-Way Delay (OWD) test assisted with GPS / GLONASS

7. Voice Frequency test
- Tone Generation (from 10 to 4000 Hz, from 0 to -60 dBm)
- Level and frequency
- ITU-T G.711 analysis: max / min / avg codes

8. Platform

8.1 Ergonomics
- Size 223 x 144 x 65 mm
- Weight: 1.0 kg (with rubber boot, one battery pack)
- 4.3 inch TFT colour screen (480 x 272 pixels)

8.2 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, VNC

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

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

8.5 Batteries
- Li Ion Polymer
- Up to 24 hours of operation in E1 (with two packs)
8.6 Operational Ranges

- IP rating: 54
- Operational range: -10°C to +50°C
- Storage range: -40°C to +70°C
- Operation humidity: 5% - 95%