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# Acterna T-BERD 310 Communications Analyzer

## All-in-One Optical Test Solution

The Acterna T-BERD 310 Communications Analyzer — the industry's landmark for optical test equipment — stands alone in its legacy of providing reliable, high-quality test results in the central office, mobile telephone switching office, laboratory, and manufacturing plant. Approved by more service providers than any other SONET tester, this all-in-one optical test instrument is the model of flexibility, testing power, and accuracy.

The T-BERD 310 can be ordered with all testing options: ATM, SONET, DS3, DS1/DS0 or it can be configured to meet specific network testing requirements. Then, as technology and networks change, T-BERD 310 customers can quickly upgrade their test instrument by ordering additional functionality that meets new test requirements. In addition, these options can be installed in the field without affecting any of the T-BERD 310's existing features. For example, if a customer uses the T-BERD 310 to verify DS3 circuits now, ATM, SONET, ORL, and DS1/DS0 test options can be added as needed, protecting past, present, and future investment.

The T-BERD 310's proven history and the industry's continued reliance on its performance demonstrate Acterna's strong commitment to delivering forward-looking test solutions that help companies improve the present and stay competitive in the future.

Using an efficient layered test strategy, the T-BERD 310 systematically detects and eliminates problems at various transport testing layers, which affect higher-layer services. The test instrument's software-based architecture enables the T-BERD 310 to integrate easily with other Acterna test solutions, providing customers with the advantages of a standardized testing platform that increases productivity and reduces equipment duplication and capital expenses.

### Highlights

- SONET/SDH/T-Carrier transmission testing from DS1 to OC48/STM-16 rates
- ATM testing capabilities for DS1, DS3, OC3, and OC12 rates
- Optical media testing (ORL, IL) at all optical rates up to OC48
- Upgradeable, rugged, portable unit ideal for use in central office, lab, mobile telephone switching office, and manufacturing floor

NIST, ISO, IEC, ANSI, NCSL, MIL-STD by [www.raeservices.com](http://www.raeservices.com)

### Physical layer testing

The T-BERD 310 performs a full range of physical-layer test functions. With one instrument, technicians can employ a full suite of physical-layer test features, such as DS3 pulse shape and jitter, bit-error-rate tests (BERT), and ATM simulations at multiple interface rates. This comprehensive test capability makes the T-BERD 310 the ideal instrument for installation and maintenance.

### Optical media testing

Using the T-BERD 310's optical media test option, technicians can verify proper output power and the stability of optical transmitters by measuring return loss, insertion loss, and optical power on both 1310 and 1550nm systems.

- Optical return loss testing  
Ensure results are within specification for the laser type, wavelength, and line rate. The T-BERD 310 uses a dual-wavelength optical continuous wave reflectometer source that measures the total amount of energy caused by reflections.

- Insertion loss testing  
Verify the end-to-end optical power loss is within the design parameters to prevent intermittent error or a total system failures. Insufficient insertion loss can cause receiver saturation and too much insertion loss can cause an unrecoverable signal.

### SONET testing

Designed with dual-wavelength laser technology, the T-BERD 310 can perform SONET testing at both 1310 and 1550 nm wavelengths. A full analysis of the results and easy-to-read LEDs provide all the data needed to diagnose and isolate problems quickly.

- Optical BER testing (figure 1)  
Identify misconfigured SONET/SDH multiplexers immediately and quickly check the path trace and pointer results to ensure the transmission quality of broadband traffic such as ATM.

- APS testing (figure 2)  
Use Through mode to inject errors on the actual SONET overhead while using the instrument as a SONET pass-through device to measure automatic protection switch (APS) time and side effects on the DS3 tributary.

- Automatic SONET, DS3, and DS1 signal synchronization  
Identify immediately the SONET payload type and DS3/DS1 framing and pattern with minimal setup and isolate incorrect equipment configurations.

- Synchronization messaging  
Evaluate SONET messages to prevent timing loops and easily verify clock integrity.

- Simultaneous results display  
View SONET, DS3, DS1, and DS0 results from a single test all at once and identify which signal is the source of errors.

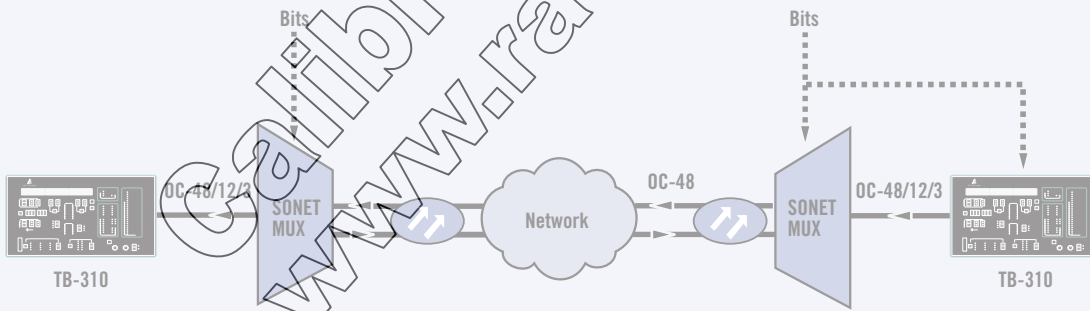


figure1 Optical BER testing

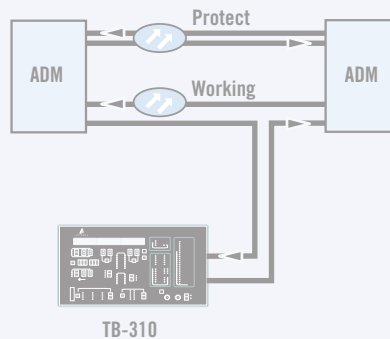


Figure 2 APS testing

### ATM Testing

The T-BERD 310's easy-to-use ATM features enable customers to perform comprehensive ATM layer testing and offer cell search and preview mode, cell loss and delay variation measurements, and OAM cell capabilities. Front panel ATM error and alarm insert function as well as front panel LEDs provide alarm notification and easy access to the ATM signal. Installers and maintainers use the T-BERD 310's unique, easy-to-use features to perform high-level tests and measurements.

- End-to-end stress test (figure 3)  
 Verify conformance to QoS standards (CBR/VBR traffic) by emulating the sustained and peak cell rate for a user-definable bandwidth and duration. Monitor side effects at the far end for delay variation, dropped cells, and network congestion and verify end-to-end connectivity using an Acterna user-definable test cell correlation tag that provides a unique call identification.
- Traffic bandwidth analysis  
 Qualify traffic patterns and verify conformance to a specified QoS.
- Delay variation  
 Measure fluctuations in cell interarrival time caused by congestion or statistical multiplexing to estimate single-point cell delay variation with minimal setup
- Cell transport verification  
 Isolate ATM congestion or configuration problems easily by measuring dropped, misinserted, or out-of-sequence cells.
- OAM support  
 Transmit AIS, RDI, and loopback cells to troubleshoot switch configuration problems and verify switch response.
- ATM cell search and preview  
 Display active cell addresses using Preview mode. Bandwidth percentage and cell types are updated in real time.
- User-defined transmit and receive cells  
 Store multiple ATM headers and assign bandwidths to stress specific ports or configure the receiver with a mask to filter specific cell types.

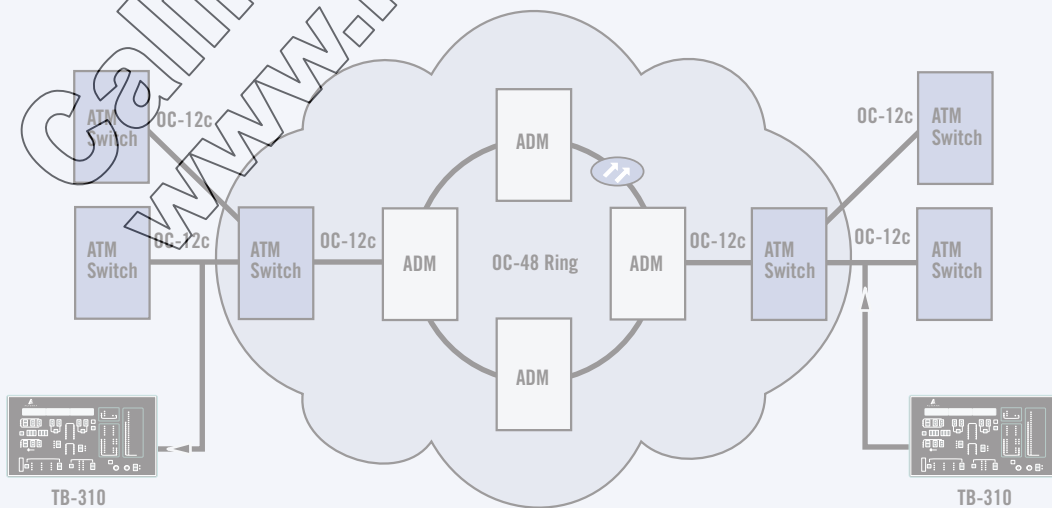


figure 3 End-to-end stress test

### DS3 testing

DS3 bandwidth supports a host of communications technologies, including cellular traffic, video conferencing, distributed data processing, and workstation-based graphics. The physical layer for ATM as well as for other transmission services that require higher layer error correction must be tested carefully to derive full network performance and prevent unnecessary cell retransmission. The T-BERD 310 performs full-featured DS3 monitoring and analysis using DS3 testing functions that include both in-service and out-of-service testing such as:

- Bidirectional DS3 testing  
 Monitor both directions independently. Analyze two live DS3 signals and isolate problems in half the time using two independent, simultaneous DS3 receivers. When errors are detected on either receiver, front panel LEDs indicate the results and customized print reports are generated automatically.
- Pulse shape and signal analysis (figure 5)  
 Identify connector and cabling troubles by measuring the DS3 pulse shape's conformance to 1991 and 1993 ANSI and ITU-T specifications. Quickly set signal levels during equipment installation and correlate error bursts with level dropouts and frequency variations. Print pulse shape graphs and verify adherence to pulse mask specifications.
- DS3 jitter analysis (figure 6)  
 Perform in-service DS3 jitter measurements to detect DS3 jitter caused by SONET/SDH pointer adjustments or perform frequency spectrum analysis on the demodulated jitter output signal. Set jitter thresholds for immediate notification of out-of-specification results.
- Multiplexed DS3 signals  
 Generate and receive multiplexed DS3 patterns while inserting errors on user-selectable DS1 channels. Insert a DS1 pattern into one or all channels to test and simulate 3:1 cross-connects or multiplexers. Test patterns, tones, loop codes, or errors can be inserted on one or all DS1 channels for additional testing flexibility. Front panel LEDs and display results indicate the DS2 frame status.
- DS3 FEAC loopcodes  
 Transmit DS3 FEAC loopcodes to sectionalize network problems and verify the functionality of DS3 NIUs. LEDs and the SUMMARY results indicate when incoming FEAC messages are received.

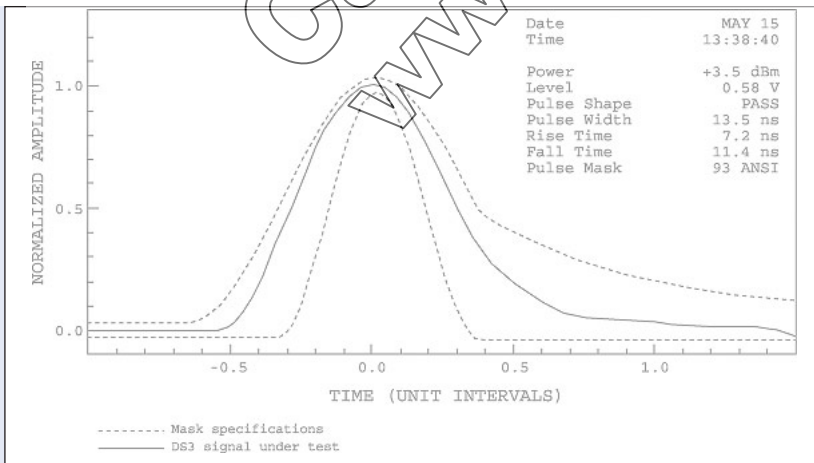


figure 5 Pulse shape and signal

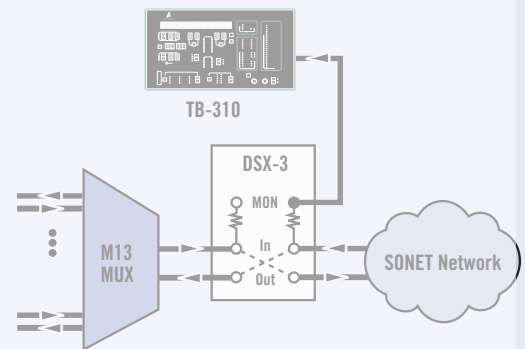


figure 6 DS3 jitter

**DS1/DS0 testing**

Providing unmatched flexibility, the T-BERD 310 can perform tests at a variety of test access points. When acting as a stand-alone DS1 test set, with the push of a button, the test set immediately begins analyzing DS1 tributaries at DS3 or SONET access points. In addition, in-service testing can be conducted using DS1 drop and insert on a live DS3 signal. Using the DS1/DS0 testing software, technicians can install, qualify, and troubleshoot DS1 signals with one test instrument and take advantage of the range of DS1/DS0 test functions.

- DS1 timing slips  
Identify clocking impairments, a common source of intermittent errors in asynchronous networks, and jitter in SONET networks. Access your DS1 timing reference from SONET, DS3, DS1, or BITS access points.
- Programmable loop codes and test patterns  
Use 3- to 8-bit programmable loop codes for nonstandard DS1 equipment. Or select standard in-band Facility 1; Facility 2; CSU; or out-of-band line, network, and payload. Use 3- to 24-bit programmable test patterns for custom tests or choose fixed, pseudo-random, or long-user patterns (LUP).

- DS1 scan and automatic payload detection  
Scan all 28 DS1s within a DS3 or SONET signal for framing format, errors, timing slips, AIS, CRC errors, and alarms in one step. Scan continuously or trigger and hold on specific DS1s that contain user-selectable error and alarm events. Reduce problem isolation time further by using automatic payload detection.
- DS0 analysis  
Verify voice quality or analyze signaling bits by dropping the voice channel from DS1 to OC-3 access points.
- ESF data link analysis  
Decode BITS synchronization messages to verify the quality of network timing sources. Analyze far-end performance report messages (PRMS) per ANSI T1.403. Generate PRMS simulating customer or carrier equipment. Transmit out-of-band line, payload, or network loop codes over the ESF datalink.

- Fractional T1 testing  
Provide verification of leased contiguous and noncontiguous channels. In addition, far-end ESF PRMs assist with single-ended turn-up

**Remote control option**

Acterna offers several remote control options for the T-BERD 310 as well as a suite of high-level, specialized software programs that enhance the T-BERD 310's power, flexibility, and ease of use.

**DTM and RTM**

The Windows-based DTM and the UNIX-based RTM software programs use a graphical user interface (GUI) to simulate the T-BERD 310's front panel on a PC, from where a technician can, in real time, remotely control or access the T-BERD 310 (or other Acterna test instruments). In addition to technicians being able to conduct comprehensive tests from a remote location, they also can perform tests using predefined sets of commands provided by the software's extensive array of script files.

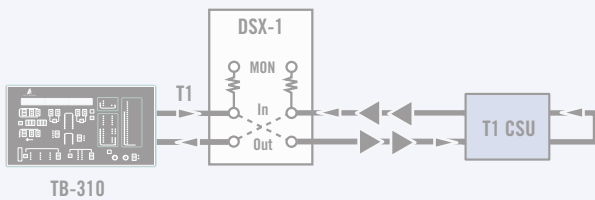


figure 7 DS1 BERT

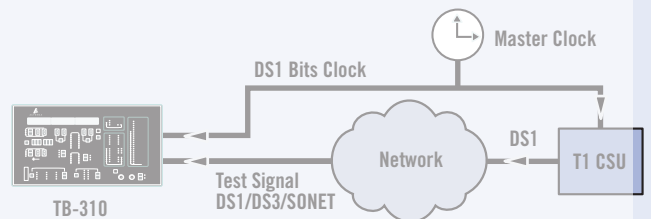


figure 8 Timing

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**Specifications**

**Mainframe**

**Dimensions and weight**

Standard chassis:

Overall dimensions (with cover) 6.5 x 14 x 18.7 in.  
 (16.5 x 35.6 x 47.5 cm)

Weight (with cover) 24.2 lb (11 kg)

**Environment**

Temperature range:

Operating 0° to 45° C (32° to 113° F)

Storage -40° to 70° C (-40° to 158° F)

Shock and vibration Meets or exceeds IEEE-743

**Power requirements**

Power supply provides automatic detection for either 115 VAC or 220 VAC, 90 to 264 VAC from 47 to 63 Hz.

Fuse 5A, 250V, Slo-Blo, 5x20 mm  
 (Little Fuse #218005 or equivalent)

**Compliances and specifications**

ISO-9001 Registered

NRTL Approved to Underwriters Laboratories (UL) specifications

CSA certified

FCC Part 15 approved

**DTM**

**T-BERD 310 requirements**

T-BERD 310 software

Rev. F or greater (basic T-BERD 310 interface)

Rev. G or greater (T-BERD 310-S user interface)

**Workstation requirements**

Windows operating system

Microsoft® Windows 3.1 or greater

Personal computer IBM-compatible PC  
 4 MB RAM  
 VGA or SVGA monitor  
 (16 color recommended)

**LABVIEW**

**T-BERD 310 requirements**

310-6 IEEE-488 option

**Workstation requirements**

Refer to the current National Instruments Corporation's Instrumentation Reference and Catalogue

**Order Information**

Model No.	Description
310	T-BERD Communications Analyzer (CLEI code: SNTQAA63AA; CPR code: 674296)
310-S	SONET/ATM user interface (CLEI code: SNTQAB93AA; CPR code: 099604)
310-6	IEEE-488 option (CLEI code: SNTQABD3AA; CPR code: 674303)
310-11	Three-Slot expansion option (CLEI code: SNTQAB13AA; CPR code: 674617)

Acterna Advantage<sup>SM</sup> – adding value with global services and solutions. From basic instrument support for your field technicians to management of complex, company-wide initiatives, Acterna's service professionals are committed to helping you maximize your return on investment. Whatever your needs – product support, system management, education services, or consulting and OSS (operations support system) business planning – we offer programs that will give you the competitive edge. Let us prove the foundation of Acterna Advantage.

Acterna is the world's largest provider of test and management solutions for optical transport, access and cable networks, and the second largest communications test company overall. Focused entirely on providing equipment, software, systems and services, Acterna helps customers develop, install, manufacture and maintain optical transport, access, cable, data/IP and wireless networks.

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