



*AT-One is the world ultimate T1 / E1 tester designed for field engineers that are installing, commissioning and troubleshooting T1, E1 links, Sync Networks, and Datacom circuits. You will enjoy its performance and accuracy. Value for Money!*

Datasheet

Updated on 24/7/19

# 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  $\Omega$  and balanced (RJ-48) 100  $\Omega$
- Unbalanced (BNC) 75  $\Omega$  and balanced (RJ-48) 120  $\Omega$

#### Port B

- Balanced (Bantam) 100  $\Omega$  and balanced (RJ-48) 100  $\Omega$
- Balanced (RJ-48) 120  $\Omega$

#### Others

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

### 1.2 Operation Modes

	DS1/T1	E1	Datacom
End-point <sup>i</sup>	YES	YES	YES
Monitor	YES	YES	YES
Pass-through	YES	YES	
Loop-back	YES	YES	
Mux-Demux	YES	YES	
Analogue	YES	YES	

- i. Bidirectional testing in End-point, Monitor and Pass-through modes by simultaneous operation in Port A and Port B

### 1.3 Clock References

- Internal clock reference better than  $\pm 2.0$  ppm
- Recovered clock
- External reference clock: 2048 kHz, 1544 kHz, 2048 kb/s, 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  $\Omega$
- Cable delay equalization up to a 6 dB attenuation.
- Configurable output freq. offset  $\pm 25,000$  ppm
- Line codes: B8ZS, AMI
- Input Level: From 0 dB to -45 dB
- Pulse mask compliance: ANSI T1.102-1999, ITU G.703
- Jitter compliance: ANSI T1.102-1999, ITU-T G.823

### 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).

### 2.2 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

## 3. ITU-T G.703 / E1

### 3.1 Line

- Configurable impedance: nominal, PMP 20 / 25 / 30dB, high (> 1000  $\Omega$ )
- Configurable output freq. offset  $\pm 25,000$  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

- 2048 kb/s unframed, ITU-T G.704, ITU-T G.704 CRC, ITU-T G.704 CAS, ITU-T G.704 CRC + CAS
- 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, MFAS error, REBE, LOF, MAIS, CAS-LOM, RAI, MRAI, CRC-LOM
- Pattern: TSE, Slip, LSS, All 0, All 1

### Modes

- Anomalies: single, rate
- Defects: continuous, burst of M, M out of N

## 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 codir, 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, DM 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 (locking time 1 s), 10 to 100 kHz (locking time < 1 s)
- Amplitude: 0 to 1000 UIpp (max. depends on modulation freq.)
- Resolution: 1 mUIpp or 1/10e4
- Accuracy: better than ITU-T 0.172

#### Jitter Results

- Peak to peak, RMS, jitter (reseteable), 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: 0 to ±2 s (single range)
- Accuracy: 2 ns

#### Results

- Built-in and real time
- Instantaneous: TIE, freq. offset, freq. drift
- Statistics results: TIE, MTIE, TDEV
- Statistics range: 10<sup>2</sup>, 10<sup>3</sup>, 10<sup>4</sup>, 10<sup>5</sup>, 10<sup>6</sup> s

### 4.5 Jitter / Wander Generation

- Waveform: sinusoidal
- Range: 1 μHz to 100 kHz
- Resolution: 0.1 Hz (jitter), 1 μHz (wander)
- Amplitude: 0–1000 UIpp. max depends on modulation freq
- Resolution: 1 mUIpp or 1/10<sup>4</sup> configured value
- Accuracy: better than 0.172
- Intrinsic jitter < 10m UIpp

### 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

- Compliance with ANSI T1.101-1999 T1 mask

## 5. ITU-T G.703 / E0

### 5.1 Connector

- Balanced (RJ-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

#### Latency

- 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
- Comple full duplex monitoring
- Test pattern generation and analysis over a datacom interfaces
- BER and ITU-T G.821 performance
- Logic analyser 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%

