## Product Highlights

- Combines multiple service testing capabilities in a single test instrument

- Performs extensive testing for services from DS0 to DS3

- Enables VF circuit testing from a digital access point

- Provides protocol testing by verifying both layer 2 and layer 3 communications for GR-303, ISDN PRI, and SS7 protocols

- Allows remote access and control from Windows®-based systems

- Includes field-upgradeable software and hardware options

- Offers an established reputation for reliable testing and proven performance

## Application Highlights

- Perform standard T1 BER testing and signal analysis measurements

- Drop and insert on any of the 24 channels from any T1 access point

- Scan any combination of the 24 channels on a T1 circuit for signaling activity and seize the first active channel for analysis of digits and supervisory events

- Perform PBX emulation and digit and events analysis to verify proper switch translations

- 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

- Qualify STS-1 and DS3 circuits with an array of BERT patterns for both M13 and C-bit framing

- Monitor and test DDS circuits from a T1 access point

- Utilize preprogrammed loop codes for intelligent repeaters to sectionalize span problems

- Monitor SS7, GR-303, and ISDN PRI protocols to verify the health of the link and potential protocol problems

ACTERNA™
The Keepers of Communications

Today's increased network complexity requires constant turn-up testing and troubleshooting for the growing number of services and protocols. The Acterna Channel Access Tester—a single instrument unmatched in its ability to perform multiple services testing—tests VF, DDS, FT1, T1, DS3, and STS-1 services as well as ISDN PRI, SS7, and GR-303 protocols. With more than 13,000 Channel Access Testers in use today, this one, highly reliable test instrument is equally at home in the central office (CO), the mobile telephone switching office (MTSO), the PBX network center, and the development lab as well as on the production floor.

## Applications

The Channel Access Tester's mainframe offers flexibility and power that is unmatched by any channel access test set on the market.

### Turn Up and Troubleshoot FT1/T1 Circuits

Users can monitor the status of in-service circuits, troubleshoot out-of-service circuits with a complete set of stress patterns, and isolate faulty equipment or circuit impairments as well as build a custom set for every testing need with the Channel Access Tester's field-upgradeable software options.

### T1 BERT Option

The Channel Access Tester mainframe with the T1 BERT Option enables the user to troubleshoot the entire T1 circuit and test the error tolerance of network equipment by inserting single burst, variable-rate bipolar violations (BPVs), frame errors, and logic errors. Through automatic configuration and results summary functions, framing, pattern, and error status are immediately identified. The two transmitters and receivers provide several different test modes that include Terminate, Drop and Insert, and Dual Receiver Monitoring. While in Dual Receiver Monitoring mode, the user can none intrusively sectionalize the T1 link; count BPVs, frame errors, and cyclic redundancy checks (CRCs); and measure the receive signal levels (volts, dBdsx) and frequencies for both T1 inputs. In addition, the test set can be used to terminate the circuit and perform turn-up and out-of-service troubleshooting using Terminate mode. And by placing the Channel Access Tester in Drop and Insert mode, the user can test a particular channel out of T1 without affecting the rest of the traffic.

### FT1 Option

The FT1 Option allows users to turn-up and troubleshoot contiguous and noncontiguous Nx56 and Nx64 FT1 circuits. When the Channel Access Tester is placed in Terminate mode, the user can completely qualify and test new FT1 circuits before connecting customer premises equipment (CPE). In addition, the test set has drop and insert capabilities and a full complement of T1 and DDS test patterns for troubleshooting FT1 circuits. And similar to the T1 BERT Option, the FT1 Option inserts single, burst, or variable-rate BPVs and logic errors across the fractional bandwidth.

### Advanced Stress Patterns Option

The Advanced Stress Patterns Option allows the user to test T1, FT1, and DDS networks with a variety of stress patterns including DDS-5, DDS-6, T1-2/TRIP, T1-3, T1-4, T1-5, T1-6, 55 octet, and T1-DALY. These advanced stress patterns help to verify the good health of the link and confirm that it is able to sustain the quality of service required.

### G.821 Option

The G.821 Option provides the measurement of the G.821 results, including severely errored seconds, percentage of severely errored seconds, degraded minutes, percentage of degraded minutes, unavailable seconds, percentage of availability, and consecutive severely errored seconds. These advance measurement results give the user greater insight into the link performance and can indicate marginal problems that have the potential to cause future problems.

### Smart Loopback/Command Codes Option

The Smart Loopback/Command Code Options supports a variety of intelligent equipment, enabling the Channel Access Tester to use preprogrammed loop codes for intelligent repeaters, which can help sectionalize span problems before dispatching maintenance personnel.

This options also allows the user to query performance monitoring NIU equipment, use loopable repeater technology to qualify and maintain outside plant T1 spans, and retrieve in-service performance data to verify remote circuit operation. By sending and receiving commands for maintenance switch operation, the user can minimize circuit downtime and query performance data.

# www.valuetronics.com

## Caller ID Option

The Caller ID Option enables the Channel Access Tester to verify caller ID performance from a T1 access point by monitoring caller ID FSK data; scanning preselected T1 channels for the first ringing activity to resolve intermittent caller ID problems; measuring frequency, level, and timing parameters; and calculating and comparing checksums to verify caller ID data. Access from the T1 can improve turn-up efficiency and decrease unnecessary dispatches to the field.



**T-BERD Channel Access Tester**
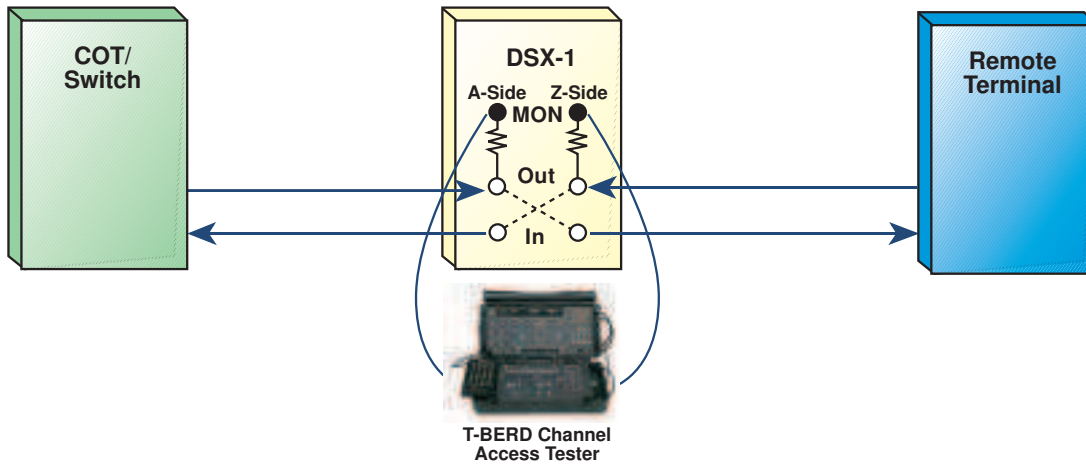
*Caller ID*

## *Test SLC Systems*

### Enhanced ESF/SLC Option

The Enhanced ESF/SLC Option adds testing flexibility to the network. It enables the Channel Access Tester to capture and display embedded data link information for complete ESF and SLC-96 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 nonintrusively capture shelf alarms, far-end loops, line protection switching, and maintenance events on SLC-96 circuits.

The Channel Access Tester with ESF capabilities allows for:
- Decoding, displaying, and transmitting performance report messages for ESF circuits
- Measuring far-end BPVs and frame and CRC errors
- Transmitting one-second broadcast messages generated by ESF CSUs and other equipment

The Channel Access Tester with SLC capabilities allows for:
- Decoding, displaying, and transmitting alarms, protection switching, loop commands, and ringing signals for SLC-96 (modes 1 and 2) and SLC Series 5 circuits
- Capturing, nonintrusively, shelf alarms, far-end loops, line protection switching, and maintenance events on SLC-96 circuits.

## *Turn Up and Troubleshoot DDS Circuits*

### DDS Option

The DDS Option provides the flexibility to monitor and test DDS circuits from a T1 access point using Dual-receiver Monitoring, Drop and Insert, and Terminate modes. By measuring the round-trip path delay of any channel in the T1, the user can verify that excessive circuit delays do not impact circuit performance. Moreover, this option offers testing of both DS0A and DS0B formatted DDS circuits at rates from 2.4 kbps to 64 kbps. When turning up and troubleshooting circuits, users can loop DDS circuits using alternating and latching OCU, DSU, and other loop codes, which allows them to test DDS circuit using various test patterns such as Bellcore standard DDS stress patterns (DDS-1 through DDS-6). By inserting single, burst, or variable-rate BPVs and frame and logic errors, the user can test the physical layer at various subrates.

# www.valuetronics.com

## Perform Signaling and Digit Analysis

### Signaling Option

The Signaling Option enables the Channel Access Tester to test the ability of a switch/PBX to handle incoming calls and emulate switch-to-switch communications. Additionally, in Dual-receiver Monitoring mode, the Channel Access Tester can nonintrusively capture and display all digits and supervision events without preprogramming sequences. The Digit Analysis Option adds the capability to analyze the captured information such as wink timing, inter-digit timing, and digit frequency and level. The combination of these two Options allows the user to send and receive DTMF, MF, or DP digits to and from switches and PBXs. In addition, the Channel Access Tester can scan any combination of the 24 channels on a T1 circuit for signaling activity and seize the first active channel for analysis. Once the physical link is verified, with these two Options the user can dial up and test the service on VF circuits.

This level of extensive testing ensures that proper PBX and switch operation can be verified through call origination, call termination, verification signaling, and in-depth event and digit measurements.



Signaling
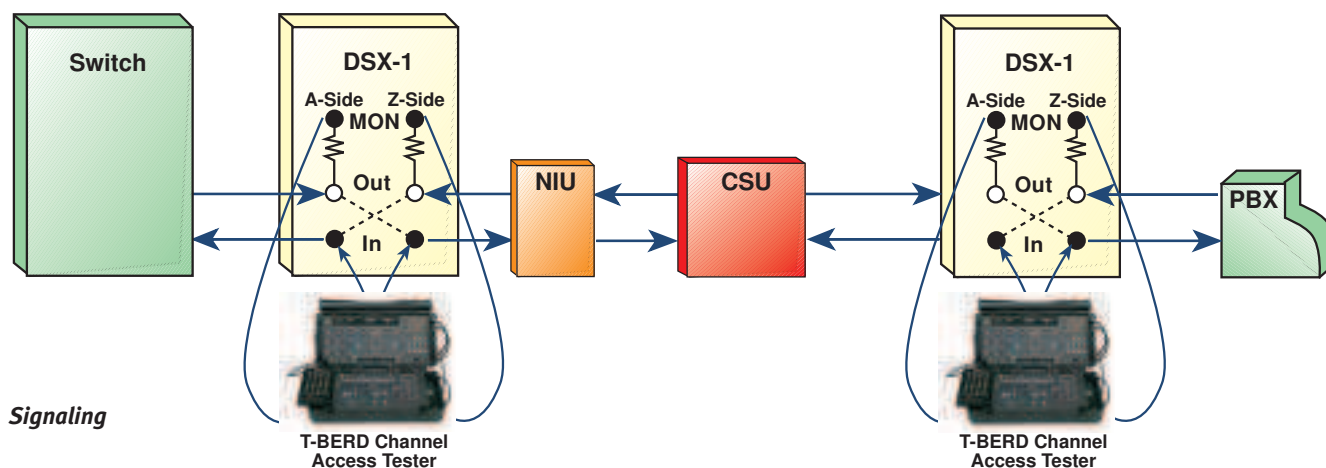
## Test Voice and Data-Grade Voice Frequency Circuits

### Voice Frequency Option

The Voice Frequency (VF) Option tests voice or data grade VF circuits from a T1 access point and provides a full range of testing functions for complete circuit analysis. With this option, the user can qualify voice-grade circuits from any digital access point by performing loss and signal noise measurements on any of the 24 channels within T1. When equipped with the VF Option, the Channel Access Tester can perform peak-to-average ratio (P/AR) and frequency sweep tests to determine if data-grade circuits meet engineering specifications. In addition, this Option allows the user to measure echo return loss on voice-grade PCM channels to determine the magnitude of talker echo. The user can carry out three-tone slope and other loss measurements using various filters (C-message, C-notch, 3 kHz flat, 3 kHz-notch), using drop and insert on any T1 channel while maintaining service on the remaining channels.

## Perform SS7 Protocol Analysis

### SS7 Call Trace Option

The SS7 Call Trace Option allows the Channel Access Tester to monitor the SS7 link by decoding layer 2 and layer 3 link statistics and information. Performing two tasks—link statistics and call trace—this option is an ideal tool for performing in-service troubleshooting of protocol translations from the access network. When equipped with this option, the Channel Access Tester is able to continuously monitor the health of the SS7 link as well as track all call processing messages.

When performing the link statistics task, the Channel Access Tester nonintrusively monitors all SS7 layer 2 messages. The results provide information about the percentage of utilization, FCS errored packet count, and message signal unit (MSU), link status signal unit (LSSU), and fill-in signal unit (FISU) packet counts. Call trace allows the user to trace and display call processing messages and expertly report a thorough range of layer 3 SS7 messages that include called state, called number, calling number, call type, network identification, call origination source, call disconnect source, and cause values. By verifying link traffic and usage, the user is able to isolate transmission and protocol problems between service switching points (SSP), signal transfer points (STP), and service control points (SCP) in the SS7 network.

# www.valuetronics.com

## Analyze Primary Rate ISDN

### Primary Rate ISDN Option

The Primary Rate ISDN Option allows the Channel Access Tester to nonintrusively monitor link statistics over ISDN PRI networks as well as perform call tracing over the ISDN D-channel. When equipped with this option, the Channel Access Tester can monitor layer 2 (LAPD) and layer 3 (Q.931) cause code messages on the D-channel, verify that a call is successfully established, or determine why a call was not completed by examining the protocol cause values. Much like the SS7 Call Trace Option, the ISDN PRI Option consists of two tasks: link statistics and call trace.

During the link statistics task, the Channel Access Tester nonintrusively monitors all layer 2 (LAPD) messages on the ISDN PRI D-channel. Test results provide information about the packets on each line and classify them as good, CRC errored, or discarded as well as provide counts for all information and receiver-ready packets. The call trace task, based on decoding layer 3 messages, enables the user to trace and display call processing messages and report cause value messages associated with disconnected calls. The user is able to filter ISDN calls by call type, calling number, and/or called number and verify why a call was not completed by examining the protocol cause values.

## Analyze GR-303 Protocol

### GR-303 Option

The GR-303 Option allows the Channel Access Tester to monitor link statistics and perform call tracing over integrated and digital loop carrier (IDSL) from a DS1 access point. This Option also consists of the link statistics and call trace tasks.

The link statistics task enables the Channel Access Tester to monitor all layer 2 (LAPD) messages on the timeslot management channel and embedded operations channel. Test results count packets on each line and classify them as good, CRC errored, or discarded as well as report CRC errored seconds and error rate. In addition, information frames and receiver ready frames are captured and counted so that a specific SAPI/TEI, EOC logical link operation can be verified. During the call trace task, the user can verify that a call is successfully established or determine why a call was not completed by examining call state and protocol cause values. Test results provide information about call state, line value, call type (POTS or ISDN BRI), DS1/DS0 assignment, origination, and disconnect source as well as cause values that display why or how the call was disconnected.



*TR-303 Monitoring*
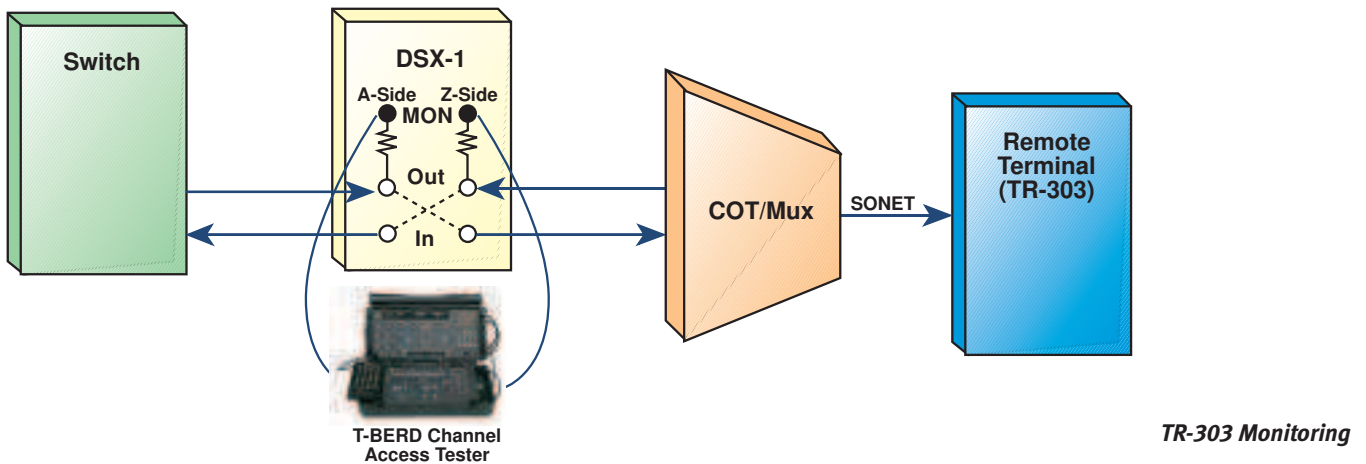
## Test Circuits Remotely

### DTM32 Option

DTM32 is a Windows-based software program that emulates the Channel Access Tester front panel in real time, allowing the user to remotely control the test set from the PC or access it from a remote site. This presents a cost-effective platform for wide area transmission tests and extends the reach of the field technicians.
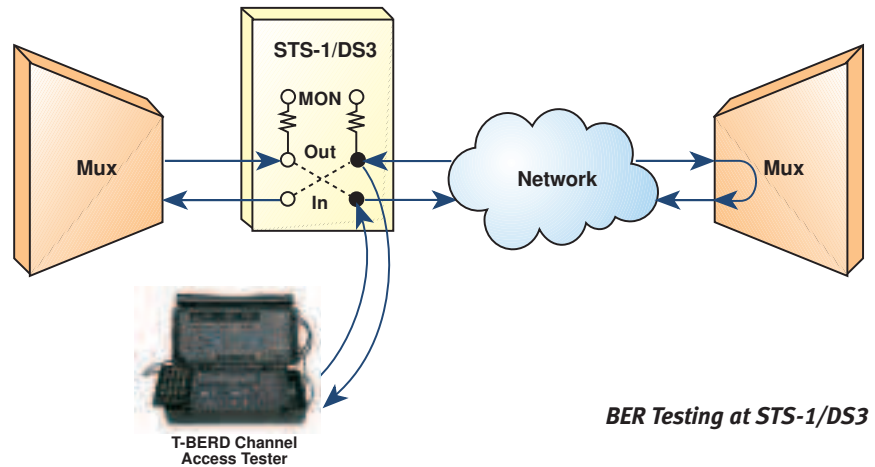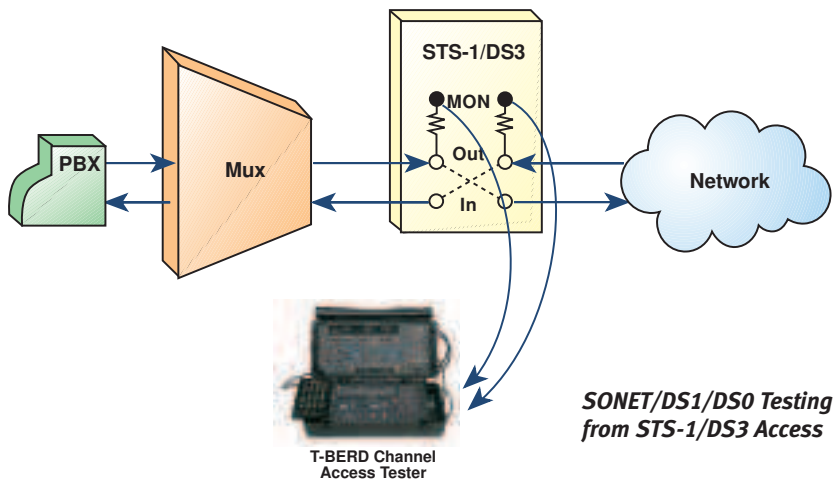
DTM32 saves on training costs, too, enabling centrally located technicians to perform comprehensive tests at remote locations, which allows network problems to be resolved rapidly.

# www.valuetronics.com

4

# Hardware Option

## SONET/DS3 Analyzer Lid

The SONET/DS3 Analyzer Option Lid enables the Channel Access Tester to quickly and easily test STS-1 (52 Mbps) and DS3 (45 Mbps) networks down to the DS1/DS0 level and adds STS-1/DS3 testing to the test set's robust DS1/DS0 testing capabilities. While in the field, the user can quickly and easily attach the lid to the Channel Access Tester's front panel without increasing the size of the mainframe.

Dual STS-1 and DS3 receivers make analyzing the signal in both directions easy by enabling the user to scan and automatically detect the signal type and framing format on both the primary and secondary receivers. With this lid the Channel Access Tester can drop selected DS1s or VT1.5s from incoming STS-1 or DS3 signals to the Channel Access Tester mainframe for DS1/DS0 analysis. In addition, the Channel Access Tester can insert a DS1 from the mainframe into a selected DS1 or VT1.5 on a STS-1 or DS3 signal. To verify the continuity of the link, the user can place the test set in Terminate mode to insert and detect STS-1 and DS3 alarms and errors as well as to transmit and receive SONET path trace messages.

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

T-BERD Channel Access Tester

BER Testing at STS-1/DS3

T-BERD Channel Access Tester

www.valuetronics.com

# Ordering Information

## Options

**220V Option**
Channel Access Tester

**224V**
Channel Access Tester SONET/DS3

**11425**
ZBTSI Framing Option

**11704**
Enhanced ESF/SLC Option

**11772**
RS223/449/V.35 Data Port

**12042**
Advanced Stress Pattern Option

**12708**
Digit Analysis Option

**12710**
SS7 with Call Trace Option

**13466**
Fractional T1 Option

**13467**
DDS Option

**13963**
Smart Loopback Command Codes

**13964**
Caller ID Option

**14875**
Primary Rate ISDN Option

**41249**
RS232/V.35 DSU Data Port

**41441**
RS232/449 DSU Data Port

**41502**
VF Option

**41934**
Signaling Option

**41934-SW**
Signaling Option for use with 224-1

**42659**
DSP Option Board

## Accessories

**224-LID**
TB224 Replacement Lid

**CC-41306**
TB224 Soft Carrying Case

**224 DS1/DS3 CB PKG**
Channel Access Tester Cable Package

**RM-41444-01**
TB224, 19" Rack Mount

**RMX-41444-02**
TB224, 19" to 23" Rack Mount Extender

**RM-42138**
Signaling Lid, 19" Rack Mount

**41404**
Side Panel Cover Plate

**www.valuetronics.com**

# Technical Specificitions
## *Mainframe and T1 BERT*

**Dimensions and Weight**
Overall Dimensions . . . . . . . . . . . . . . . . . . . . . . . .6.5 x 14 x 11 in
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .(16.5 x 35.6 x 27.9 cm)
Weight . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .14 lbs (6.4 kg)

**Environment**
Temperature Range . . . . . . . . . . . . . . . . . . . .0 to 45°C (operating)
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .-40 to 70°C (storage)

**Power Requirements**
115/230 VAC ±10%

**Operating Modes**
Automatic configuration to incoming D4, SLC®-96, ESF, and
EFSz[1] framing
T1 Framed:
    D1D
    D2
    D3/D4
    SLC-96
    ESF
    ESFz[1]
    ESF/D[4]
T1 Test Loopback
T1 Line Loopback

---

[1] Requires ZBTSI Option.
[2] Requires T1 BERT Option.

**Test Patterns[2]**
All Ones
All Zeros
Min/Max
$2^{23}$ -1
$2^{20}$ -1
$2^{15}$ -1
$2^{15}$ -1 INV
QRSS
3 in 24
1:7
Auto Configuration

**Insert Sources (Mainframe Only)**
1004 Hz
VF Interface
DS0 Interface

**Input/Output Connectors**
Line 1:
WECO 310, Bantam
Line 2:
WECO 310, Bantam

**Transmit Timing Sources**
Recovered Clock (Line 1 or 2)

Internal Clock
External Clock (BNC Connector)

**Oscillator Accuracy**
1.544 MHz ±5 ppm

**Frequency Measurement**
1 Hz resolution; ±5 ppm accuracy

**Signal Loss**
No pulse detected for 150 ms

**Excess Zeros**
16 or more consecutive zeros are detected

**Frame Loss Sync**
D1D, D2:
    2 frame errors out of 4 frame bits
D3/D4, SLC-96:
    2 frame errors out of 4 frame bits
ESF, ESFz[1]:
    2 frame errors out of 4 frame bits

**Pattern Sync Loss**
250 or more errors are detected in 1000 or fewer bits

**B8ZS**
Code is not detected for 150 ms

**Yellow Alarm**
D1D, D2, D3/D4, and SLC-96 declared when bit
2 set to "0" for 255 consecutive DS0 channels

**Alarm Indication Signal (AIS)**
2048 consecutive confirmed ones

**T1 Level Measurement**
+6.0 dBdsx to -40.0 dBdsx:
    +6.0 to -6.0: 0.1 dB resolution
    -6.0 to -40.0: 0.5 dB resolution
+23.0 dBm to -23.5 dBm:
    0.1 dBm resolution
+7.0 dBm to -13.5 dBm:
    0.5 dBm resolution
+12.0 to +0.05 V p-p:
    0.01 V p-p resolution

**Remote Control**
RS-232
IEEE-488[3]

**VF Interfaces**
2-wire:
    Connectors: Metallic Posts (for butt set)
4-wire:
    Connectors: WECO 310 jacks
Impedance:
    600 ohms

**www.valuetronics.com**

**DSo Interface**

Bipolar Data Connectors:
  Bantam jacks

Clock Output Connectors:
  9-pin D female

64 kHz Bit and 8 kHz Byte Clocks:
  TTL and differential outputs

---

3 Requires IEEE-488 Option.

# SONET/DS3 Analyzer Option

**Dimensions and Weight**

Overall Dimensions . . . . . . . . . . . . . . . . . . . . . . . . .6.5 x 14 x 3 in

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . .(16.5 x 35.6 x 7.62 cm)

Weight . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .1.5 lbs (0.85 kg)

**Environment**

Temperature Range . . . . . . . . . . . . . . . . . . .0 to 45 °C (operating)

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .-40 to 70 °C (storage)

**Power Requirements**

Powered by mainframe

**Operating Modes**

Automatic configuration to STS-1 and DS3 signals with the framing and payload types listed below:

  STS/DS3-M13

  STS/DS3-C-bit

  STS/VT1.5

  DS3-M13

  DS3-C-bit

  DS3-Unframed

**Test Patterns/Formats**

$2^{23}$ -1

$2^{20}$ -1

$2^{15}$ -1

1010 (Blue)

1100 (Idle)

All Ones

Muxed

DS1 Drop & Insert

**Input/Output Connectors**

Primary Rx, Secondary Rx, and Transmitter:
  WECO 560A jacks

DS1 Bits Clock:
  Bantam

**Transmit Timing**

STS-1:
  Internal
  Recovered
  DS1 Bits

DS3:
  Internal
  Recovered

**Oscillator Accuracy**

STS-1:
  51.840 MHz (center) ±6 ppm, payload ±130 ppm

DS3:
  44.736 MHz (center) ±6 ppm

# DTM

**T-BERD 224 Requirements**

Rev. E software or greater

**PC 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)

Modem Support:
  Hayes-compatible modem (AT command set)
  1200 baud minimum
  9600 baud maximum

# RTM®

**T-BERD 224 Requirements**

Rev. F software or greater

**Workstation Requirements**

Hardware:
  SUN SPARC station II or higher
  16 MB RAM
  10 MB disk space
  15 in monitor capable of 8-bit color at 1152 x 768
  LAN/WAN server for remote access (optional)

Software:
  SUN OS 4.1.x (Solaris 1.1.x)
  X11/R4 or higher
  OSF/Motif 1.2 or higher

Modem Support:
  Hayes-compatible modem (AT command set)
  1200 baud minimum
  9600 baud maximum

**www.valuetronics.com**

TB224/A/DS/LL/SAN/08-01

## Regional Sales Headquarters

**Global Headquarters**
20400 Observation Drive
Germantown, Maryland 20876-4023 USA
Toll Free 1-800-638-2049
Tel +1-301-353-1550
Fax +1-301-444-8468
www.acterna.com

**North America**
20400 Observation Drive
Germantown, Maryland 20876-4023 USA
**Toll Free** 1-800-638-2049
**Tel** +1-301-353-1550
**Fax** +1-301-444-8468

**Latin America**
Av. Eng. Luis Carlos Berrini
936 8/9. Andar
04571-000 Sao Paulo, SP
Brazil
**Tel** +55 11 5503 3800
**Fax** +55 11 5505 1598

**Asia/Pacific**
42 Clarendon Street
PO Box 141
South Melbourne, Victoria 3205
Australia
**Tel** +61 3 9690 6700
**Fax** +61 3 9690 6750

**Western Europe**
Arbachtalstrasse 6
72800 Eningen u.A.
Germany
**Tel** +49 7121 86 2222
**Fax** +49 7121 86 1222

**Eastern Europe, Middle East & Africa**
Elisabethstrasse 36
PO Box 13
2500 Baden
Austria
**Tel** +43 2252 85 521 0
**Fax** +43 2252 80 727

1st Neopalimovskiy Per. 15/7 (4th floor)
119121 Moscow
Russia
**Tel** +7 095 248 2508
**Fax** +7 095 248 4189

**ISO 9001 CERTIFIED**   C E

Acterna is present in more than 80 countries. To find your local sales office, go to www.acterna.com

**ACTERNA**™
The Keepers of Communications

# www.valuetronics.com