



High-Speed Datacom Testing with the Multi-Services Application Module (MSAM)

T-BERD®/MTS-6000A



The T-BERD/MTS-6000A platform is the industry's most compact and powerful multi-function tester that tests:

- Datacom and conditioned diphas (CDI)
- Legacy TDM and SONET/SDH
- Carrier-grade Ethernet and IP services at multiple layers

With field applications for servicing metro core telecom networks, wireless/cable switch centers, backhaul networks, government telecommunications, and network equipment manufacturer field installation and support groups, the MSAM is the latest innovation for the award-winning, industry-leading T-BERD/MTS family of test solutions.

The datacom physical interface module (PIM) adds test functionality for verifying end-to-end circuit continuity and throughput, stressing and verifying clock recovery circuits, and verifying quality of service (QoS) over datacom circuits, including RS232/V.24, EIA530, EIA530A, V.35/306, RS449/V.36, X.21, MIL-188C, and MIL-188-114. The new conditioned diphas PIM adds support for testing diphas multiplexers and communication links.

This addition of datacom testing lets technicians easily migrate from datacom to fiber to time-division multiplexing (TDM) (DS1/3, OC-3/12/48/192), fibre channel, optical transport network (OTN), link capacity adjustment scheme (LCAS), and Ethernet technologies, and enjoy the size of a handheld tester—all in one instrument.

Key Features

- Datacom testing for EIA530, EIA530A, RS449/V.36, RS232/V.24, X.21, V.35 serial interfaces
- Supports government standards for MIL-188C and MIL-188-114
- Interface module for conditioned diphas (CDI) testing
- Synchronous/asynchronous DTE/DCE modes of operation
- ANSI and ITU BER patterns with data rate support up to 20 Mbps
- Compatible with FIREBERD 6000A, FIREBERD 8000, and FIREBERD 6000 for datacom testing



Beyond Datacom

Traffic Generation

The T-BERD/MTS-6000A includes all common bit error rate (BER) patterns including those found in the Viavi Solutions FIREBERD 6000A (FB-6000A) and FIREBERD 8000 (FB-8000). This enables the T-BERD/MTS-6000A to run an end-to-end test in conjunction with a FB-8000, FB-6000A, FB-6000, FB-60000M, MC-6000, or FB-4000.

Internal, External, and Recovered Clock Capabilities

The T-BERD/MTS-6000A provides the same timing options as the legacy Fireberd platforms including internal, external, interface, and recovered. In balanced V:11 modes, the T-BERD/MTS-6000A supports synchronous clocking up to 20 Mbps. The recovered clocking option also allows the T-BERD/MTS-6000A to extract clocking from the receiver data signals up to 10 Mbps.

“Virtual Breakout Box” Functionality

Easy-to-interpret “soft” light emitting diodes (LEDs) on the T-BERD/MTS-6000A provide technicians with information regarding the state of the signaling and data leads of the circuit under test, much like a breakout box. In addition, user-controllable signaling leads (CTS, RTS, RLSD, DTR, DSR, RI, TM, RL, and LL) are available. The combination of LEDs and signal lead manipulation allows for complete flow-control troubleshooting.

Conditioned Diphas Testing

The CDI module transmits and receives modulated conditioned diphas signals, allowing the T-BERD/MTS-6000A to test diphas multiplexers and communication links.

Remote Operation, Results Storage, and Event Logs

The T-BERD/MTS-6000A can be remotely controlled with VNC over an IP connection or SCPI commands over a serial connection. Removable storage media can be connected to the T-BERD/MTS-6000A, facilitating the storage of test results for external reporting and analysis. Customized printouts are also available showing only the specified results, allowing for quick detection of hard-to-find BER problems and easy interpretation of test results. Event logs help troubleshoot intermittent problems by displaying errors which have occurred over time.

Battery Operation

In keeping with the portable requirements of today’s technicians, the T-BERD/MTS-6000A can be battery operated to maximize its portability, particularly in environments where AC power is unavailable or unreliable.

Durability

The T-BERD/MTS-6000A was built with ruggedness in mind.

Applications

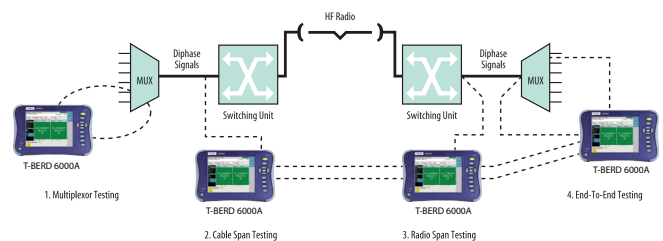
Verifying End-to-End Connectivity

Using two T-BERD/MTS-6000As, technicians can quickly isolate any problem to a specific direction by analyzing the performance of an entire digital link in both directions. With a variety of supported interfaces, the T-BERD/MTS-6000A tests the performance of multiplexer or loopback testing on sections of the link to quickly verify operation or to isolate a problem. The T-BERD/MTS-6000A can be connected at access points in the network to verify channel routing, cable integrity, and communication across radio or satellite links. Full-duplex end-to-end testing enables analysis of all circuits and equipment within the network.

Timing Analysis

In synchronous mode of operation, if a receiving device’s data is not synchronized to the clock signal, the device may misinterpret bits and cause bit errors. The T-BERD/MTS-6000A provides all standard clocking options, letting technicians rapidly diagnose network timing problems. Technicians can operate the T-BERD/MTS-6000A on circuits that support data rates up to 20 Mbps, enabling network element verification of high-speed datacom signals and components.

The recovered clock capability of the T-BERD/MTS-6000A lets technicians differentiate timing problems from transmission problems by using different clock modes. In addition, a technician can generate pattern slips at the transmitter by inserting an extra bit into the normal bit pattern, thereby stressing the clock recovery circuits.



Verifying End-to-End Connectivity

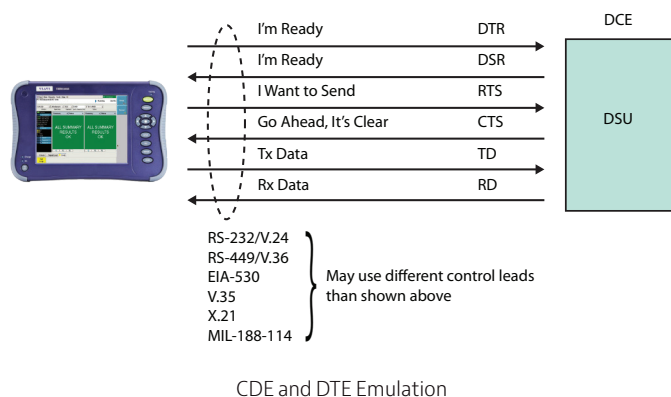
DTE and DCE Emulation

At the physical interface, the interaction between the data terminal equipment (DTE) and data communications equipment (DCE) is comparable to a telephone conversation. The connection between the DTE and DCE uses transmit and receive lines and separate control signal lines. Using the T-BERD/MTS-6000A, technicians can replace a network element (either DTE or DCE) to verify that proper interaction occurs between the elements. Through the use of the virtual breakout box functionality and user-controllable signaling leads, technicians can verify the proper operation of the DTE or DCE under test.

Quality of Service Testing

Circuits must be qualified before service hand-off to the end user. The results analysis from the T-BERD/MTS-6000A, including round-trip delay, G.821, and pattern slips, allows technicians to quickly verify that circuits are performing according to specified metrics before bringing them into service.

The T-BERD/MTS-6000A also features a graphical histogram capability, displaying all counter results in graphical format. The T-BERD/MTS-6000A can monitor bit errors, block errors, pattern losses, clock losses, receiver data losses, and transceiver clock losses.



Specifications

Physical Characteristics		
Datacom interfaces	RS-232/V.24, EIA-530, E1A-530A, MIL-188C, V.35, RS-449/V.36, MIL-188-114, X.21 via adapter cable	
Diphase module		
LED panel		
External clock		
User Interface		
Mechanical		
AC adapter 100 – 220 at 60 Hz or 200 – 240 at 50 Hz		
VAC to 19 V DC, 3.16 A		
LCD graphic color display (touchscreen), LEDs power, charging, low battery		
Environmental		
Temperature	Operating	32 °F (0 °C) to 104 °F (40 °C)
	Storage	-4°F (-20 °C) to 140 °F (60 °C)
Safety/EMC		
UL, CSA, TUV, FCC Class A		
Front Panel LEDs		
Datacom		
MARK, SPACE		
RS232/V.24/EIA530/ EIA530A	RD,TD, RT, ST, TT, CTS, RTS, DSR, DTR, RLSL, RI, RL, LL, TM	
RS449/V.36	RD, SD, RT, ST, TT, CS, RS, DM, TR, RR, IC, RL, LL, TM	
V.35	RD, SD, SCR, SCT, SCTE, CTS, RTS, DSR, DTR, RLSL, CI, RL, LL, TM, RI	
X.21	R, T, S, X, I, C	

Receiver	
Current, History, Signal Present, Clock Present, Frame Sync, Pattern Sync, Pattern Invert, Clock Invert, Data Loss, Summary	
Interfaces (Datacom)	
X.21	
15-pin D-type connector	
Emulate DTE or DCE with X or S timing	
Receiver input termination unterminated or 78/100/124 Ω	
Data rates	5 bps to 20 Mbps synchronous with X, cable length dependent with S
Supported signaling leads	C and I
RS232/V.24	
25-pin D-type connector	
Emulate DTE or DCE with TT or ST timing	
Data rates	5 bps to 256 kbps synchronous 5 bps to 128 kbps asynchronous
Supported signaling leads	CTS, RTS, DSR, DTR, RLSL, RI
EIA530/530A	
25-pin D-type connector	
Emulate DTE or DCE with TT or ST timing	
Signal formats and input terminations	
Balanced	Unterminated or 78/100/124 Ω terminated
Unbalanced	
Data rates	
Balanced	5 bps to 20 Mbps synchronous
Unbalanced	5 bps to 256 kbps synchronous
Supported signaling leads	RTS, CTS, DSR, DTR, RLSL, LL, RL, TM
MIL-STD-188c	
25-pin D-type connector	
Emulate DTE or DCE with TT or ST timing	
Signal formats and input terminations	Unbalanced
Data rates	5 bps to 64 kbps synchronous 5 bps to 64 kbps recovered
Supported signaling leads	RTS, CTS, DSR, DTR, RLSL, LL, RL, TM, RI
RS449/V.36 and MIL-188-114	
37-pin and 25-pin D-type connectors	
Emulate DTE or DCE with TT or ST timing	
Signal formats and input terminations	
RS422 and MIL-188-114	Unterminated or 78/100/124 terminated balanced
RS-423 and MIL-188-114 unbalanced	
Data Rates	
RS-422/Balanced	5 bps to 20 Mbps synchronous
RS-423/Unbalanced	5 bps to 64 kbps synchronous
Supported signaling leads	RS, CS, DM, TR, RR, LL, RL, TM, IC
V.35	
34-pin Winchester using an adapter cable to 25-pin D-type connector	
Emulate DTE or DTC with TT (306) or ST timing	
Receiver input termination	124 Ω
Data rates	5 bps to 15 Mbps synchronous Note: due to propagation delay (cable length dependencies), the user may have to invert their clock.
Supported signaling leads	RTS, CTS, DSR, DTR, RLSL, RL, LL, TM, CI

Specifications

Conditioned Diphase	
2 BNC connectors	1 TX and 1 RX (via plug-in Interface module)
Receiver	
Selectable-input termination	58, 135, or bridge (>2000)
Single-ended operation	58 Ω
Differential operation	135 or bridge
Automatic compensation up to 30 dB of cable loss	
Valid signal indication	Signal valid if > ±90 mV
Transmitter	
Transmit timing selectable from internal synthesizer or recovered from receiver interface	
Data rates	1.2 to 4608 Kbps
Clock and data encoding	Diphase (Manchester) Conditioned diphase (differential Manchester)
Key Functionality	
BER Test Patterns	
Mark (all ones), space (all zeros), 1:1, 63, 511, 2047, 2047R (reverse), 2047RI (reversed and inverted), 2 ¹⁵ -1*, 2 ²⁰ -1, 2 ²³ -1*, QRSS, user byte pattern, QBF1 (FOX), long user (1,2,3), delay, all zeros, 1:3, 1:4, 1:7, 3:1, 7:1 *Note: both ANSI and ITU variations of these patterns are supported.	
Transmit Clock Sources	
Internal from synthesizer	
Recovered from test interface (with the Recovered Clock option)	
External BNC (via clock adapter cable)	
Internal Clock Synthesizer	
50 Hz to 20 MHz, ±1 Hz resolution, 1.5 ppm accuracy, 1 ppm per year aging	
Error Insertion	
Bit error(s)	Single and rate (1E-3 through 1E-7)
Pattern Slip Insertion	
Single bit insertion	
Signaling Lead Control	
Emulate DTE	RTS, DTR, (LL), (RL)
Emulate DCE	RLSD (RR), DSR (DM), CTS, RI
Self Loop	
All test interfaces will loop transmit to receive for the purpose of validating the instrument and the selected test interface.	

Asynchronous Operation	
Parity selection	odd, even, and none
Data bits	5, 6, 7, or 8 bits
Stop bits	1, 1.5, or 2 bits
In-band flow control	
Out-of-band flow control	
Remote Operation	
The unit will support remote GUI operation through an Internet browser or VNC viewer.	
Key Results	
BERT category	Delay, Pattern Losses, Pattern Slips, Bit Errors, Bit Error Rate, Interval BER, Total Blocks, Block Errors, Block Error Rate, Int Block Error Rate, Character Errors (Async only)
Signal category	Transmitter Clock, Frequency, Receiver Clock Frequency, Clock in Frequency, Clock out Frequency, Receiver Clock Loss, Data Loss, Pattern Sync Loss, Transmitter Clock Losses

G.821	
Err Secs, % Err Sec, Error Free Secs, % Error Free Secs, Sev Err Sec, % Sev Err Sec, Avail Secs, % Avail Secs, Unavail Secs	
Time Category	
Date, Time, Elapsed Seconds, Elapsed Time	

Ordering Information

Description	Part Number
Datacom and Diphase Interfaces	
Datacom PIM includes 68 pin universal datacom connector	CPHSDATAV2
Diphase PIM includes dual BNC connectors	CPCDIV2
Datacom and Diphase Test Options	
Includes RS232/V.24, RS449/V.36, V.35/306, EIA530, EIA530A, X.21, MIL-188C, MIL-188-114	CTHSDATA
Includes conditioned diphase testing	CTCDI
Accessories	
Datacom PIM clock adapter cable	CB-DCCLK
RS-232/V.24 DTE/DCE emulation cable	CB-21148994-002
V.35 DTE/DCE emulation cable	CB-21148995-002
X.21 DTE/DCE emulation cable with X support	CB-21149199-001
RS-449/V.36 DTE/DCE emulation cable with IC support	CB-2144332-002



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