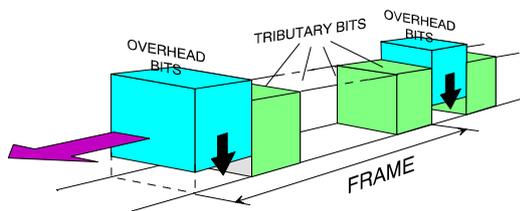


# AT-2048 Datacom / Wander

*in Test we Trust*

**The AT-2048 is the ultimate tester designed specifically for field engineers that are installing, commissioning and trouble-shooting E1 and Datacom circuits.** The AT-2048 has been designed and manufactured by ALBEDO Telecom in Barcelona and is a brand new platform incorporating the latest available electronics. Consequently you will enjoy top performance, high accuracy and, of course, a very competitive price.

The AT-2048 analyzer is a simple to use, rugged handset, equipped with a full color GUI specifically designed for field use for the analysis and maintenance of telecom circuits. Its comprehensive performance includes framed and unframed signalling, drop and insert Nx64Kbps, data and jitter into any time slot.



Moreover, the AT-2048 also provides the markets most complete variety of E1 line status, transmission events, performance testing, BERT, monitoring, results, remote control and configurations. In other words, this equipment has been designed to match the performance and budget over five continents.

## Best in town

The AT-2048 is a very powerful and fully featured tester and we have two good reasons to justify this point: (a) our architects have designed more E1 testers than any one else, (b) based on latest technologies available in 2010, you will manage easily to execute any verification, whether it is - channel test, alarm report, quality monitoring, faultfinding or signalling verification

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**“Low Cost, Fully Featured everything in E1, Datacom, Jitter/Wander testing”**

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Friendly and rugged, the AT-2048 is presented in a compact case and equipped with all interfaces to reach every point of the network topology.

Have a look and try this flexible tool, you will love it after discovering how the latest FPGA can overcome previous limitations in accuracy, space or performance. Honestly, nothing else can really be compared with this outstanding update to E1/Datacom/Jitter testing.

**ALBEDO**  
Telecom

# First-class E1 tester

Designed and manufactured *in Europe* and equipped with the latest components in the industry including a long life battery, TFT full colour 480x272 touch screen, SD memory, USB and Ethernet port, Smart serial 26p DTE/DCE ports. Moreover, it has also adopted the state-of-the-art technology in FPGAs, ergonomics, GUI, and testing methodologies. Honestly, nothing compares with the AT-2048.

## Excellence

After such extended experience, we can at least say we understand field technician needs. The AT-2048 is an excellent tester for network operators, contractors and enterprise users that have to manage fixed and mobile networks that are using E1 and Datacom backhaul circuits. Your engineers will require a minimum training for installation and commissioning.

## Highlights

The AT-2048 reports and generates all events to verify your circuit performance, including frequency level and other functions to ensure a healthy support of any customer applications. The E1 frame defines a cyclical set of 32 time slots of 8 bits that can be analysed in detail including a list of event reports and graphics such as logs, chronograph and histograms for maintenance. The time slot 0 is devoted to transmission management and time slot 16 for signalling; the rest were assigned originally for voice/data transport. All of them can be tested with PRBS, Fixed Code and 16-bit user word.

## Top Featuring

The robust, handheld E1 and data tester is used for installation, commissioning and maintenance of digital networks. It can carry out both framed and unframed tests on a wide range of equipment. The AT-2048 E1 and data tester provides a scalable test solution for E1 and data testing applications, supported by a large range of software options for E1 services and sub rate multiplexing system. It allows for rapid evaluation of circuits through a user interface with an auto configure feature. For large, clear results the

screen employs a full set of physical layer tests for E1 balanced and unbalanced circuits including BERT, VF, round trip delay and signal level. Upgradable software via an integrated USB interface is offered. Some important functions include:

- Multi-interface capability: V.24/RS232, V.11/X.24, V.35, V.36/RS449, G.703 (2048/704kbit/s), G.703 co-directional,
- ITU-T G. 821, G. 826, and M. 2100 performance analysis,
- Collection of call records from remote locations,
- CAS signalling generation and monitoring,
- Extensive error and alarm generation,
- VF tone generation and measurement,



iRemote Control

The screenshots display the following features:

- Time Navigation:** A menu with options like Test, Setup, Results, File, and System.
- Analyzer:** A screen for configuring tests with parameters like Pattern, Atten.(dB), and Freq.(Hz).
- Port A Multiplexer:** A screen for selecting test patterns and overheads.
- Port A CAS signaling capture:** A screen showing captured signaling data in a grid format.
- Waveform:** A graph showing signal amplitude over time with parameters like Level (V), Undershoot, and Overshoot.
- Summary:** A screen providing a comprehensive overview of test results, including Analyzer, Generator, and Performance metrics.

- Frequency, clock slip and level measurement,
- Jitter measurement,
- Pulse mask representation.

(C) ALBEDO TELECOM

100% Designed and Manufactured in Europe





Internet Access  
 Mobiles  
 IM S  
 Data Links  
 Leased Lines  
 Synchronization

## E1 Applications

E1 is still probably the best and most reliable standard established in telecommunications. It is so widely deployed that it will last for many years to come.

### E1 testing market

This market has plenty of new opportunities including traditional applications such as voice, data, synchronization and leased lines, plus the new challenging architectures that combine E1 circuit with Carrier-Ethernet and IP.

### Voice and Data

E1 systems are perfect for voice transfers. The E1 connection has the capability to handle up to 32 voice conversations at once. The 2 Mbit/s circuit is widely used to connect millions of users attached to a PBX, base stations, satellite and microwaves links, with main exchange supporting voice and signalling of any standard including ISDN, POTS, VoIP and IMS.

### Synchronization

Most of the mobile base-stations rely on E1 backhaul connections then synchronization is not an issue.

When transport is migrated to Ethernet/IP packets, then mobile networks use to maintain the E1 circuits to achieve the levels of synchronous timing and frequency needed.

### Earth-to-earth communications

Voice and data signals use compression techniques to maximize available bandwidths that are often transported by E1 lines. For instance, audio codec's like the G729a, very popular in WANs, uses E1 to handle up to 107 simultaneous calls interconnecting the new voice solutions by means of TDM circuits.

### TDM emulation

The network convergence has moved Service Providers to carry native E1 TDM traffic transparently across the packet switched network (PSN), using various circuit emulation techniques. The TDM traffic is encapsulated in Ethernet or IP frames to emulate the functionality of a TDM circuit, ensuring that all original feature sets are preserved. The AT-2048 will ensure that the jitter, typical of packet networks, is compliant with ITU-T O.172.



Smart Cisco Data Cables

(C) ALBEDO TELECOM

#### BENEFITS

- All in one: E1, Data, Jitter
- Designed in 2011
- Ultra high performance
- Double Port
- Extra rugged & lightweight
- Hand-held 1kg
- High value - low cost
- Very High accuracy
- SoftLEDs all events at a glance

#### KEY FEATURES

- Jitter/Wander test
- Touchscreen & mouse
- Pulse Mask
- Field tester extra rugged
- Cisco Data Cables
- X.21/V.11, V.35, V.36, V.24/V.28
- Analogue and VF test
- 2xUSB & RJ45Ports
- 24h on batteries

#### USERS

- E1 installers
- Mobile base stations
- Fixed line operators
- E1 Datacom Maintenance
- Electrical power utilities
- Air traffic control
- Frame Relay service
- Synchronization networks
- Defence links

E1 testing	
Connectors	<ul style="list-style-type: none"> <li>Port A: Unbalanced (BNC) 75 Ω and balanced (RJ-45) 120 Ω; Port B: Balanced (RJ-45) 120 Ω</li> <li>Port C: Unbalanced (BNC) 75 Ω Analogue voice frequency audio port</li> </ul>
Line	<ul style="list-style-type: none"> <li>Connection modes: E1 monitor, E1 endpoint, E1 mux, E1 demux, E1 through, G.703 / E0 endpoint, analogue</li> <li>Bidirectional testing (E1 monitor, E1 endpoint, E1 through) by simultaneous operation of Port A and Port B</li> <li>Configurable input impedance: nominal line impedance, PMP 20 dB, PMP 25 dB, PMP 30 dB, high impedance (&gt; 1000 Ω)</li> <li>Configurable output frequency offset within ±25,000 ppm around the nominal frequency</li> <li>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</li> </ul>
Frame	<ul style="list-style-type: none"> <li>2048 kb/s unframed, ITU-T G.704, ITU-T G.704 CRC, ITU-T G.704 CAS, ITU-T G.704 CRC + CAS</li> <li>Generation of custom NFAS spare bits (ITU-T G.704 frame with CRC-4 multiframe)</li> <li>CAS A, B, C, D bit generation for each voice channel. Generation of CAS multiframe spare bits (ITU-T G.704 frame with CAS multiframe)</li> </ul>
Patterns	<ul style="list-style-type: none"> <li>PRBS 9 (0.150, 0.153), PRBS 11 (0.150, 0.152, 0.153), PRBS 15 (0.150, 0.151), PRBS 20 (0.150, 0.153), PRBS 23 (0.150, 0.151), PRBS 9 inverted, PRBS 11 inverted, PRBS 15 inverted, PRBS 20 inverted, PRBS 23 inverted, all 0, all 1; User configurable 32 bit word</li> <li>Tone (10 Hz to 4000 Hz, +6 dBm to -60 dBm); External signal: Analogue, 64 kb/s G.703 / E0(AT-2048 only), Datacom interface</li> </ul>
Analysis	<ul style="list-style-type: none"> <li>Analogue: Attenuation (dB), freq. (Hz), freq. deviation (ppm), round trip delay (ms). Results include pass / fail indications</li> <li>Anomalies &amp; Defects: LOS, LOF, AIS, RAI, CRC-LOM, CAS-LOM, MAIS, MRAI, LSS, All 0, All 1, Code, FAS, CRC, REBE, MFAS, TSE, Slip</li> <li>Live and history LEDs for all Defects and Anomalies</li> <li>ITU-T G.821, G.826 and M.2100 performance results include Near / Far-end statistics, PASS / FAIL indications</li> <li>ITU-T G.711 occupation map and time slot analysis: maximum code, minimum code, average code, time slot level and frequency</li> <li>CAS A, B, C, D bit analysis; Drop to external output: Analogue, 64 kb/s codirectional (Port A only), data communications interface</li> </ul>
Events	<ul style="list-style-type: none"> <li>Physical: AIS, LOS; Frame: FAS, CRC, MFAS, REBE, LOF, MAIS, CAS-LOM, RAI, MRAI, CRC-LOM; Pattern: TSE, Slip, LSS, All 0, All 1</li> <li>Insertion modes: Single (anomalies), rate (anomalies), continuous (defects), burst of M (defects), M out of N (defects)</li> </ul>
Pulse Mask	<ul style="list-style-type: none"> <li>Measurement of pulse width, rise time, fall time, level, overshoot and undershoot (positive and negative pulses)</li> <li>Operation modes: Eye diagram or continuous run; Pass / Fail indication for compliance with ITU-T G.703 E1 mask</li> </ul>

Jitter & Wander	
Generation	<ul style="list-style-type: none"> <li>Waveform: sinusoidal; Freq. range: 1 μHz to 100 kHz; Resolution: 0.1 Hz (jitter), 1 μHz (wander)</li> <li>Amplitude: 0 – 1000 Uipp Max. depends on Freq.; Resolution: 1 mUipp or 1/10<sup>4</sup> configured value; Accuracy: better than 0.172</li> <li>Smooth amplitude changes in jitter range (10 Hz – 100 kHz); Intrinsic jitter &lt; 10 mUipp</li> </ul>
Jitter Analysis	<ul style="list-style-type: none"> <li>Freq range: 0.1Hz to 100kHz (locking time 10s), 1Hz to 100kHz (locking time 1s), 10Hz to 100kHz (locking time &lt; 1s)</li> <li>Amplitude: 0 to 1000 Uipp (single range) (max. depends on modulation Freq.); Resolution: 1 mUipp; Accuracy: better than ITU-T 0.172</li> <li>Results: peak to peak jitter, RMS jitter, maximum jitter (user resettable), hits detection and count (user selectable threshold)</li> <li>Filters: LP (f &lt; 100 kHz), LP+HP1 (20 Hz &lt; f &lt; 100 kHz), LP+HP2 (18 kHz &lt; f &lt; 100 kHz), LP+RMS (12 kHz &lt; f &lt; 100 kHz)</li> </ul>
Wander Analysis	<ul style="list-style-type: none"> <li>Open loop measurement method. Reference freq. required; Modulation Freq. range: 1 μHz to 10 Hz; Sampling: 50 Hz</li> <li>Modulation amplitude: 0 to ±2 s (single range); Accuracy: 2 ns</li> <li>Instantaneous: TIE, freq. offset &amp; drift; Built-in &amp; real-time Statistics: 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</li> </ul>

Datacom	
Interfaces	<ul style="list-style-type: none"> <li>V.24/V.28 asynchronous/synchronous (RS-232) from 50 b/s to 128 kb/s</li> <li>X.21/V.11, V.35, V.36 (RS-449), EIA-530 from 50 b/s to 2048 kb/s</li> </ul>
Operation	<ul style="list-style-type: none"> <li>Test pattern generation and analysis over a datacom interfaces</li> <li>Defects/ Anomalies: LOC, AIS, LSS, All 0, All 1, TSE, Slip; Analogue: Line attenuation (dB), Freq. (Hz), Freq. deviation (ppm)</li> </ul>

Miscellaneous	
E0/nx64	<ul style="list-style-type: none"> <li>Balanced (RJ-45) 120 W; Clock ITU-T G.703 contradirectional and centralized</li> <li>Bit rate N x 64 kb/s; Test pattern generation and analysis over co-directional interfaces</li> <li>Anomalies and Defect insertion and analysis: LOS, AIS, LSS, All 0, All 1, TSE, Slip</li> </ul>
Frame Relay	<ul style="list-style-type: none"> <li>Interfaces: X.21/V.11, V.35, V.36 (RS-449); EIA-530 / EIA-530A from 50 b/s to 2048 kb/s</li> <li>Settings: DLCI, Events, Long frames, short frames, Alignment errors, FCS errors, Frame abort count</li> <li>Statistics: Bandwidth, Maximum and minimum frame size; Frames with FECN, BECN and DE; Active DLCI list, LMI frame count</li> </ul>
Analogue	<ul style="list-style-type: none"> <li>Tone Generation (from 10 Hz to 4000 Hz, from 0 dBm to -60 dBm); Level and Freq.</li> <li>ITU-T G.711 analysis: maximum code, minimum code, average code.</li> </ul>
Synchronization	<ul style="list-style-type: none"> <li>Internal clock reference; External reference clock: 2,048 kb/s (ITU-T G.703), 2,048 kHz; Configurable input gain: 0 dB, -20 dB</li> </ul>

Platform	
Instrument	<ul style="list-style-type: none"> <li>Touchscreen 480 x 272 TFT, Mouse, USB &amp; Ethernet ports; SNMP, VNC support; Soft LEDs, 1 kg, 223 x 144 x 65mm; IP-54</li> <li>Rechargeable Batteries continuous working up to 24 hours</li> <li>Operating 0°C ~ 50° C Storage -20°C ~ 70°C; Humidity 5% ~ 95%</li> <li>All events at a glance: 2xLEDS executing logical OR and Multiple Soft LEDs in screen</li> </ul>

