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T-BERD<sup>®</sup> 224

PCM Analyzer



**T**1, Fractional T1 (FT1), ISDN, SS7, DDS, TR-303, STS-1, DS3 – there is a constant demand for new services and technologies. Testing multiple services used to mean purchasing multiple test sets. Now, one test set provides a complete testing solution for *all* of these services – TTC's T-BERD® 224 PCM Analyzer. The T-BERD 224 is equally at home in the central office (CO), in the mobile telephone switching office (MTSO), in the PBX network center, in the development lab, and on the production floor.

With over 8,000 T-BERD 224s in use today, and an industry-leading three-year warranty, the quality and proven reliability of the T-BERD 224 is well established.

## The T-BERD 224 Mainframe and T1 BERT Option

The T-BERD 224 mainframe's straightforward functionality offers flexibility and power that is unmatched in any channel access test set. Use the T-BERD 224 to monitor the status of in-service circuits, to troubleshoot out-of-service circuits with a complete set of stress patterns, and to isolate faulty equipment or circuit impairments. The T-BERD 224's field-upgradeable software options enable you to build a custom set for every testing need. The T1 BERT Option enables you to stress test the entire T1 circuit. Test the error tolerance of network equipment by inserting single, burst, variable-rate BPVs, frame errors, and logic errors.



*The T-BERD 224 offers unmatched flexibility and power in one test set.*

### Highlights

- Automatic configuration and results summary functions immediately identify framing, pattern, and error status. All controls and indicators are on the front panel to save time in training, test setup, and operation
- Loop smart jacks and CSUs with in-band and out-of-band loop codes to verify T1 circuits with a single test set
- Detect differences in system timing between two T1 inputs. Immediately identify and isolate network synchronization problems
- Sectionalize the T1 link with non-intrusive bidirectional monitoring. Count bipolar violations (BPVs), frame errors, and cyclic redundancy checks (CRCs). Measure the receive signal levels (volts, dBdsx) and frequencies for both T1 inputs
- Verify extended superframe (ESF) to D4 conversions, and monitor with split framing on the T1 inputs
- Monitor on hook/off hook conditions and drop selected DS0s to audio output or perform further testing with other T-BERD 224 option packages
- Test the full T1 span with a wide range of test patterns
- Drop (receive) and insert (transmit) on any of the 24 channels from any T1 access point, while maintaining service on the remaining 23 channels

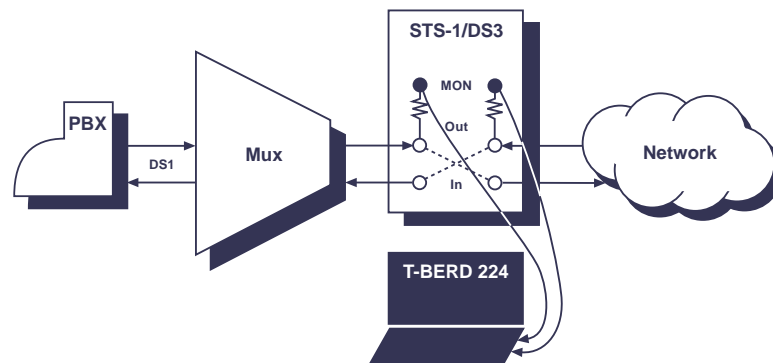
## SONET/DS3 Analysis Option

Test SONET (STS-1) and DS3 networks, down to the DS1 or DS0 level, quickly and easily with the SONET/DS3 Analyzer Option. This option gives the T-BERD 224 test access to the services and data from STS-1 (52 Mb/s) or DS3 (45 Mb/s) access, and adds STS-1/DS3 testing to the T-BERD 224's robust DS1/DS0 testing capabilities.

This *field-upgradeable* option attaches to the T-BERD 224's front panel and doesn't add any additional size to the mainframe.

### Highlights

- Dual STS-1 and DS3 receivers provide easy analysis of *both* directions of the signal
- Scan and automatically detect the signal type and framing format on both the primary and secondary receivers
- Drop selected DS1s or VT1.5s from incoming STS-1 or DS3 to the T-BERD 224 mainframe for DS1/DS0 analysis
- Insert a DS1 from the T-BERD 224 mainframe into a selected DS1 or VT1.5 on a STS-1 or DS3
- Qualify STS-1 and DS3 circuits with an array of BERT patterns for both M13 and C-bit framing
- Insert and detect STS-1 and DS3 alarms and errors



*DS1/DS0 Testing from STS-1/DS3 Access*



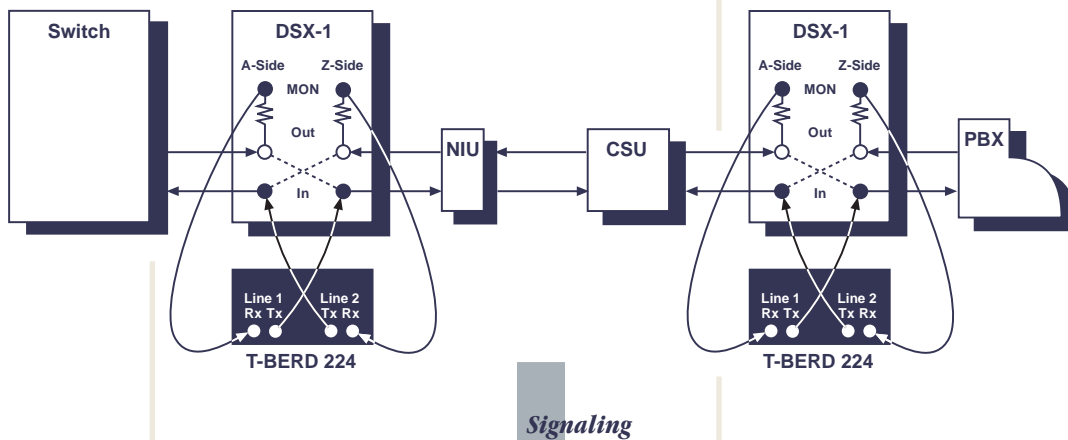
**S**ignaling – the process of transferring call status and routing information – is crucial to the delivery of communications services. The T-BERD 224's signaling functionality includes two options, the Signaling Option and the Digit Analysis Option.

## Signaling and Digit Analysis Options

The Signaling Option enables you to test the ability of a switch/PBX to handle incoming calls and allows you to emulate switch-to-switch communications. Additionally, the T-BERD 224 can non-intrusively capture and display all digits and supervision events without pre-programming sequences. The Digit Analysis Option adds the capability to analyze the captured information (e.g., wink timing, interdigit timing, and digit frequency and level).

### Highlights

- Send/receive DTMF, MF, or DP digits to/from switches and PBXs
- Scan any combination of the 24 channels on a T1 circuit for signaling activity. Seize the first active channel and analyze digit/supervision events to troubleshoot intermittent problems
- Dial-up, simulate, and test Switched 56 circuits from the customer premise or CO
- Dial-up and test VF circuits



## FT1 Option

The FT1 Option provides: drop and insert capability, a full complement of T1 and DDS test patterns for troubleshooting FT1 circuits, and insertion of single, burst, or variable rate BPVs and logic errors across the fractional bandwidth.

### Highlights

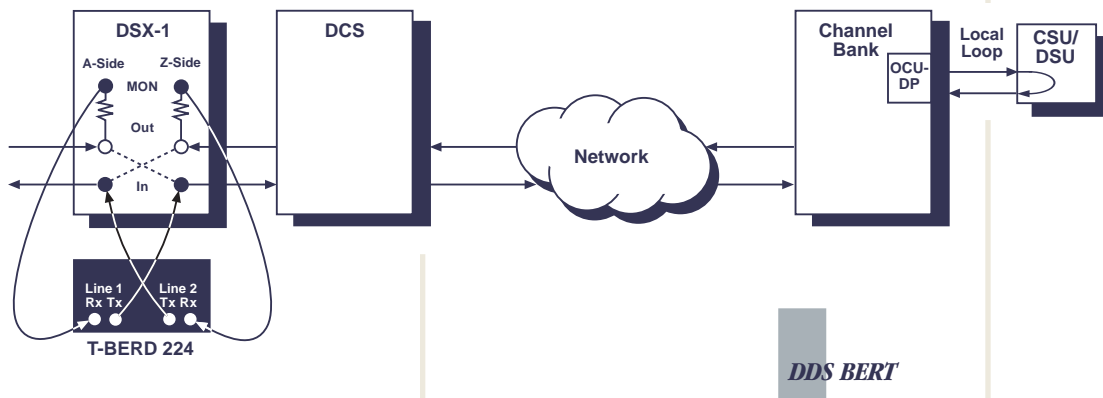
- Test contiguous and non-contiguous Nx56 and Nx64 FT1 circuits
- Incorporate new ANSI standard FT1 loop codes. Perform single set testing of FT1 circuits from a convenient T1 access point
- Completely qualifies and tests new FT1 circuits before connecting customer premises equipment
- Measure the round trip path delay of any channel in the T1. Verify that excessive circuit delays do not impact circuit performance

## DDS Option

The DDS Option provides the flexibility to monitor and test DDS circuits from a T1 access point. Loop DDS circuits using alternating and latching OCU, DSU, and other loop codes. Test DDS circuits with a full range of test patterns, including 63, 511, 2047, and Bellcore standard DDS stress patterns (DDS-1 through DDS-6).

### Highlights

- Test both DS0A and DS0B formatted DDS circuits at rates from 2.4 kb/s to 64 kb/s. Test various DDS rates and formats from one location using one test set
- Measure the round trip path delay of any channel in the T1. Verify that excessive circuit delays do not impact circuit performance
- Insert single, burst, or variable rate BPVs, frame, and logic errors at various subrates



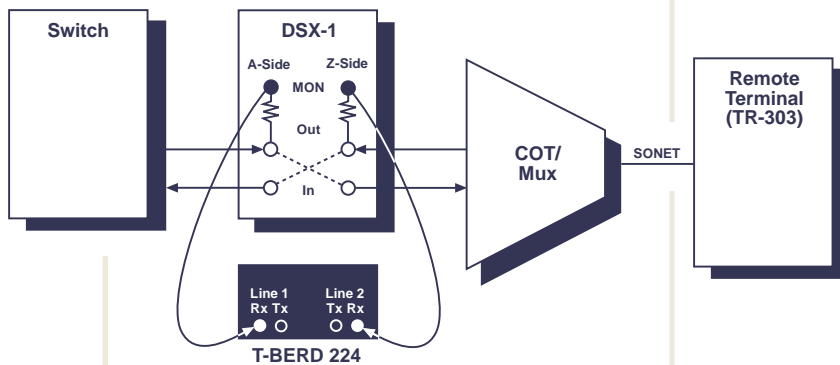


## TR-303 Option

Bellcore's TR-303 standard offers a number of benefits over SLC<sup>®</sup>-96, its predecessor technology. The TR-303 Option enables you to track TR-303 calls based on the subscriber's line number and/or the call type (POTS or Basic Rate ISDN). Determine the source of the call (CO or remote terminal (RT) originated), and the DS1/DS0 channel assignment, in real-time. Also, this option enables you to verify specific Embedded Operations Channel (EOC) logical link operation. Whether you are testing at the CO, from a RT, or in the development lab, the TR-303 Option provides a practical, easy-to-use solution.

### Highlights

- Non-intrusively monitors Timeslot Management Channel (TMC) and EOC
- Supports TMC layer 2/layer3 protocols and EOC layer 2 protocol
- Verify that a call is successfully established, or determine why a call was not completed, by examining the call state and protocol cause value
- Verify EOC logical link operation by capturing Information and Receive Ready (RR) frames for a specific SAPI/TEI



*TR-303 Monitoring*



## Primary Rate ISDN Option

The Primary Rate ISDN Option provides a complete and easy-to-use solution for testing ISDN by non-intrusively monitoring PRI LINKS from any T1 access point.

### Highlights

- Non-intrusively monitor layer 2 (LAPD) and layer 3 (Q.931) messages on Primary Rate ISDN D channel
- Filter ISDN calls by call type, calling number and/or called number
- Count total packets, FCS errored packets, discarded packets, information packets and RR packets
- Verify that a call is successfully established or determine why a call was not completed by examining the protocol cause value

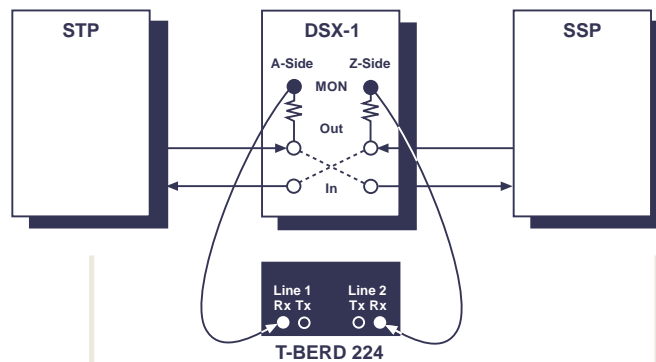
## SS7 Call Trace Option

Track call activity and instantly target the source of problems with the SS7 Call Trace Option's continuous SS7 link monitoring. Simply lock onto a specific call, track all call processing messages and monitor SS7 link statistics. Immediate test results display the called and calling numbers, origination and destination point codes and other vital statistics.

### Highlights

- Access the SS7 facility link from DS1, DS3, and STS-1 access points
- Non-intrusively monitor SS7 link statistics, such as layer 2 messages, percent utilization, FCS errored packet count, and MSU, LSSU and FISU packet count
- Expertly report a thorough range of layer 3 SS7 messages: call state, called number, calling number, call origination source, call destination source and cause value
- Trace and display call processing messages
- Isolate transmission and protocol problems between service switching points (SSP), signal transfer points (STP) and service control points (SCP)

*SS7 Call Trace*

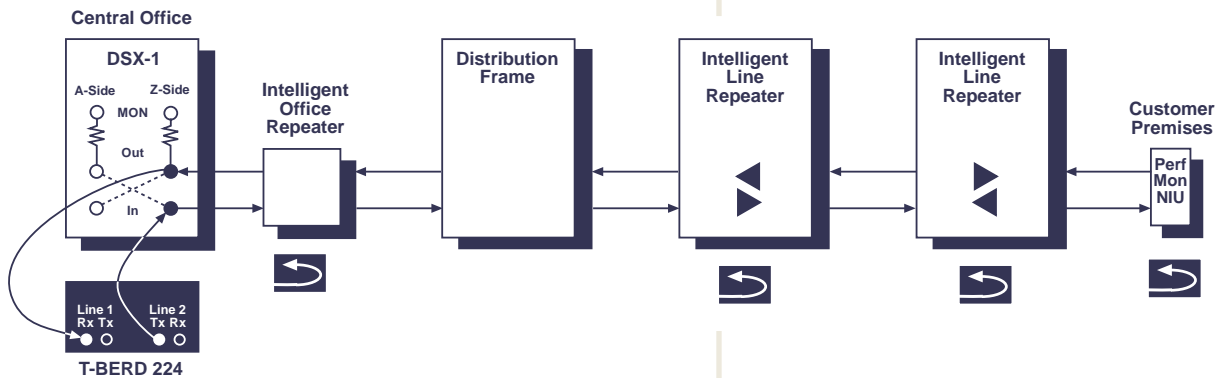


## Smart Loopback/Command Codes Option

Take full advantage of intelligent network equipment's capabilities for improved circuit turn-up efficiency and on-going maintenance. Utilize loopable repeater technology to qualify and maintain outside plant T1 spans, query performance monitoring NIU equipment, and retrieve in-service performance data to verify remote circuit operation. Send and receive commands for maintenance switch operation to minimize circuit downtime and query performance data.

### Highlights

- Choose from a variety of intelligent equipment vendors and models
- Utilize pre-programmed loop codes for intelligent repeaters to sectionalize span problems prior to dispatching maintenance personnel
- Query remote performance monitoring NIUs to isolate network and equipment troubles



Smart Loopback/Command Codes

## Voice Frequency (VF) Option

The VF Option tests voice or data grade VF circuits from T1 access with digital signal processing (DSP) accuracy, and gives you full-range testing to provide complete circuit analysis.

### Highlights

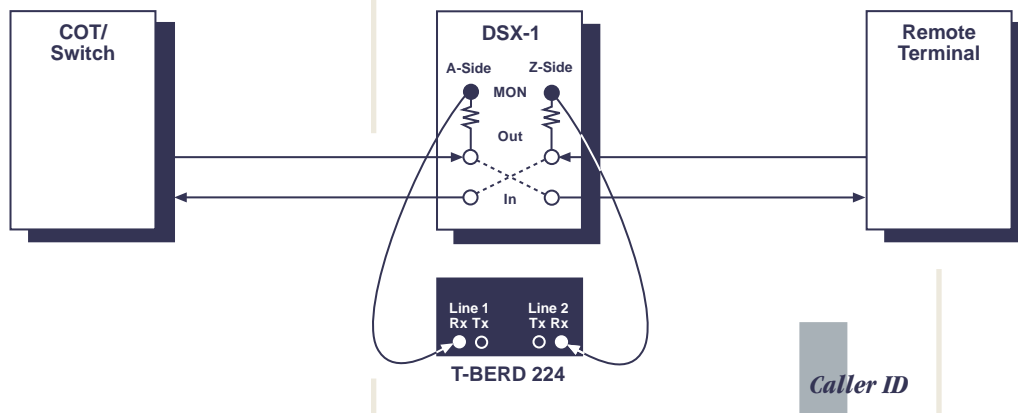
- Perform peak-to-average ratio (P/AR) and frequency sweep tests to determine if data-grade circuits meet engineering specifications
- Measure echo return loss on voice-grade PCM channels to determine the magnitude of talker echo
- Qualify voice-grade circuits from any digital access point by measuring C-message, C-notch, 3 kHz flat, 3 kHz-notch, and signal noise on any PCM channel in the T1
- Perform 3-tone slope and other tone tests on any channel using drop and insert while maintaining service on the remaining channels

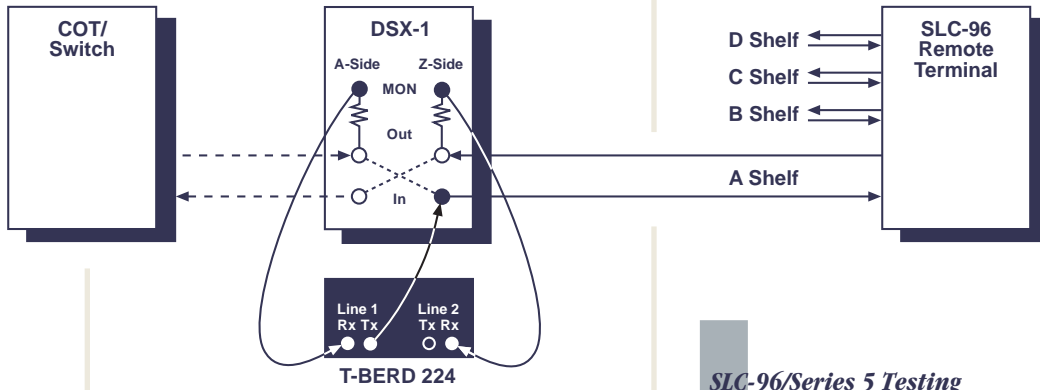
## Caller ID Option

When you support Caller ID services, you need a tool that verifies Caller ID performance from a T1 access point. The Caller ID Option enables you to monitor Caller ID FSK data from the T1, and resolve intermittent Caller ID problems on selected T1 channels. Access from the T1 can improve turn-up efficiency and decrease unnecessary dispatches to the field.

### Highlights

- Monitor Caller ID FSK data from any T1 access point
- Scan preselected T1 channels for the first ringing activity to resolve intermittent Caller ID problems
- Measure frequency, level, and timing parameters
- Calculate and compare checksums to verify Caller ID data





SLC-96/Series 5 Testing

## Enhanced ESF/SLC Option

The Enhanced ESF/SLC Option adds testing flexibility to your network. Capture and display embedded data link information for complete ESF and SLC-96/Series 5 circuit testing; receive and transmit one-second broadcasts generated by ESF CSUs and other equipment; perform full-duplex error analysis from a single T1 access point; and non-intrusively capture shelf alarms, far-end loops, line protection switching, and maintenance events on SLC-96 circuits.

### Highlights (ESF)

- Decode, display, and transmit performance report messages (PRMs) for ESF circuits
- Measure far-end BPV, frame, and CRC errors
- Transmit one-second broadcast messages generated by ESF CSUs and other equipment

### Highlights (SLC)

- Decode, display, and transmit alarms, protection switching, loop commands, and ringing signals for SLC-96 (Modes 1 and 2) and SLC Series 5 circuits
- Non-intrusively capture shelf alarms, far-end loops, line protection switching, and maintenance events on SLC-96 circuits

## G.821 Performance Option

Evaluate long-term performance with ITU-T recommended analysis. This option enables you to measure G.821 results, including severely errored seconds, percent severely errored seconds, degraded minutes, percent degraded minutes, unavailable seconds, percent availability, and consecutive severely errored seconds.

## Advanced Stress Patterns Option

The Advanced Stress Patterns Option enables you to stress T1, FT1, and DDS networks with the following patterns: DDS-5, DDS-6, T1-2/TRIP, T1-3, T1-4, T1-5, T1-6, 55 OCTET, and T1 DALY.

**T**hree specialized software programs: TTC's Distributed Test Manager™ (DTM), Remote Test Manager® (RTM), and LabVIEW® from National Instruments Corporation™, go beyond remote control to expand the T-BERD 224's capabilities as a distributed test instrument. (See *The TTC Remote Test Manager* and *LabVIEW Drivers for TTC Test Instruments* data sheets.)

## DTM and RTM

DTM is a Windows®-based software program that emulates the T-BERD 224 front panel in real-time, allowing you to remotely control the T-BERD 224 (or other TTC test instruments) from your PC, or access it from a remote site. DTM makes your PC a cost-effective platform for wide area transmission tests, and extends the reach of your field technicians. This speeds up the time it takes to troubleshoot problems, and optimizes a technician's time in the field.

DTM saves on training costs too, by enabling centrally located technicians to perform comprehensive tests at remote locations. You can centrally locate troubleshooting expertise, and solve network problems faster. DTM enables you to cut and paste test results into spreadsheets or other Windows applications. DTM creates a virtual front panel for the T-BERD 224, so if you know how to use the T-BERD 224 – you will know how to use DTM.



*DTM and RTM extend the range of your T-BERD 224 and network maintenance personnel.*

RTM is a specialized software package that provides a graphical user interface of the T-BERD 224 front panel on a UNIX platform. RTM enables you to control multiple remotely-located T-BERD 224's from SUN SPARC™ workstations. An extensive array of script files enables you to perform predefined sets of commands.

## TTC Customer Care

TTC Customer Care starts with a three-year warranty on all mainframes<sup>1</sup> and includes repair and calibration capabilities worldwide. TTC also offers extended warranty options, as well as service/calibration plans to meet your unique needs. To complement our instruments and systems, TTC's Technical Assistance Center engineers offer expert consultation on any technical problem from 8 a.m. to 8 p.m. Monday through Friday, EST (1-800-638-2049 or 1-301-353-1550). And to support your changing testing applications and technologies, TTC provides practical, hands-on training that can be tailored to your specific needs.

<sup>1</sup>See product manual for exclusions.

## Options

<i>Model No.</i>	<i>Description</i>		
224	T-BERD PCM Analyzer	12709	SS7/Primary Rate ISDN Option
224-1	T-BERD SONET/DS3 Analyzer	13963	Smart Loopback/Command Codes Option
41500	T1/FT1/DDS BER Testing Bundle	13964	Caller ID Option
43016	T1 BERT Option	14875	TR-303 Option
13466	FT1 Option	11704	Enhanced ESF/SLC Option
13467	DDS Option	11772	RS-232/RS-449/V.35 Dual DSU Data Port Option
12041	G.821 Performance Option	41249	RS-232/V.35 DSU Data Port Option
12042	Advanced Stress Patterns Option	11425	ZBTSI Framing Option
42659	DSP Option Board	41243	IEEE-488 Remote Control Option
41502	VF Testing Option	12043	Advanced Software Upgrade Option
41934	Signaling Option		
12708	Digit Analysis Option		



*The T-BERD 224's side panel offers many options for testing.*



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