

# Acterna T-BERD Outside Plant Tester (2090SP)

Simplifying test procedures with one complete solution

Outside plant technicians have to perform a number of tasks: install apparatus cases and splice cables; locate and repair span faults such as bridged taps, load coils, shorts, opens; and verify that cable meets carrier requirements prior to Central Office or Customer Premise equipment installations. With this multitude of tasks, outside plant technicians need a solution that enables them to perform extensive physical layer testing in an all inclusive, easy-to-use test set.

The Acterna T-BERD Outside Plant Tester (209OSP) is a complete tool that meets the exclusive testing requirements of the outside plant technicians. It combines copper prequalification features (TDR and DC measurements) with service turn-up and troubleshooting features for T1/FT1/HDSL/ISDN /DDS technologies. The combination of copper analyzer and digital loop tester features makes the T-BERD Outside Plant Tester the most flexible, all-inone solution for outside plant testing.

# Highlights

- Copper analysis with DC measurements and graphical TDR
- Combined testing of digital services and circuits – T1, HDSL, DDS and ISDN
- Field-upgradeable software allows for building a custom test set
- Rugged NEMA 4X compliant design endures the harsh weather conditions
- Battery-powered operation allows for field-portable testing
- Reliable testing and proven performance



A complete solution, the T-BERD Outside Plant Tester provides:

- One tool, multiple tasks
   Cost savings through consolidation of multiple test capabilities and features (copper analysis, FT1/T1, HDSL, DDS, ISDN, span sectionalization) into a single test set
- Investment protection
   Customers can build a custom test set for their testing needs with an option of field-upgrading their unit later with additional features at a fraction of the cost of buying a new test set

## - Fast implementation

A variety of accessories and features with a common menu interface reduces training time for technicians and leads to quicker turn-ups and closures of trouble tickets

- Reliability

T-BERD's long-running reputation for designing reliable test equipment means customers can be assured that their test set will not incur unnecessary repair costs

## Applications

The T-BERD Outside Plant Tester can verify physical layer functionality by performing standard BER testing. In addition, it performs DC measurements to accurately identify copper faults. The TDR's graphical display allows the technician to view the respective faults and confirm the location, as well as the type of fault. Along with BER testing, the T-BERD Outside Plant Tester can use intelligent repeater technology to sectionalize span problems, while the preprogrammed loop codes enable the user to loopback various equipment on the span. When equipped with the HDSL/ISDN/DDS Measurement Option, the T-BERD Outside Plant Tester is able to perform loss measurements at various frequencies to assure proper signal level on the span for HDSL, ISDN, BRI, and DDS circuits.

# Test copper loops

In order to verify that the copper loop is able to support digital service such as a T1, the copper facility has to be tested. To effectively test the loop, technicians need a digital volt ohmmeter (DVOM) and TDR to determine the physical impairments and measure the distance to the fault. The T-BERD Outside Plant Tester's DC Measurement Option, along with the TDR Option, allow the technician to effectively prequalify the copper loop.

## **DC Measurement Option**

This option enables the T-BERD Outside Plant Tester to perform ohm, amp, and, voltage measurements:

- Ohm measurements' allow the technician to quickly identify physical impairments, such as opens, shorts, grounds, and one-side faults with automated resistance measurements between tip, ring, and ground
- 'Amp measurements' immediately detect one-side faults, such as opens and grounds, with an automated current measurement between tip and ring; Automated voltage measurements help isolate bad repeaters and span-powering problems



### **TDR Measurement Option**

This option locates copper faults. The T-BERD Outside Plant Tester can be easily configured for TDR measurement by selecting the cable type and approximate cable length being used. By completing these simple steps, the cumbersome process of determining complex constants such as pulse width and pulse height is avoided. Once the TDR is set up, the graphical display on the mainframe front panel allows the user to immediately view the TDR traces. A built-in zoom feature facilitates fault identification by focusing on copper faults such as bridged taps, splits, load coils, high-resistance opens, and bad splices. Fault identification is performed at the push of a button, with the distance to the fault displayed in feet.

# Turn Up and Troubleshoot FT1/T1 Circuits

The T-BERD Outside Plant Tester mainframe features a full-span T1 transmitter and receiver used to identify marginal troubles with all standard T1 stress patterns at various output levels. Automatic configuration and results with summary functions immediately identify the presence of T1 pulses, pattern, framing, and error status. Additionally, the mainframe can gualify T1 spans with automated MULTIPAT<sup>™</sup> and BRIDGTAP<sup>™</sup> stress patterns. To stress the entire T1 span and verify the error tolerance of network equipment, the T-BERD Outside Plant Tester can insert bit errors and BPVs.

#### Fractional T1 (FT1) Option

This option enables the T-BERD Outside Plant Tester to perform BER tests on selected channels in order to verify transmission on contiguous and noncontiguous FT1 bandwidth. It also allows the technician to verify VF circuit performance with 404, 1004, 2804, and 2713 Hz tones at various output levels.

Standard T1/FT1 BER testing provides the most accurate measure of pointto-point transmission performance by stress-testing the circuits to ensure proper circuit configuration. The advanced software options that complement T1/FT1 BER testing include: Advanced Stress Patterns Option, Channel Monitor Option, Enhanced ESF Option and Smart Loopback/Command Codes Option.

#### **Advanced Stress Patterns Option**

This option enables the technician to stress repeatered T1/FT1 circuits with a variety of stress patterns such as 55 octet, T1-DALY, and other long user patterns as recommended by the ANSI T1.403 standard.

#### **Channel Monitor Option**

With this option, the T-BERD Outside Plant Tester is able to simultaneously monitor ABCD bits of all 24 timeslots, listen to voice quality, and view the data bits of individual DSO channels.

# **Enhanced ESF Option**

This option adds testing flexibility to the T-BERD Outside Plant Tester. It enables the T-BERD Outside Plant Tester to decode ESF one-second broadcast performance report messages (PRMs) to verify remote in-service circuit performance. With this option, the T-BERD Outside Plant Tester can also emulate ANSI T1.403-compatible CSU equipment to verify proper operation during circuit installation and fault isolation as well as query performance monitoring NIU equipment to retrieve in-service performance data to verify remote circuit operation. This option supports Westell<sup>™</sup>equipment.

# Smart Loopback/Command Code Option

This option enables the T-BERD Outside Plant Tester to send and receive commands for maintenance switch operation to minimize circuit downtime and query performance data. This option supports Teltrend<sup>™</sup> and Westell equipment. In addition, this option enables the user to utilize intelligent repeater technology to qualify and isolate troubles on outside plant spans. The use of preprogrammed loopcodes for intelligent repeaters enables the T-BERD Outside Plant Tester to sectionalize span problems prior to dispatching maintenance personnel. It supports Teltrend<sup>™</sup>, Westell, Wescom<sup>™</sup>, XEL<sup>™</sup>, and TxPort<sup>™</sup> equipment. Please refer to figure 1.

# Test local loop for HDSL/ISDN/DDS circuits

When equipped with the 'HDSL/ISDN/ DDS Measurement Option', the T-BERD Outside Plant Tester is able to perform loss measurements at 28 kHz, 40 kHz, 48 kHz, 82 kHz, 163 kHz, 196 kHz, and 392 kHz to assure proper signal level at equipment inputs for HDSL, BRI, and DDS circuits. In addition, the user can ensure that the local loop does not exceed the customer service agreement requirements for maximum loop length, including bridged tap length, when provisioning HDSL, BRI, and DDS circuits. This option also includes preprogrammed HTU-C, HTU-R, and doubler loop codes, which enable the T-BERD Outside Plant Tester to quickly sectionalize transmission troubles. The option supports PairGain<sup>™</sup>, Tellabs<sup>™</sup>, Adtran<sup>™</sup>, Westell, and ADC<sup>™</sup> equipment. Please refer to figures 2 and 3.

#### Turn Up and Troubleshoot DLC systems

The DLC/DSO Analyzer Lid Option is a tool for verifying DLC/DSO circuits and contains features that perform the following functions:

- Full duplex channel monitor

The T-BERD Outside Plant Tester can decode signaling bits in both directions on all channels simultaneously. The technician can listen to either one or both directions of a VF circuit by dropping the channel(s) to the internal speaker or an external TIMS.

- Channel insert

Channel insert allows an internal test tone or voice and digits from an external butt-set to be inserted and controls signaling bits without disrupting the remaining active channels.



figure 1 Use preprogrammed loop codes to sectionalize span problems with the smart Loopback/Command Code Options



figure 2 Measure total length of the loop, including bridged taps, to verify that it meets CSA standards



figure 3 Measure signal loss to qualify loop integrity prior to circuit turn-up

### SLC-96 datalink monitor

The T-BERD Outside Plant Tester can capture major and minor shelf alarms, far-end loopback, line protection switches, and maintenance events in both directions for nonintrusive, in-service verification.

## SLC-96 datalink emulation

The user can verify central office switch and terminal response to alarms, far-end loopbacks, and line protection switches as well as execute test pair maintenance requests during system installation and in-service maintenance.

# Two-Wire VF input/output

The T-BERD Outside Plant Tester allows a butt-set to be connected for DTMF digit transmission, call placement, and talk path for subscriber maintenance and PBX applications.

# SLC-96 Mode 2 configuration timeslot assignment results

The T-BERD Outside Plant Tester can determine channel and timeslot assignment for systems configured for SLC-96 Mode2 concentrated applications. Please refer to figure 4.



figure 4 Ensure remote terminal operations, verify voice-grade service, and validate signaling transmissions during system qualifications

### Hardware accessories

Users can order accessories for the T-BERD Outside Plant Tester that can enhance the test set's functionality in performing a number of testing applications.

# Troubleshoot T1 spans – Repeater adapter

The repeater adapter enables the

T-BERD Outside Plant Tester to test repeatered spans with a single cable. During this process, the user can control test access to easily sectionalize span trouble. The repeater adapter allows testing toward the customer or central office as well as testing the repeater itself to sectionalize span trouble. It also provides an additional access point, at the repeater casing, along the T1 span.

## - Repeater power supply

The repeater power supply powers-up a T1 circuit from the main distribution frame (MDF) which allows the T-BERD Outside Plant Tester to test and qualify circuits prior to installation and connection of the central office repeater. If the span is longer than 17 repeaters, the user can select a current between 60 mA, 100 mA, and 140 mA to power-up longer spans. The repeater power supply displays span voltage and current for comparison with circuit design.

#### - Repeater power supply multiplexer

The repeater power supply multiplexer allows the user to switch automatically between T1s in the field. It can remotely switch power between up to six T1 spans and provide regenerative signal loopback for single-technician applications. It may be used with standard and intelligent line repeaters.

# Turn Up and Troubleshoot HDSL spans – HDSL doubler power supply

With the HDSL doubler power supply, the technician can access the span at the MDF and emulate the HDSL transmission unit at the central office (HTU-C) by housing the 220 mechanics HTU-C card. The HTU-C card inside the doubler power supply performs T1-to-HDSL conversion and supplies the appropriate span power. The front panels of the doubler power supply contain T1 jacks that allow the T-BERD Outside Plant Tester to perform BER testing. In addition, the T-BERD Outside Plant Tester can provide loopback capabilities using preprogrammed HTU-C, HTU-R, and doubler loopcodes.

#### - HDSL remote access shelf

With the HDSL remote access shelf, the user gains additional access points on the HDSL span. The shelf houses the HDSL transmission unit at the remote site, namely a standard 200/400-mechanics HTU-R card. Much like the HTU-C card within the HDSL doubler power supply performs T1-to-HDSL, the HTU-R within the remote access shelf performs the HDSL-to-T1 conversion. The remote access shelf also contains T1 jacks that allow the T-BERD Outside Plant Tester to perform BER testing.

## Package descriptions

#### 2090SP-P1

Mainframe, DC Measurements, TDR Measurements, Repeater Adapter

# 2090SP-P2

Mainframe, DC Measurements, TDR Measurements, HDSL/ISDN/DDS Measurements, Repeater Adapter 2090SP-P3

#### 203031-13

Mainframe, DC Measurements, TDR Measurements, Channel Monitor, Advanced Stress Patterns, Enhanced ESF, Smart Loopback/Command Codes,

FT1, Repeater Adapter

## 2090SP-P4

Mainframe, DC Measurements, TDR Measurements, Channel Monitor, Advanced Stress Patterns, Enhanced ESF, Smart Loopback/Command Codes, FT1, HDSL/ISDN/DDS Measurements, Repeater Adapter

#### Ordering information

Mainframe				
- 2090SP	T-BERD T-Carrier Analyzer			
Options				
- 2090SP-1	DC Measurements			
- 2090SP-2	TDR Measurements			
- 2090SP-3	Channel Monitor			
<b>-</b> 2090SP-4	Advanced Stress patterns			
- 2090SP-5	Enhanced ESF			
- 2090SP-6	Smart Loopback/Command Codes			
- 2090SP-7	Fractional T1			
- 2090SP-8	HDSL/ISDN/DDS Measurements			
- 2090SP-96	DLC/DS0 Analyzer Lid			
Upgrades				
- 2090SP-UPG1	Cable Qualification			
- 2090SP-UPG2	Advanced Services/Intelligent			
	Network Support			
- 2090SP-UPG3	HDSL/ISDN/DDS Measurements			
- 2090SP-UPG4	HDSL/Advanced Services/			
	Intelligent Network Support			
Accessories				
<b>-</b> 41084	T-BERD Repeater Power Supply			
<b>-</b> 43141				
T-BERD	Repeater Power Supply Multiplexer			
- 44116 T	-BERD HDSL Doubler Power Supply			
- 44527	T-BERD HDSL Remote Access Shelf			
<b>-</b> 41754	T-BERD Repeater Adapter			
<b>-</b> 41157	T-BERD Repeater Extender			
- PR-40A	Thermal Graphics Printer with			
	Carrying Case			
- 10966	Thermal Printer Paper			
- CC-42215	Soft Carrying Case for Outside			
	Plant Tester			
- CC-42632	Soft Carrying Case for Repeater			
	Power Supply			
- CC-OSPLID	Soft Carrying Case for Outside			
	Plant Tester Lid			

# Technical specifications

#### Mainframe specifications

**Operating modes** 

- Self Test
- Automatic Configuration
- T1 Unframed
- **-** T1 D4
- T1 ESF
- T1 SLC Framed
- T1 DID Framed
- FT1 D4 Framed\*
- FT1 ESF Framed\*
- T1 Test Loopback
- T1 Line Loopback
- Repeater Test\*
- DC Measurements\*
- TDR Measurements\*
- HDSL Measurements\*
- SMARTNIU Measurements\*
- Patterns
- All Ones
- 1:1
- 1:7
- 2 in 8
- 3 in 24
- **-** 63\*
- **-** 511\*
- **-** 2047\*
- T1 QRSS
- BRIDGTAP™
- MULTIPAT™
- Programmable (3 to 24 bits) (3)
- All Zeroes
- 404, 1004, 2804, 2713 Hz\*
- T1-Daly
- T1-2/96\*
- **–** T1-3/54\*
- 11-3/34
- **-** T1-4/120\*
- **-** T1-5/53\*
- 55 Octet\*
- MIN/MAX\*

# Input and output connectors

- WECO 310, T1 Repeater Port,

- 8 pin RS-232, RJ48

#### Input impedance

тиристтрецансе	
- BRIDGE	1000 W with ALBO
- TERM	100 W with ALBO
<ul> <li>DSX-MON</li> </ul>	100 W with AGC
Receive level	
<ul> <li>BRIDGE or TERM</li> </ul>	+6 to –35 dBdsx
<ul> <li>DSX-MON</li> </ul>	+6 to –24 dBdsx

## Level measurement

- +6.0 to -40.0 dBdsx,
- +6.0 to -6.0: 0.1 dB resolution
- -6.0 to -40.0: 0.5 db resolution

- 1 Hz resolution; 5 ppm a	iccuracy
Transmit timing sources	
- Internal Clock	
- Recovered Clock	
Line codes	
– AMI, B8Zs	
Loopback codes	
- CSU	
- CSU Line (ESF)	
<ul> <li>CSU Payload (ESF)</li> </ul>	
- NIU (FAC1, FAC2, FAC3)	
<ul> <li>NIU Network (ESF)</li> </ul>	
- Programmable (3 to 8 bi	it)
<ul> <li>Intelligent Repeaters*</li> </ul>	
<ul> <li>HDSL End-Equipment*</li> </ul>	
DC measurements*	
- Resistance	10 W to 10 MW
<ul> <li>Volts DC</li> </ul>	0.5 to 400 VDC
<ul> <li>Simplex Current</li> </ul>	0 to 200 mA
TDR measurements*	
<ul> <li>Pulse Amplitude</li> </ul>	10.0 V р-р
– Measurement Range	50 to 10,500 ft
HDSL measurements*	
– Loop Loss	0.0 dB to 40.0 dB
<ul> <li>Accuracy</li> </ul>	±0.5 dB
<ul> <li>Resolution</li> </ul>	0.1 dB
<ul> <li>Loop Length</li> </ul>	100 to 20,000 ft
<ul> <li>Capacitance</li> </ul>	1500 pF to 323,500 pF
<ul> <li>Power</li> </ul>	-40.0 to +13.0 dBm
Power	
<ul> <li>AC Operating and Charg</li> </ul>	ing Power
1	15 VAC ±10%, 50-60 Hz
<ul> <li>Battery Type</li> </ul>	Lead Acid
<ul> <li>Battery Operation</li> </ul>	5 hours (nominal)
<ul> <li>Battery Charging Time</li> </ul>	8 hours (nominal)
Physical characteristics	
<ul> <li>Enclosure Dimensions (h</li> </ul>	ı x w x d)
	7.0 x 13.6 x 7.8 in
	(17.8 x 34.5 x 19.8 cm)
– Weight	1.4 lb (5.6 kg)
Operational characteristic	25
<ul> <li>Battery Operating Tempe</li> </ul>	erature20 to 50°C
<ul> <li>AC Operating Temperatu</li> </ul>	re -20 to 40°C
<ul> <li>Storage Temperature</li> </ul>	-20 to 60°C
<ul> <li>DLC/DS0 Specifications</li> </ul>	

Frequency measurement

\*Optional

DLC/DSO lid specification	15				
- Automatic Configuratio	n				
- SLC-M1 (SLC-6 Mode 1	– SLC-M1 (SLC-6 Mode 1) Framed				
- SLC-M2 (SLC-96 Mode	2) Framed				
- T1 DID Framed					
- T1 D4 Framed					
<ul> <li>T1 ESF Framed</li> </ul>					
Channel insert sources					
<ul> <li>VF PCM Tones</li> </ul>	404, 1001, 2804 Hz				
	-16, -10, -3, 0, +3 dBm				
- Two-Wire VF Interface					
Signaling insert sources					
<b>–</b> A, B, C, D					
– On-hook, Off-hook, Rin	g				
Datalink insert sources					
– Major Alarm	Shelf A, B, C, D, No Shelf				
– Minor Alarm					
- Power/Miscellaneous A	larm				
<ul> <li>Far-end Loopback</li> </ul>	Shelf A, B, C, D, Protect				
- Switch to Protect	Shelf A, B, C, D				
<ul> <li>Maintenance Test</li> </ul>					
- Idle					
Input and output connec	tors				
- WECO 310, Two-Wire V	F Posts				
Input impedance					
- BRIDGE	1000 W with ALBO				
- TERM	100 W with ALBO				
<ul> <li>DSX-MON</li> </ul>	100 W with AGC				
Line codes					
– AMI, B8ZS					
Power					
$-115$ VAC $\pm 10\%$ , 50-60	) Hz				
Physical characteristics					
- Enclosure Dimensions	(h x w x d)				
	7.8 x 13.7 x 4.4 in				
– Weight	4.5 lb (2.0 kg)				
<b>Operational characterist</b>	ics				
<ul> <li>Operating Temperature</li> </ul>	32 to 122°F				
	(0 to 50°C)				

\*Optional

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