ALBEDO Telecom
the Path to Excellence


*ALBEDO AT.2048 is a rouged, extremly fast, and full-featured field tester designed in 2010 for E1 / Datacom mobile & fixed networks*

# AT-2048: E1+Datacom+Wander

Datasheet

CONFIDENTIAL

## 1. E1 Generation / Analysis

### 1.1 Connectors

- Port A: Unbalanced (BNC) 75 Ω and balanced (RJ-45) 120 Ω.
- Port B: Balanced (RJ-45) 120 Ω.
- Analogue voice frequency audio port

### 1.2 Line

- Connection modes: E1 monitor, E1 endpoint, E1 mux, E1 demux, E1 through, analogue
- Bidirectional testing (E1 monitor, E1 endpoint, E1 through) by simultaneous operation of Port A and Port B
- Configurable input impedance: nominal line impedance, PMP 20 dB, PMP 25 dB, PMP 30 dB, high impedance (> 1000 Ω)
- 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

### 1.3 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

### 1.4 Test Patterns and Signals

- 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 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 +10 dBm to -60 dBm)
- External signal: Analogue (Port A only ), 64 kb/s codirectional (port A only), datacomms interface
- CAS a, b, c, d bit generation for each time slot

### 1.5 Analysis

- Analogue: Line attenuation (dB), frequency (Hz), frequency deviation (ppm), round trip delay (µs). Analogue results include pass / fail indications
- Defects: LOS, LOF, AIS, RAI, CRC-LOM, CAS-LOM, MAIS, MRAI, LSS, All 0, All 1
- Anomalies: Code, FAS error, CRC error, REBE, MFAS error, TSE, Slip
- Live and history LEDs for all Deffects and Anomalies
- 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
- ITU-T G.711 occupation map and time slot analysis: current code, maximum code, minimum code, average code, timeslot level and frequency
- FAS / NFAS word analysis
- CAS a, b, c, d bit analysis
- Drop to external output: Analogue, 64 kb/s codirectional (Port A only), data communications interface

### 1.6 Event Insertion

- Physical: Code, 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 (anomalies), rate (anomalies), continuous (defects), M-single (defects), MN-repetitive (defects)

## 2. Jitter and Wander Generation

- Modulation waveform: sinusoidal
- Modulation frequency range: 1 mHz to 100 kHz
- Modulation frequency resolution: 0.1 Hz (jitter), 1 mHz (wander)
- Modulation amplitude: 0 – 1000 Uipp. Maximum depends on modulation frequency
- Modulation amplitude resolution: 1 mUIpp or 1/104 configured value
- Modulation amplitude accuracy: better than O.172
- Smooth changes in range (10 Hz – 100 KHz)
- Intrinsic jitter < 10 mUIpp

## 3. Jitter Analysis

- Closed loop phase measurement method. Reference frequency not required
- 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 aplitude depends on modulation freq.)
- Modulation amplitude resolution: 1 mUIpp
- Measurement accuracy: better than ITU-T O.172
- Jitter measurement results: peak to peak jitter, positive peak jitter, negative peak jitter, RMS jitter, maximum jitter (user reseteable),hits detection and count (user selectable threshold)
- Jitter measurement observation time: 1 s
- Measurement selectable filters: LP (off - 100 kHz), HP (off - 20 Hz - 18 kHz)
- Status indication: No clock, unlock, lock, out of range

## 4. Wander Analysis

- Open loop measurement method. Ref. freq. required
- Modulation frequency range: 1 mHz to 10 Hz
- Wander sampling frequency: 50 Hz
- Modulation amplitude: 0 to ±1 s (single range)
- Modulation amplitude resolution: 2 ns
- Instantaneous: TIE, frequency offset, frequency drift.
- Statistics results: TIE, MTIE, TDEV
- Statistics range: 102, 103, 104, 105, 106 s
- Built in, real time statistics analysis

## 5. ITU-T G.703 Co-directional I/F

- Balanced (RJ-45) 120 W connector
- Bit rate N x 64 kb/s (N = 1 to 31)
- Test pattern generation and analysis over co-directional interfaces
- Defect insertion / analysis: LOS, AIS, LSS, All 0, All 1.
- Anomaly insertion and analysis: TSE, Slip

## 6. Data Communications

- Smart Serial universal datacom connector for the DTE and DCE (all interfaces)

### 6.1 Interfaces

- V.24/V.28 async. (RS-232) from 50 b/s to 128 kb/s
- V.24/V.28 sync. (RS-232) from 50 b/s to 128 kb/s
- X.21/V.11 from 50 b/s to 10 Mb/s
- V.35 from 50 b/s to 128 kb/s
- V.36 (RS-449) from 50 b/s to 128 kb/s
- EIA-530 from 50 b/s to 128 kb/s

### 6.2 Tests

- Operation: DTE emulation, DCE emulation and full duplex monitor
- Test pattern generation and analysis over a datacom interfaces
- Logic analizer capability
- Defects: LOC, AIS, LSS, All 0, All 1
- Anomalies: TSE, Slip
- Analogue: Line attenuation (dB), frequency (Hz), frequency deviation (ppm)

## 7. Synchronization

- Internal clock (better than ±3.0 ppm)
- External ref. clock: 2,048 kb/s (ITU-T G.703) 2,048 kHz
- Configurable input gain: 0 dB, -20 dB

## 8. General

- *Instant On* (the equiment measures inmediately after power on)
- Operation time with NiMh batteries : 5h. (one pack) and 10h (two packs)
- Operation time with LiIon batteries : 8h. (one pack) and 16h (two packs)
- IP remote control through attached Ethernet port
- Configuration and report storage and export through attached USB port
- TFT colour screen (480 x 272 pixels)
- Dimensions: 223 mm x 144 mm x 65 mm
- Weigth: 1.0 kg (inc. rubber boot and one battery pack)