

# T-BERD/MTS-8000 Scalable Optical Test Platform

## 40G Transport Module Product Specifications



### Display

High-visibility touch screen TFT color display	26.42 cm
800 x 600 LCD	10.4 in

### Storage

Internal memory	8 MB
Hard disk minimum	20 GB
CD read/write (optional)	
Input/output interfaces	RS-232C, 2 x USB, VGA, RJ11
Modem (optional)	
RJ45 Ethernet	
DIN external switch	
Compact flash <sup>1</sup>	

### Optional Interfaces

Power meter (optional)	+10 to -50 dBm (-45 dBm from 800 to 1250 nm)
Talk set (optional)	45 dB range
VFL (optional)	1 mW, Class 2 laser, universal push/pull (UPPP) connector
Video microscope (optional)	250X, 400X, through USB port

### Power Supply

Power supply <sup>2</sup>	
AC/DC Transport Module power adapter:	85-260 V, 50-60 Hz, 2A Output: 26 V, 11.5 A

- 1 Compact flash receptacle is used for the Transport Module application card
- 2 To be used when operating a T-BERD/MTS-8000 with the 40 G Transport Module

## General Specification

### Module Physical Specifications

Height	10.25 cm (4.1 in)
Width	32.0 cm (12.6 in)
Depth	25.3 cm (9.96 in)
Weight	5 kg (11 lbs)

### Combined Physical Specifications

40 G Transport Module when attached to the base unit without battery:

Height	18.25 cm (7.2 in)
Width	32.0 cm (12.6 in)
Depth	25.3 cm (9.96 in)
Weight	8.3 kg (18.3 lbs)

### Environmental Specification and Operating Temperature

EMI/ESD CE Mark	Class A
Operational temperature	32 to +104°F (0 to +40°C)
Storage temperature	-4 to +140°F (-20 to +60°C)
Humidity	5 to 95% non-condensing
Shock/drop sustain-ability	acc. to IEC 721-3-7, 2 <sup>nd</sup> Ed for Class 7M2 products

### Optical Interface

According to ITU-T G.693	VSR2000-3R2(F)
Telecordia GR-253-CORE	SR-2
Coding	NRZ
Connector type	FC, SC, LC, DIN, ST

### Transmitter

Wavelength	1550 nm
Output power (mean)	0 to +3 dBm
Extinction ratio	≥8.2 dB

### Receiver

Wavelength	1310/1550 nm
Sensitivity	( $\lambda = 1310$ nm, BER = $1 \times 10^{-12}$ ) <-5 dBm ( $\lambda = 1550$ nm, BER = $1 \times 10^{-12}$ ) <-6 dBm
Overload	≥+3 dBm
Reflectance	<-27 dB

### Transmit Timing Source

Internal, Recovered, External (BITS, SETs)<sup>3</sup>

- 3 Reference clock and sine wave are for 2.048 MHz

### Transmit Timing Output

Connector	SMA
Impedance	50 $\Omega$ , AC-coupled
Output level	≥400 mVpp

### Unframed Rates

#### Rate

39.813 Gb/s, 43.018 Gb/s	
Modes of operation	Terminate, through
Error/alarm insertion and analysis	LOS, Bit/TSE error

#### PRBS

2 <sup>7</sup> -1, 2 <sup>2</sup> -1 inverse
2 <sup>15</sup> -1, 2 <sup>15</sup> -1 inverse
2 <sup>23</sup> -1, 2 <sup>23</sup> -1 inverse
2 <sup>31</sup> -1, 2 <sup>31</sup> -1 inverse

### Key results

#### Signal category

LOS Count, LOS Seconds, RX Frequency, TX Timing Source, Optical RX Level (dBm), Optical RX Overload, APS Switchover Time (ms)

#### BERT category

LSS seconds, Bit/TSE Errors, Bit /TSE error rate

### SONET/SDH

#### Rate

39.813 Gb/s

#### Modes of Operation

Terminate
Intrusive Through Mode
Monitor (can turn laser on for non-intrusive Through Mode)

#### Frequency Offset TX

± 50 ppm

#### Mappings SDH

VC-4-256c
VC-4-64c
VC-4-16c
VC-4-4c
VC-4
VC-3

## Specifications

### Mappings SONET

STS-768c

STS-192c

STS-48c

STS-12c

STS-3c

STS-1

### Test Patterns/PRBS

 $2^{11}-1$ ,  $2^{11}-1$  inverse $2^{15}-1$ ,  $2^{15}-1$  inverse $2^{23}-1$ ,  $2^{23}-1$  inverse<sup>4</sup> $2^{31}-1$ ,  $2^{31}-1$  inverse<sup>4</sup>

Digital word

32 bit

Delay pattern

### Anomaly/Errors Generation and Analysis

Bit/TSE

B1 single, rate

B2 single, rate

B3 single, rate

MS-REI/REI-L single, rate

HP-REI/REI-P single, rate

FAS Word single, rate

### Defects/Alarms Generation and Analysis (SDH)

LOS, LOF, MS-AIS, MS-RDI, AU-LOP, AU-AIS, HP-RDI, OOF, RS-TIM, HP-TIM, HP-UNEQ, HP-PLM

### Defects/Alarms Generation and Analysis (SONET)

LOS, LOF, TIM-S, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, TIM-P, PLM-P, UNEQ-P

### Pointer Generation

Increment, decrement

Pointer stress sequences

### Service Disruption

Triggers (can be used in parallel)

LOS, Bit/TSE, LOF, OOF/SEF, MS-AIS, AIS-L, MS-RDI/RDI-L, AU-AIS/AIS-P, AU-LOP/LOP-P, HP-RDI/RDI-P, HP-UNEQ/UNEQ-P, HP-PLM/PLM-P, FAS, B1, B2, MS-REI/REI-L, B3, HP-REI/REI-P

### Key Results

#### Signal Category

LOS Count, LOS Seconds, RX Frequency, TX Timing Source, Optical RX Level (dBm), Optical RX Overload, APS Switchover Time (ms), Delay

#### RSOH/Section Overhead Category

LOF Count, LOF Seconds, OOF Count, OOF Seconds, SEF Seconds, FAS Word Errors, FAS/FrameWord Error Rate, B1 Errors, B1 Error Rate, RS Trace (JO)

#### MSOH/Line Overhead Category

MS/Line-AIS Seconds, MS-RDI Seconds, B2 Errors, B2 Error Rate, MS/Line-REI Errors, MS/Line-REI Rate, APS Message Count, ASP K1 Bridge Request Code (Ring), APS K1 Destination Node ID (Ring), APS K2 Source Node ID (Ring), APS K2 Path Code (Ring), APS K2 Status (Ring), Sync Status (S1)

#### HP (High-Path) Category

AU/Path-LOP Seconds, AU/Path-AIS Seconds, AU/Path Pointer Increments, AU/Path Pointer Decrements, AU/Path-NDF Count, AU/Path Pointer Value RX, TX AU/Path Pointer Size, B3 Errors, B3 Error Rate, HP/Path-REI Errors, HP/Path-REI Rate, HP/Path Trace (J1), Signal Label (C2), HP/Path-UNEQ Seconds

#### SOH and POH Viewing and Manipulation

A1, A2, J0, J1, B1, E1, F1, B3, D1-D156, C2, H1, H2, H3, G1, B2, K1, K2, K3, F2, H3, H4, F2, F3, S1, Z1, Z2, Z3, Z4, E2, N1

#### Service Disruption

Log and Statistics (Total number of events, longest, shortest, average, pass/fail)

#### BERT Category

LSS/Pattern Sync Loss Count, TSE/Bit Errors, TSE/Bit Error Rate

#### Performance Measures

G.826 (ISM/OOS), G.828 (ISM/OOS), G.829 (ISM/OOS), T1.231

#### Time

Current Date, Current Time, Test Elapsed Time

#### Event Log and Histogram

Up to 20 000 entries

### OTN

#### Rate

43.018 Gb/s

#### Modes of Operation

Terminate, Intrusive Through Mode

#### Clients

Bulk

SONET STS-768c, STS-192c

SDH VC4-256c, VC4-64c

ODU-Muxing ODU-1, ODU-2

### Anomaly /Error Generation and Analysis

OTU3

FAS, MFAS, FEC uncorrectable, FEC correctable, SM-BIP, SM-BEI, PM-BIP, PM-BEI, TCMi-BIP, TCMi-BEI (i = 1 to 6)

### Defects / Alarm Generation and Analysis

OTU3

LOS, LOF, OOF, LOM, OOM, OUT-AIS, SM-IAE, SM-BDI, SM-BIAE, ODU-AIS, ODU-LCK, OU-OCI, PM-BDI, Forward-SF, Forward-SD, Backward-SF, Backward-SD, TCMi-AE, TCMi-BDI, TCMi-BIAE (i = 1 to 6)

### Overhead generation / monitor

Section Monitoring (SM), Path Monitoring (PM)  
Tandem Connection Monitoring (TCMi), (i = 1 to 6)  
FTFL signaling  
Payload type

### Service Disruption

Triggers (can be used in parallel)

LOF, OOF, LOM, OOM, OTU-AIS, SM-IAE, SM-BDI, SM-BIAE, ODU-AIS, ODU-LCK, ODU-OCI, PM-BDI, FAS, MFAS, SM-BIP, SM-BEI, PM-BIP, PM-BEI

### Test Patterns OTN Bulk

#### PRBS

 $2^{23}-1$ ,  $2^{23}-1$  inverse $2^{31}-1$ ,  $2^{31}-1$  inverse

Digital word

32 bit

Delay pattern

### Test Patterns OTN with Client

#### PRBS

 $2^{11}-1$ ,  $2^{11}-1$  inverse $2^{15}-1$ ,  $2^{15}-1$  inverse $2^{23}-1$ ,  $2^{23}-1$  inverse $2^{31}-1$ ,  $2^{31}-1$  inverse

Digital word

32 bit

Delay pattern

4 ANSI and ITU implementations are supported

**Key Results**

(results of the respective client apply in addition)

**Interface test results**

LOS Seconds
Optical Rx Overload
Optical Rx Level (dBm)
Rx Frequency (kHz)
Rx Freq Deviation (ppm)
Rx Freq Max Deviation (ppm)
Rx Freq Min Deviation (ppm)
Round Trip Delay (10 $\mu$ s resolution)

**FEC test results**

Uncorrected Word Errors
Uncorrected Word Error Rate
Corrected Word Errors
Correctable Word Errors
Corrected Word Error Rate
Correctable Word Error Rate
Corrected Bit Errors
Correctable Bit Errors
Corrected Bit Error Rate
Correctable Bit Error Rate

**Framing test results**

LOF Seconds
OOE Seconds
FAS Errors
FAS Error Rate
LOM Seconds
OOM Seconds
MFAS Errors
MFAS Error Rate

**OTU test results**

OTU-AIS Seconds
SM-IAE Seconds
SM-BIP Errors
SM-BIP Error Rate
SM-BDI Seconds
SM-BIAE Seconds
SM-BEI Errors
SM-BI Error Rate
SM-TIM Seconds
SM-SAPI
SM-DAPI
SM-Operator Specific

**ODU test results**

ODU-AIS Seconds
ODU-LCK Seconds
ODU-OCI Seconds
PM-BIP Errors
PM-BIP Error Rate
PM-BDI Seconds
PM-BEI Errors
PM-BEI Error Rate
PM-TIM Seconds
PM-SAPI
PM-DAPI
PM-Operator Specific

**FTFL test results**

Forward-Fault Type
Forward-SF Seconds
Forward-SD Seconds
Forward-Operator Identifier
Forward-Operator Specific
Backward-Fault Type
Backward-SF Seconds
Backward-SD Seconds
Backward-Operator Identifier
Backward-Operator Specific

**TCM test results**

IAE Seconds
LTC Seconds
BIP Errors
BIP Error Rate
BDI Seconds
BIAE Seconds
BEI Errors
BEI Error Rate
TIM Seconds
SAPI
DAPI
Operator Specific

**OPU test results**

Payload Type Mismatch Seconds
Payload Type

**Service Disruption**

Log and Statistics (Total number of events, longest , shortest , average, pass/fail)

**Payload/BERT results**

LSS Seconds
BIT/TSE Errors
BIT/TSE Error Rate

**Test & Measurement Regional Sales**

<b>NORTH AMERICA</b> TEL: +1 866 228 3762 FAX: +1 301 353 9216	<b>LATIN AMERICA</b> TEL: +1 954 688-5660 FAX: +1 954 3454668	<b>ASIA PACIFIC</b> TEL:+852 2892 0990 FAX:+852 2892 0770	<b>EMEA</b> TEL:+49 7121 86 2222 FAX:+49 7121 86 1222	<a href="http://www.jdsu.com/test">www.jdsu.com/test</a>
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