VIAVI T-BERD®/MTS-5800 Specifications

Platform

Platform Requirements

The mainframe shall be non modular

The product shall be field upgradeable

The test system shall utilize Linux operating system to ensure optimum stability

Display

The size of the display shall be 7 inches minimum, and 1200x600 type for best resolution

The Test Set shall support a Screen Saver

The Test Set shall support a mode that 'locks' the touchscreen for use without a password

T-BERD®/MTS-5800

Power/Battery

The Test Equipment must be battery operated

The Test Equipment must have a built-in battery charger

The battery must be field replaceable

The equipment shall perform a 10G test for a minimum of 3 hours on battery power.

Operating time Between 2 to 5 hours depending on the application

Charging time Approximately 7 hours from empty

Unit power input 12VDC, 60 Watt Max

Power supply input 100 to 240 VAC, 50/60 Hz, auto-sensing

Power supply output 12VDC, 5 AMP Max

Industry Standards and Compliance

CE Class A Compliant

EMI/ESD: CE compliant, FCC part 15 subpart A Class A

FCC Part 15 Compliant

Physical and Environment Specifications

Temperature range:
· Operating, all options: 0°C to +50°C (+32°F to +122°F)
· Storage: - 20°C to +60°C (-4°F to +140°F)

Storage Humidity: 10-95% without condensing.

Operating Humidity: 10-90% without condensing.

Drop Test - Shock

per IEC 68-2-27 and 68-2-29 Ed. 2.0

Drop Test - Durability

per IEC 721-3-7 2nd Ed./IEC 61010-1

Vibration

per IEC 68-2-6 and MIL-PRF-28800F (Class 2)

Field Operation

The Test Equipment shall be portable, battery operated and rugged for field operations.

The Test Equipment must be protected by bumpers.

Weight and Size

The weight of the test set shall not be greater than 4.2 lbs/1.9kg while supporting up to 10G rates

The size of the test set shall not be greater than 17.78 x 24.13 x 7.62cm (7"x9.5"x3") while supporting up to 10G rates

Operation

The base unit shall be able to be turned on and operational in less than 2 minute

The Test Equipment shall accept operations with an external keyboard.

The unit will boot to a simplified launch page allowing the user to select previous test configurations and/or favorite test configurations.

I/O's

The Test Equipment shall include the following I/O interfaces
· VT100 (RJ-45)
· 2 x USB
· RJ-45 (Ethernet/IP)
· Serial
· Wifi (optional)
· Bluetooth (optional)

The Test Equipment shall be able to download data to PC or compatible device via standard interface or protocol:

Test, Files and Data Storage

Report Generation - HTML, PDF, TXT, CSV, XML

Ability to create a customized name structure.

The Test Set UI supports a screen capture

The internal storage capacity shall be at least 1GB.

Job Manager to push common job information into multiple test applications.

Ability to create summary reports including all tests performed in a job with pass/fail verdict of each

Remote Operation

The Test Equipment shall be remotely controlled via Web browser.

In remote operation, the remote user can FTP files from the test set.

In remote operation, the remote user can FTP files to the test set.

The Test Equipment should not require the installation of client software on a PC for remote operation.

Access via Smart Access Anywhere Codes

Calibration

Minimum calibration interval must be 3 years

Warranty

The Product shall support a 3 year warranty

Included Items

User manual

AC Power Source

AC Power cords

Optical Fiber Microscope

The Test Equipment shall be able to accept an optical video microscope with autofocus capability.

The connector image shall be displayed on the Test Equipment and saved into a .JPEG file format.

The microscope shall offer a switchable 200/400x magnification capability.

It shall be provided with the dedicated tips to connect to the patch panel or directly to the connector ferrule.

Saved Configurations

Users shall be able to save test configurations for future recall

Users shall be able to transfer pre-defined test configurations between test sets

Ethernet

Test Interfaces/Bit Rates

10/100/1000M Electrical	Dual Port Capable
100M Ethernet Optical	Dual Port Capable
GigE (Optical)	Dual Port Capable
10GigE WAN Phy (9.9G)	Dual Port Capable
10GigE LAN Phy (10.3G)	Dual Port Capable

Interface Type

RJ-45

SFP

SFP+

SFP+Tunable

General

Line Rate Traffic Tx and RX for all Interfaces

Single Stream Generation/Analysis

10 Streams Generation/Analysis

Auto Discovery of Test Sets

Modes of Operation

Terminate

Monitor

Thru (Intrusive)

Loopback

Half Duplex

Full Duplex

Timing

Recovered from Rx

Internal (Stratum 3)

Recoverd from External (BITs/SETs)

Freq Offset Transmit/Receive

Ethernet Features

Layer 1 (Unframed) Bit Error Testing Patterns

High Frequency test pattern

Low frequency test pattern

Mixed frequency test pattern

Random Data Pattern (RPAT)

Jitter Tolerance Test Pattern (JTPAT)

Supply Noise Test Sequence (SPAT)

Layer 2 (Framed) Bit Error Testing Patterns

Compliant Random Data Pattern (CRPAT)

Compliant Jitter Tolerance Pattern (CJPAT)

Compliant Supply Noise Pattern (CSPAT)

Framed Pattern Test

PRBS (2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{31}-1 and inverse)

All 1s, All 0s

1:3, 1:7, 3:1, 7:1, 2 in 8

User defined

MAC Frame Payload

PRBS Pattern

Editable Digital Word

Flow Control

 Emulation On/Off

Pause Frames

Tx Insert

Pause Quanta - Definable

Pause Frame Analysis (counts etc)

Ethernet Generator

Frame Type

802.3

DIX

VPLS with inner and outer MAC

MAC in MAC 802.1ah

EtherType Field-Editable

MAC Addressing

Destination MAC Address - Unicast

Destination MAC Address - Broadcast

Destination MAC Address - Multicast

Source MAC Address - User Defined

Source MAC Address - Auto Increment

MAC Frame Size

64, 128, 256, 512, 1024, 1280, 1518

User defined

Jumbo (to 10k)

EMIX

Random

VLAN

VLAN Tagging 802.1q

VLAN Tag Editable Fields
· Priority
· VID
· VLAN Scan

VLAN Stacking (Q-in-Q)

SVLAN Tag Editable Fields

SVLAN ID

SVLAN Priority

SVLAN DEI

SVLAN TPID

CVLAN ID	**Ethernet OAM**	**IPv6 Editable Fields**
CVLAN Priority	***Y.1731 Service OAM and 802.1ag CFM***	Traffic Class
Supports up to 8 stacked VLAN Tags	CCM Messages	Flow Label
VPLS	Programmable CCM Rate	Next Header
VPLS Parameters - MAC Addresses	CCM Type - Unicast, Multicast	Hop Limit
VPLS Parameters - Frame Type	MEG ID End Point	**IP Ping**
VPLS Parameters - EtherType	Maintenance Domain Level	**Fast Ping**
VPLS Tunnel and VC Label - Label, CoS, TTL	AIS Tx/Rx	**IP TraceRoute**
VPLS Control Word - Reserved Bits, Sequence Number	RDI Tx/Rx	**Traffic Generator**
MAC in MAC/PBT/PBB	LBR/LBM (Ping) - Unicast, Multicast	Number of Traffic Engines
Parameters - MAC Address	LTM/LTR (Trace)	Bandwidth Controlled
B-Tag - TPI, VID, Priority, DEI	MEP Discovery	Bandwidth Specification in Mbps or kbps
I-Tag - TPI, SID, Priority, DEI, NCA, Res1, Res2	***802.3ah Link OAM***	Bandwidth Granularity
MPLS	Mode - Passive/Active	Bandwidth Specification in %
Single Label Support	Vendor OUI	Bandwidth Utilization Accuracy - 0.1%
Stacked Label Support - Up to 2	Vendor Specific Info	Burst Mode - Burst Size - 1 to 2M frames
Editable Parameters/Results - Label	Max PDU Size	Bandwidth Specified - Definable
Editable Parameters/Results - CoS	Unidirectional Links	Continuous Tx
Editable Parameters/Results - TTL	Remote Loopback	Once Tx - Definable frames/burst
MPLS-TP	Link Events	Traffic generation in LBM frames at line rate
MPLS-TP Label Support (Tunnel and VC)	Variable Retrieval	Analysis of LBR frames at line rate
VLAN Tag Support	Dying Gasp	**Traffic Profiles**
Linerate Traffic Generation	Link Fault	Constant B/W
Traffic Analysis	Critical Event	Ramp B/W
Editable Parameters/Results - Label	Errored Symbol Period Event	Bursty B/W
Editable Parameters/Results - Priority	Errored Frame Event	Flood B/W
Editable Parameters/Results - TTL	Errored Frame Period Event	Traffic generation in Mbps, kbps, or % utilization
Rx Filters	Errored Frame Second Summary Event	B/W configurable based on L1 or L2
GAL (Label 13) + ACH from ITU-T G.8113.1 · Common Header Label - PW, LSP, Section · CCM Generation and Analysis · LBM/LBR Generation and Analysis · AIS Generation and Analysis	**IP Packet Generator**	**TCP Throughput**
	IP	10/100/1000M Linerate Stateful Emulation
	IPv4 Frame Format	1GigE Linerate Stateful Emulation
	IPv6 Frame Format	10GigE Linerate Stateful Emulation
OAM Alert Label (Label 14) from ITU-T G.8114 · Common Header Label - PW, LSP, Section · CCM Generation and Analysis · LBM/LBR Generation and Analysis · AIS Generation and Analysis	TCP Port Number	Configurable Src and Dest IP address
	UDP Port Number	Packet length
	IP Addressing	TCP/UDP Traffic Modes
	Destination IP Address - User Defined	Source Port
	Source IP Address - User Defined	Destination Port
OAM Alert Label (Label 14) from ITU-T Y.1711 Common Header Label - PW, LSP, Section · CCM Generation and Analysis · FFD Generation and Analysis · BDI Generation and Analysis · FDI Generation and Analysis	**IPv4 Editable Fields**	Listen Port
	ToS	Configurable TCP Window Size
	DSCP	Measures TCP Efficiency
	Flags	Measures Buffer Delay
	Protocol	TCP Client Emulation
Simultaneous OAM and background traffic generation	TTL	TCP Server Emulation

Up to 64 TCP Stateful Sessions Simultaneously

Supports 4 Background Streams

Compatible with IPERF

RFC 2544

Asymmetric Testing

Symmetric Testing

Throughput

Frame Loss

Out of sequence frames

Errored Frames

Delay

Back to Back

Committed Burst Size (CBS)

Policer Test

Jitter

Master/Slave

Pass/Fail Thresholds per MEF 23.1

Connectivity QuickCheck

Parallel Testing

Optional Testing with line rate LBM frames

Definable Frame Size

LAG Support
· Sequential MAC Addresses
· Suppression of OOS Frames

Report formats

Graphical Results

Total Test Time Display

One Way Delay with GPS or CDMA receiver

ITU-T Y.1564

10 Traffic Streams

Service Configuration Test

Service Performance Test

Committed Information Rate (CIR)

Extended IR (EIR)

Maximum IR (MIR)

Frame Loss Rate (FLR)

Frame Delay (FD)

Frame Delay Variation

Committed Burst Size (CBS)

Policer Test

Round Trip Testing

Concurrent Bi-directional Testing

Configurable VLAN, Priority, Addressing and Pass/Fail Thresholds

Programmable Pass/Fail Thresholds

Graphical Results

Screenshot support

Auto-Negotiation Check

Saved Test Profiles

Saved Reports

Configurable DEI, TPID, TOS/DSCP

Inclusive of L2 Ethernet, IPv4, and IPv6

Integrated TrueSpeed TCP traffic stream with background streams

Optional Testing with line rate LBM frames

Asymmetric Testing

LAG support
· Sequential MAC Addresses
· Suppression of OOS Frames

One Way Delay with GPS or CDMA receiver

IETF RFC 6349

Supported on 10/100/1000 M Electrical and 1/10 G Optical Interfaces

Automated TCP Throughput test per RFC 6349

Path MTU Detection Test

Round Trip Time Test

Walk the Window Test

TCP Throughput Test

Traffic Shaping Test

TCP Efficiency Metric

Buffer Delay Metric

Up to 64 TCP Stateful Sessions Simultaneously

1 KB TCP Window Size Granularity

Jumbo Frame Support

Graphical Results and Report Generation

Configurable File Sizes and Window Sizes

Total Test Time Display

Configurable Saturation Window Test

Compatible with the following endpoints:
· T-BERD/MTS instruments
· QT-600 Ethernet Probes
· TrueSpeed VNF Server

Layer 2 Transparency Testing

Send/Receive Ethernet Control Plane Traffic

Encapsulation supported
· VLAN
· Q-in-Q
· Spanning Tree
· Cisco Protocols (Discovery etc.)
· GARP
· STP

Send/Receive Ethernet Control Plane Traffic
· Spanning Tree Frames Tx/Rx
· Cisco Discovery Protocol
· LDP Frames Tx/Rx
· Link Aggregation LACP
· Cisco UDLD, ISL, PagP, DTP, PVST-PVST+
· MAC Bridging 802.1d
· VLAN-BRDGSTP
· Custom Frame Builder

Synchronous Ethernet

1GE and 10GigE Tx/Rx

1000M/100M/10M Electrical Tx/Rx

100M/1000M Optical Tx/Rx

G.826x Compliant

Frequency offsets ± 100 ppm in 1 or 10 ppm increments

Recovered Interface Timing

4.6ppm Frequency Accuracy

SSM Message Decode

ESMC Message Transmit & Capture

Quality Message Decode

Definable SSM PDU Rate (pps)

Background Dataplane traffic generation

IEEE 1588v2 PTP

1GE and 10G Tx/Rx

1588v2 Master Emulation

1588v2 Slave Emulation

1G Dual Monitor

Encapsulations supported	None, VLAN, and Q-in-Q

Packet Delay Variation Measurements on Control Plane Traffic

Generate up to 4 streams of Background Dataplane traffic

Frame/Packet Capture and Decode via Wireshark

Layer 2 1588v2 Messaging

Layer 4 1588v2 Messaging

Message rates Multicast: Fastest = 16/128/8 (Announce/Sync/Delay); Slowest = one message every 16 seconds

Message rates Unicast: Fastest = 16/128/8 (Announce/Sync/Delay); Slowest = one message every 16 seconds

Support for Unicast and Multicast Address Mode

Support for Forwardable and Non-forwardable Address

Static Unicast message negotiation: ON or OFF

Thresholds for Sync and Delay PDV and FPP (Floor Packet Processing)

Single- & Dual Step operation in both slave and master modes

Master Mode Clock Classes Supported
· Primary
· Primary Holdover
· Arbitrary
· Arbitrary Holdover
· Primary A
· Arbitrary A

1588v2 Delay Measurements (Master/Slave)

One-way (Master to Slave and Slave to Master) Delay

Differential Delay and Delay Asymmetry Measurements

Time Error Measurements (1ns resolution)

Max |TE| and cTE Measurement

PktSelected2wayTE
Measurements including:
APTS: pk to pk
PTS: Abs Max

Wander Analysis of Time Error Measurement

Automated Time Error Measurement workflow.

NTP Features

Capture

Analyze

Monitor

PDV Analysis

Supports distribution analysis of PDV and comparison against ITU limits

Graph resolution of up to 5ns

Supports evaluation according to MAFE

Supports FPP analysis according to G.8261.1 and comparison against ITU limits

Supports masks defined by user

Supports sample rates up to 100 samples per second

Supports offline data analysis

Supports packet synchronization data analysis for NTP protocols

Supports measured data analysis according to PDD packet delay allocation level

Supports measured data analysis according to FPP minimum packet rate

Supports PDV data collection of PTP for laboratory analysis and corrective path

Loopback

Manual (LLB)

Automatic

Local

Far End

Auto Discovery of Test Sets

Delay

Round Trip Delay

Acterna Test Protocol Version 3 (default)
· 10GE High Precision - low delay
· GE Optical High Precision - low delay

Acterna Test Protocol Version 2 with Fill byte
· High Precision - low delay
· Lower Precision — high delay

One Way Delay

Delay Measurement Accuracy

CAT-5 Testing

Link speed

Link status

Cable status

Crossover/straight (MDI/MDIX)

Distance to fault

Pin mapping

Pair length

Polarity

Skew

Capture/Decode

Wirespeed Capture up to 10Gb/s

Wirespeed Capture up to 10/100/1000 Mb/s

Integrated Wireshark on the TestSet

256MB Capture Buffer per port

Triggers

Tx and Rx Capture

Frame Slicing

Expert Decode/Analysis

Decode/Analysis Capture Files

Detect Half-Duflex Ports

Detect ICMP Layer Issues

Identify Top Talkers

TCP Layer Diagnosis - ex. Retransmissions

Traffic Profiling

Detect and display up to 128 streams of live traffic

Specify Filters for stream detection

Stream Classification

Network Discovery

Automatically detect networks, domains, devices, and hosts

Traffic Filtering

Ethernet (Layer 2) Traffic Filtering

MAC source and destination address

Frame Type/Length

VLAN ID

VLAN Priority

VLAN Discovery

VLAN (Layer 2.5) Tags - 802.1q

TPI

Priority

CFI/DEI

VID

VLAN (Layer 2.5) Tags - QnQ, 802.1ah

SVLAN ID

SVLAN Priority

SVLAN TPI

CVLAN ID

CVLAN Priority

IP (Layer 3) Traffic Filtering

Source and destination IP address

Subnet mask

IPv6 Traffic Class

TOS/DSCP Fields

TCP/UDP (Layer 4) Traffic Filtering

ATP Listen Port

Protocol Analysis

CDP and LLDP Frame Discovery and Decode

CDP Analysis

Device Identifier

Port Identifier

VLAN ID

Source MAC Address

IP Subnet Addresses

LLDP Analysis

Chassis Identifier

Port Identifier

Time To Live

Source MAC address and optional VLAN ID

Management IP Address

MAU Type Information

Errors Tx/Rx

Code Error Tx/Rx

FCS Error Tx/Rx

IP Checksum Tx/Rx

Bit Error Tx/Rx

Insertion Profile - Once

Insertion Profile - Rate

Insertion Profile - Burst

Alarms Tx/Rx

Local Fault Tx/Rx

Remote Fault Tx/Rx

Ethernet Results

Custom Results

Histogram and Graphical Results Script

Link Status

Loss of signal

Link active

Frame detected

Sync obtained

VLAN tagged frame detected

Auto-negotiation status

Link configuration ack

Link advertisement status

Pause capable

Remote fault

Destination MAC address when using ARP

Link counts/statistics

Bandwidth utilization

Frame rate

Tx Mbit/s

Rx Mbit/s

Round trip delay

Service disruption time

Received frames

Transmitted frames

Received packets

Transmitted packets

Pause frames

Lost frames

Out of sequence frames

Out of sequence packets

VLAN frames

CVLAN ID

SVLAN ID

CVLAN Priority

SVLAN Priority

Unicast frames

Unicast packets

Multicast frames

Multicast packets

Broadcast frames

Broadcast packets

Frame length

Packet length

Packet jitter, Avg

Packet jitter, Max

Errored Counts

Symbol errors

Code violation

FCS errored frames

Runts

Jabbers

Oversized frames

Undersized frames

OOS frames

Lost frames

IP checksum errors

IP packet length errors

Pkt Payload Errors

Bit error

Bit error rate

QoS Measurements

Throughput

Frame Loss

Packet Jitter

Delay

Out of Sequence

Frame/Packet Size Binning

MAC Throughput Rx

IP Throughput Rx

TCP/UDP Throughput Rx

Payload Throughput Rx

Service Disruption Measurements
· Definable Threshold Time

Round Trip Delay Measurements

One Way Delay Measurements

Rx Bytes

Rx Mbits

Rx Frames

Rx frames per Second

Utilization %

Current Rx Results

Min Rx Results

Average Rx Results

Max/Peak Rx Results

Ratio Rx Results

Seconds Rx Results

Event Log

Event, Date, Start Time, Stop Time, Duration, Value

Real Time Histogram

Seconds, Minutes, Hours, Days

Time

Current Date, Current Time, Test Elapsed Time

Graphical Displays

Errors versus Time

Frame Loss versus Time

Packet Jitter versus Time

Latency versus Time

Throughput versus Time

Application Testing

Walk the Window

FTP Throughput

HTTP Throughput

SONET/SDH

Test Interfaces/Bit Rates	
STS-1 (e)	Dual Port Capable
STM-1 (e)	Dual Port Capable
STM-1 (o)	Dual Port Capable
OC-3	Dual Port Capable
OC-12	Dual Port Capable
STM-4	Dual Port Capable
OC-48	Dual Port Capable
STM-16	Dual Port Capable
OC-192	Dual Port Capable
STM-64	Dual Port Capable

Laser Type

SFP

SFP+

SFP - Tunable

Modes of Operation

Terminate

Monitor

Thru (Intrusive)

Tributary Scan

Drop and Insert

Timing

Recovered from Rx

Internal (Stratum 3)

Recovered from External (BITs/SETs)

Recovered from 10 MHz clock

SONET/SDH Features

SONET/SDH Framing	
Overhead Manipulation/Analysis	
Optical/Electrical Power Level	
PRBS Generation	
PM/SM TTI messages Tx/Rx	
Overhead Byte Viewing/Manipulation	
Service Disruption Measurements · SD Separation/Debounce Time Setting · SD Threshold Time Settings	
Signal Label generation/display	
Freq Offset Transmit/Receive	

Round Trip Delay Measurement

RTD Measurement Accuracy	

PRBS Patterns

215-1, 215-1 Inverse	
2^20-1, 2^20-1 Inverse	
2^23-1, 2^23-1 Inverse	
2^31-1, 2^31-1 Inverse	
Programmable - 32 bit	
ANSI and ITU implementations	

Anomaly/Error generation

Bit/TSE	
Frame Word	
B1	
B2	
B3	
HP-REI	
MS-REI, LP-BIP	
LP-REI	
Insert - Single	
Insert - Rate	
Multiple	

Defects/Alarms Generation/Analysis

LOS	
LOF	
RS-TIM	
MS-AIS	
MS-RDI	
AU-LOP	
AU-AIS	
HP-UNEQ	
HP-RDI	
HP-TIM	
HP-PLM	
TU-LOP	
TU-AIS	
TU-LOM	
LP-UNEQ	
LP-RDI	
LP-TIM	
LP-PLM	
LP-RFI	

SDH Mappings

VC4 Bulk, AU-4-4c, AU-4-16c, AU-4-64c	
VC12	
VC4	
VC3	
E4	
DS3	
E3	
E1	

SONET Mappings

STS-1, STS-3c, STS-12c, STS-48c, STS-192c	
VT1.5	
DS3	
DS1	
E1	

Results

Signal Category

Signal Present	
Signal Loss Count	
Signal Loss Seconds	
Receive Frequency	
Receive Frequency Deviation	
Receive Frequency Maximum Deviation	
Transmit Frequency	
Electrical Input Level STS-1 STM-1e	dBdsx, dBm, volts dBnom only
BPV Count (STS-1 only)	
BPV-Error Rate (STS-1 only)	

Regenerator/Section OH Category

FAS/Frame Word Error Count	
FAS/Frame Word Error Rate	
LOF Count	
OOF Count	
B1-BIP error Count	
B1-BIP Error Rate	
Severely Errored Seconds	
OOF Seconds	
Section Trace Mismatch	TIM
J0-Regenerator Trace	

Multiplexer/Line OH Category

APS Message Count	
APS Bridge Request Code	Ring
APS Destination Node	Ring
APS Source Node	Ring
APS Path Code	Ring
APS Status	Ring
APS Request Code	Linear
APS K1 Channel Number	Linear
APS K2 Channel Number	Linear
APS MSP Architecture	Linear
APS Status	Linear
B2-BIP Error Count	
B2-BIP Error Rate	
SES	
Unavailable Seconds	
AIS Seconds	
REI Count	
REI Rate	
S1 Synchronization Message	
Z1 Byte Value	

High Path (AU, VC3/4) OH Category

Pointer Justification Count	
Pointer Increment Count	
Pointer Decrement Count	
Pointer NDF Count	
Pointer Value	
Pointer Size	SS Bits
LOP Count	
B3 (BIP) Error Count	
B3 (BIP) Error Rate	
B3 (BIP) Errored Seconds	
REI Count	
VC-3/4 REI Rate	
POH SES	
POH Unavailable Seconds	
Signal Label	C2
J1 Trace Message	
Path Status	G1

Low Path (VC3/12, TU3/12, VT1.5) Category

Pointer Transmitted

Pointer Received

Pointer Just Count

Pointer Increment Count

Pointer Dec Count

Pointer NDF Count

LOP Count

LOP Seconds

B3/V5 BIP Count

B3/V5 BIP Error Rate

REI Count

Pointer Transmitted

Pointer Received

Signal Label	C2/V5

Signal Label Mismatch

J2-Lower Order Trace Message

J2 Lower Order TIM

Logic Category

Pattern loss Count

Bit Error/TSE Count

Bit Error/TSE Rate

Pattern Slip Count

Pattern Slip Secs

Pattern Loss Count

Pattern Synchronization Loss Secs

Pattern Synchronization Status

Alarms

Signal Loss Status

Frame Synchronization Loss Status

Pattern Synchronization Loss Status

MS/Line-AIS

AIS (HP)

AIS (LP)

LOP (HP)

LOP (LP)

LOS

OOF

LOF

MS/Line RDI

LP RDI

HP RDI

MS/Line-REI

Regenerator Trace Identifier Mismatch	TIM
High Path Trace Identifier Mismatch	TIM
HP-UNEQ/UNEQ-P	
Low Path Trace Identifier Mismatch	TIM
Loss of Multiframe	TU-12, TU-3, VT-1.5

Overhead Byte Manipulation/Viewing – High Path

A1, A2, J0, J1, D1, D2, D3, C2, H1, H2, H3, G1, B2, K1, K2, F2, D4, D5, D6, H4, D7, D8, D9, H4, D7, D8, D9, Z3/F3, D10, D11, D12, Z4/K3, S1, Z1, M1/Z2, E2, Z5/N1

SDH Low Order View (AU/VT)

V5, S2, N6, K4

SOH and POH Evaluation

Text decode of S and C bytes for the trace identifier. J0 display of 16-byte ASCII sequence. J1, J2 display of 16- or 64-byte ASCII sequence.

Tandem Connection Monitoring (TCM)

Analysis of the N1 and N2 bytes, Monitoring/Display of: AIS, ODI, RDI, OEI, REI, APId, incoming B3/Computed BIP Comparison, IEC, TC-UNEQ

Performance Measures

G.826	ISM/OOS
G.828	ISM/OOS
G.829	ISM/OOS
M.2101	
T1.231	
T1.514	

K1/K2 Event Log

Date, Time, K1 Value, Code, Channel, K2, Bridge, MSP, Status

Event Log

Event, Date, Start Time, Stop Time, Duration, Value

Real Time Histogram

Seconds, Minutes, Hours, Days

Time

Current Date, Current Time, Test Elapsed Time

OTN G.709

Test Interfaces/Bit Rates

OTU1 (2.7G)	Dual Port Capable
OTU2 (10.7G)	Dual Port Capable
OTU1e (11.045G)	Dual Port Capable
OTU2e (11.095G)	Dual Port Capable

Laser Type

SFP

SFP+

SFP+ - Tunable

Modes of Operation

Terminate

Monitor

Monitor/Thru

OTN Layer

OTN/ODU Framing

ODU1 in ODU2 Multiplexing

ODU0 Multiplexing
- ODU-0 Bulk BERT from an OTU-2
- ODU-0 1-Gigabit Ethernet Layer 2 & IPv4 traffic from an OTU-2
- ODU-0 Bulk BERT from an OTU-1
- ODU-0 1-Gigabit Ethernet Layer 2 & IPv4 traffic from an OTU-1
- ODUflex Bulk BERT from an OTU-2
- ODUflex 1-Gigabit Ethernet Layer 2 from and OTU-2
- Generic Mapping Procedure (GMP) supported
- GFP-T encapsulation of Ethernet 8B/10B PCS

GFP-T
- CID
- UPI

Overhead Manipulation/Analysis

Power Level

PM/SM TTI messages Tx/Rx

Overhead Manipulation/Analysis

Service Disruption Measurements
- SD Separation/Debounce Time Setting
- SD Threshold Time Settings

Payload Type (PT) Label generation/display

Transfer Delay

Freq Offset Transmit/Receive

PRBS Patterns

2^20-1, 2^20-1 Inverse

2^23-1, 2^23-1 Inverse

2^31-1, 2^31-1 Inverse

Programmable - 32 bit

ANSI and ITU implementations

Error Insertion Capability

Single, Rate

OTU Error Tx/Rx

FAS

MFAS

SM-BIP/BEI

PM-BIP/BEI	FTFL Fwd Sig Degr.	Tx Frequency (Hz)
FEC Uncorrectable	FTFL Bwd Sig Fail	Tx Frequency Deviation (ppm)
FEC Correctable	FTFL Bwd Sig Degr	**FEC**
TCM1–6 BIP	TCM1–6 IAE	Uncorrected Word Errors
TCM1–6 BEI	TCM1–6 TIM	Uncorrected Word Error Rate
Bit Error	TCM 1-6 BDI	Corrected Word Errors
Code Word Errors (Corr/Incorrect)	TCM1–6 BIAE	Correctable Word Errors
OTU Alarm Tx/Rx	**OPU Errors/Alarms Tx/Rx**	Corrected Word Errors Rate
LOF	PT Label Mismatch	Correctable Word Error Rate
OOF	Client Loss	Corrected Bit Errors
LOM	Bit Error	Corrected Bit Errors Rate
OOF	**ODU Mappings**	Correctable Bit Errors
OOM	Bulk	Correctable Bit Error Rate
SM-IAE	ODU0	**Framing**
SM-TIM	ODU1	Frame Sync Loss Seconds
SM-BDI	ODU2	Frame Sync Losses
SM-BIAE	**SDH Mappings**	OOF Seconds Count
PM-TIM	VC4 Bulk, AU-4-4c, AU-4-16c, AU-4-64c	FAS Errors
PM-BDI	VC4	FAS Error Rate
FTFL Fwd Sig Fail	VC3	LOF
FTFL Fwd Sig Degr.	**SONET Mappings**	LOF Seconds
FTFL Bwd Sig Fail	STS-1, STS-3c, STS-12c, STS-48c, STS-192c	Multiframe Sync Loss Seconds
FTFL Bwd Sig Degr	**Ethernet Mappings**	OOM Seconds Count
TCM1–6 IAE	10GigE	MFAS Errors
TCM1–6 TIM	1GigE	MFAS Error Rate
TCM 1-6 BDI	**Results**	**OTU**
TCM1–6 BIAE	**LEDS**	OTU-AIS
ODU Errors Tx/Rx	Signal Present	OTU AIS Seconds
FAS	Frame Sync	SM-IAE
MFAS	Pattern Sync	SM-IAE Seconds
PM BIP/BEI	LOS	SM-BIP Error Counts
TCM BIP/BEI	LOF	SM-BIP Error Rate
Bit Error	LSS	SM-BDI Seconds
ODU Alarms Tx/Rx	**Interface**	SM-BDI Count
LOF	Invalid Rx Signal Seconds	SM-BIAE Seconds
OOF	LOS Count	SM-BIAE Count
LOM	Optical Rx Level (dBm)	SM-BEI Count
OOM	Reference Frequency	SM-BEI Error Rate
AIS	Round Trip Delay	SM-TIM Count
OCI	Rx Frequency Max Deviation (ppm)	SM-TIM Seconds
LCK	Rx Frequency (Hz)	SM-SAPI
PM-TIM	Rx Frequency Deviation (ppm)	SM-DAPI
PM-BDI	Signal Losses Count	SM-Operator Specific
FTFL	Tx Clock Source	GCC BERT Bits
FTFL Fwd Sig Fail	Tx Freq Max Deviation (ppm)	GCC BERT Bit Errors

GCC BERT Bit Error Rate	

ODU

ODU-AIS
ODU-AIS Seconds
ODU-LCK
ODU-LCK Seconds
ODU-OCI
ODU-OCI Seconds
PM-BIP Count
PM BIP Error Rate
PM-BDI Seconds
PM-BDI Count
PM-BEI Count
PM-BEI Error Rate
PM-TIM Seconds
PM-TIM Count
PM-SAPI
PM-DAPI
PM-Operator Specific
PM Round Tip Delay Recent
PM Round Trip Delay Last

FTFL

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

TCM 1-6

IAE Seconds
BIP Errors
BIP Error Rate
BDI Seconds
BIAE Seconds
BEI Errors
BEI Error Rate
TIM Seconds
SAPI
DAPI
Operator Specific
GCC BERT Bits
GCC BERT Bit Errors
GCC BERT Bit Error Rate

OPU

Payload Type Mismatch Seconds
Payload Type

Payload

Pattern Sync Loss Seconds
Pattern Sync Losses
TSE/Bit Errors
TSE/Bit Error Rate

Ethernet Client

As per Ethernet results
RFC 2544 on 10 GE client

SONET/SDH Client

As per SONET/SDH results

OTN Check

Automated workflow is available at all OTN rates for OTN Bulk

Set test duration based on Bit Error Rate Theory or actual time

Bit Error Rate Theory parameters for test duration:
· Data Rate (e.g. OTU4)
· BER Threshold
· Confidence Level (% value)

Key automated tests

Payload BERT
· PRBS pattern selection
· Pass/Fail BER Threshold

Round Trip Delay
· Selection of applicable OH fields: PM, TCM1-6
· Measurement Frequency
· Pass/Fail Threshold (ms)

GCC Transparency
· Selection of applicable OH field: GCC0, GCC1 or GCC2
· Pass/Fail BER Threshold

Report generation and formats

Fibre Channel

Laser Type

SFP
SFP+

Modes of Operation

Terminate
Monitor
Thru

Test Interfaces/Bit Rates

1.0625 Gbit/s	Dual Port Capable
2.125 Gbit/s	Dual Port Capable
4.25 Gbit/s	Dual Port Capable
8.5 Gbit/s	Dual Port Capable
10.519 Gbit/s	Dual Port Capable
14.025 Gbit/s	Dual Port Capable

Fibre Channel Features

General

Flow Control
Login
Buffer Credits

Fibre Channel Login

at "F-Port"
at "N-Port"

Layer 1 (Unframed) Bit Error Testing Patterns

High frequency test pattern
Low frequency test pattern
Mixed frequency test pattern
Random Data Pattern (RPAT)
Jitter Tolerance Test Pattern (JTPAT)
Supply Noise Test Sequence (SPAT)

Layer 2 (Framed) Bit Error Testing Patterns

Compliant Random Data Pattern (CRPAT)
Compliant Jitter Tolerance Pattern (CJPAT)
Compliant Supply Noise Pattern (CSPAT)

Framed Pattern Test

PRBS ($2^{23}-1$, $2^{31}-1$ and inverse)
All 1s
All 0s
User defined

Fibre Channel Traffic Generation

Transmit Traffic profiles	
Constant	
Ramp	
Bursty	
Traffic generation in Mbit/s and % utilization	
Configurable Source and Destination ID	
Sequence ID	
Originator ID	
Responder ID	
Frame length	28, 32, 76, 512, 1024, 1536, 2076, 2140, User defined
Packet payload	
Granularity	1 to 6.7%

Fibre Channel Traffic Filtering

Routing Control

Destination Identifier

Source Identifier

Data Structure Type

Sequence Count

Fibre Channel Error Insertion

Bit error

CRC

Framed Bit

Code violation

Insertion Type - Single, Rate, Burst

Enhanced Fibre Channel Test (RFC 2544 like)

Selectable Configuration Template

Throughput

Latency

Frame Loss

Back to Back

Buffer Credits

Buffer Credit Throughput

Selectable Flow Control Login Type

Definable Frame Length

Pass Fail Thresholds

Report Generation

Screen Capture Support

Graphical Results

8 Gig Fibre Channel Specific

Scrambling in FC-1/MAC layer, on total FC frame

Supported IDLE and FILL WORD patterns include IDLE on Link INIT and as FILL WORD; IDLE on INIT and ARBFF on FILL WORD; ARBFF on INIT and as FILL WORD

Results

Interface

Signal Losses

Signal Loss Seconds

Sync Loss Seconds

Optical Rx Overload

Optical Rx Level (dBm)

Login Status

Far-end Buffer to Buffer Credits

Login Status

Tx/Rx ELP Accept

Tx/Rx ELP Ack1

Tx/Rx ELP Reject

Tx/Rx ELP Request

L2 Link Statistics

Total Utilization %

Frame Rate

Frame Size

Rx Mbps

Tx Mbps

Round Trip Delay (us)

Service Disruption (us)

L2 Link Counts

Rx Frames

Tx Frames

Rx Acterna Frames

Tx Acterna Frames

Rx Frame Bytes

Tx Frame Bytes

Class F Frames

Class 1 Frames

Class 2 Frames

Class 3 Frames

BERT Stats

Pattern Losses

Pattern Loss Seconds

Bit Error Rate

Bit Errors

Bit Errored Seconds

Bit Error-Free Seconds

Bit Error-Free Seconds (%)

Error Stats

Symbol Errors

CRC Errored Frames

Fiber Runts

Fiber Jabbers

Undersized Frames

Code Violations

Code Violation Rate

Code Violation Seconds

PDH

Test Interfaces

E4

DS3

E3

E1 Balanced

E1 Unbalanced

T1

Interface Type

BNC

Bantam

RJ48

E4

Modes of Operation

Terminate

Monitor

Thru (Intrusive)

Timing

Recovered from Rx

Internal (Stratum 3)

Recoverd from External (BITs/SETs)

Framing

Framed

Unframed

Test Patterns

2^15-1* (Inverse)

2^20-1* (Inverse)

2^23-1* (Inverse)

User Programmable

Round Trip Delay

ANSI and ITU

Mappings

E3

E1

64 k

Anomaly/Error Insert/Analysis

Frame Errors

TSE/Bit Error

Single

Rate

Defect/Alarm Insert/Analysis

AIS

RDI/FAS Distant

General

Frequency Offset ±100 ppm

National Bit Support

Performance Measures

G.821	OOS
G.826	ISM/OOS
M.2100	ISM/OOS

Results

Signal Category

Receive Frequency

Receive Frequency Deviation

Receive Frequency Max Deviation

Transmit Frequency

Round Trip Delay

Frame Category

FAS TSE Count

FAS TSE Rate

FAS Word Error Count

FAS Word Error Rate

Frame Synchronization Loss Count

Frame Synchronization Loss Seconds

Logic Category

TSE/Bit Error Count

TSE/Bit Error Rate

Pattern Slips

Pattern Slip Seconds

Pattern Synchronization Loss Count

Pattern Synchronization Loss Seconds

DS3

Modes of Operation

Terminate

Monitor

Through (Intrusive)

Timing

Recovered from Rx

Internal (Stratum 3)

Recoverd from External (BITs/SETs)

Framing

M13

C-bit

Unframed

Test Patterns

All 1s

All 0s

2^15-1* (Inverse)

2^20-1* (Inverse)

2^23-1* (Inverse)

Round Trip Delay

User Programmable (3,,,,32 bits)

User Byte

100

1100 (aka IDLE)

1010 (aka BLUE)

ANSI and ITU

Mappings

E1

T1

64k

Anomaly/Error/Insert/Analysis

BPV/Code Error

Frame

Parity

C-Bit Parity

TSE/Bit Error

Single

Rate

Multiple

Defect/Alarm Insert/Analysis

AIS

RDI/FAS Distant

REBE

TS-16 AIS

TS-16 RDI/MFAC Distant

General

Frequency Offset +/- 100ppm

Loop Codes Tx NIU, CSU, Line

Rx Compensation - High - 0 ft

Rx Compensation - Low - 450 ft

Rx Compensation - Low - 900 ft

Service Disruption

Performance Measures

G.826	ISM/OOS
G.821	
M.2100	
M.2101	
T1.231	
T1.510	

Results

Signal Category

Receive Frequency

Receive Frequency Deviation

Receive Frequency Maximum Deviation

Transmit Frequency

BPV/Code Rate

BPV/Code Count

Electrical Input Level

Round Trip Delay (ms)

Frame

Frame Error Count

Frame Error Rate

Frame Error Seconds

Frame Synchronization Loss Count

Near End Out of Frame Seconds

Far-End Out of Frame Seconds

C-Bit Format

RX X-Bits

FEAC Word

Parity Error Count

Parity Error Rate

Parity Error Seconds

C-Bit Parity Error Count

C-Bit Parity Error Rate

C-Bit Error Seconds

FEBEs

DS2 Frame Synchronization Loss Count

Logic

Bit Error/TSE Count

Bit Error/TSE Rate

Pattern Slips

Pattern Slip Seconds

Pattern Synchronization Loss Count

Pattern Synchronization Loss Seconds

Pattern Synchronization Status

E3

Modes of Operation

Terminate

Monitor

Thru (Intrusive)

Timing

Recovered from Rx

Internal (Stratum 3)

Recoverd from External (BITs/SETs)

Framing

Framed

Unframed

Test Patterns

All 1s

All 0s

2047

2^11-1* (Inverse)

2^15-1* (Inverse)

2^20-1* (Inverse)

2^23-1* (Inverse)

User Programmable (3,,,,32 bits)

User Byte

Round Trip Delay

1:1

1:3

1:4

1:7

ANSI and ITU

Mappings

E1

64k

Anomaly/Error Insert/Analysis

Code Error

FAS Error

TSE/Bit Error

Single

Rate

Defect/Alarm Insert/Analysis

AIS

RDI/FAS Distant

General

Frequency Offset Tx +/- 100ppm

Tx LBO - 0 dB Loss

Tx LBO - 6 dB Loss

National Bit Support - On/Off

Service Disruption

Performance Measures

G.826	ISM/OOS
G.821	
M.2100	

Results

Signal Category

Transmit Frequency

Receive Frequency

Receive Frequency Maximum Deviation

Electrical Input Level

Code Error Count

Code Error Rate

Round Trip Delay (ms)

APS Switch Time (ms)

Frame Category

FAS Bit Error Count

FAS Bit Error Rate

FAS Word Error Count

FAS Word Error Rate

Frame Synchronization Loss Count

8M FAS Word Error Rate

8M FAS Bit Error Count

8M FAS Bit Error Rate

8M FAS Word Error Count

8M FAS Word Error Rate

Logic Category

TSE/Bit Error Count

TSE/Bit Error Rate

Pattern Slips

Pattern Slip Seconds

Pattern Synchronization Loss Count

Pattern Synchronization Loss Seconds

Pattern Synchronization Status

E1

Modes of Operation

Terminate

Monitor

Thru (Intrusive)

Timing

Recovered from Rx

Internal (Stratum 3)

Recoverd from External (BITs/SETs)

Framing

Unframed

PCM30

PCM30C

PCM31

PCM31C

Test Patterns

All 1s

All 0s

2^15-1* (Inverse)

2^20-1* (Inverse)

2^23-1* (Inverse)

QRSS

User Programmable (32 bits)

Round Trip Delay

1:1

1:3

1:4

1:7

ANSI and ITU

Mappings

64k

Anomaly/Error Insert/Analysis

Code Error

FAS Error

MFAS Error

TSE/Bit Error

Single

Multiple

Rate

Defect/Alarm Insert/Analysis

AIS

REBE

TS-16 AIS

TS-16 RDI/MFAS Distant

General

Frequency Offset Tx +/- 100ppm

Service Disruption

Performance Measures

G.826	ISM/OOS
G.821	
G.829	ISM/OOS
M.2100	

Results

Signal Category

2M Receive Frequency

2M Reference Frequency

2M Receive Frequency Deviation

2M Receive Frequency Maximum Deviation

2M Transmit Frequency

Electrical Input Level

Code Error Count

Code Error Rate

Round Trip Delay (ms)

Timing Slips

Frame Slips

APS Switch Time

Logic Category

TSE/Bit Error Count

TSE/Bit Error Rate

Pattern Slips

Pattern Slip Seconds

Pattern Synchronization Loss Count

Pattern Synchronization Status

Alarm Category

FAS/Frame Synchronization

MFAS Synchronization

CRC Synchronization	QRSS	Loop Code Tx - Repeater
AIS	User Programmable (3,,,,32 bits)	HDSL Loop Code Tx CO to Customer direction Customer to CO direction
RDI	User Byte	
Power Loss Count	BridgeTap	

Column 1:

CRC Synchronization

AIS

RDI

Power Loss Count

2M Alarm

Frame Category

FAS Bit Error Count

FAS Bit Error Rate

FAS Word Error Count

FAS Word Error Rate

Non-Frame Alignment Word

MFAS Word Error Count

MFAS Word Error Rate

Time Slot Rx Byte

CRC Error Count

CRC Error Rate

CRC Synchronization Loss Count

FAS Synchronization Loss Count

MFAS Synchronization Loss Count

Remote End Block Error (REBE)

T1

Modes of Operation

Terminate

Monitor

Through (Intrusive)

Timing

Recovered from Rx

Internal (Stratum 3)

Recoverd from External (BITs/SETs)

Framing

Unframed

SF

ESF

SLC-96

Test Patterns

63

511

511 QRSS

2047 QRSS

2047

All 1s

All 0s

2^15-1* (Inverse)

2^20-1* (Inverse)

2^23-1* (Inverse)

Column 2:

QRSS

User Programmable (3,,,,32 bits)

User Byte

BridgeTap

MultiPat

Round Trip Delay

1:1

1:3

1:4

1:7

2 in 8

3 in 24

MIN/MAX

T1 DALY

55 OCTET

T1-2/96

T1-3/54

T1-4/120

T1-5/53

Mappings

64k

56k

Anomaly/Error Insert/Analysis

Frame Errors

BPV Errors

TSE/Bit Error

Single

Rate

Multiple

Defect/Alarm Insert/Analysis

AIS

REBE

General

Frequency offset Tx ±100 ppm

Performance Measures

G.826	ISM/OOS
G.828	ISM/OOS
G.829	ISM/OOS
M.2100	
T1.231	
Tx LBO	0, 7.5, 15, 22.5 dB Loss
Service disruption	

Loop Codes

Loop Code Tx	NIU, CSU
Loop Code Emulation	NIU, CSU

Column 3:

Loop Code Tx - Repeater

HDSL Loop Code Tx
CO to Customer direction
Customer to CO direction

User Defined Loop Code Support

Results

Signal Category

Receive Frequency

Reference Frequency

Receive Frequency Deviation

Receive Frequency Maximum Deviation

Transmit Frequency

Simplex Current

Receive Level (Vp)

Receive Level (dBdsx)

Receive Level (dBm)

BPV Error Count

BPV Error Rate

Frame Slip Count

Signal Loss Count

Signal Loss Seconds

Round Trip Delay (ms)

Timing Slips

Frame Slips

APS Switch Time

Frame Category

Frame Error Count

Frame Error Rate

Frame Error Seconds

Frame Loss Count

Frame Loss Seconds

Severely Errored Seconds

CRC Error Count

CRC Error Rate

CRC Errored Seconds

CRC Severely Errored Seconds

Logic Category

Bit Error/TSE Count

Bit Error/TSE Rate

Bit Error/TSE Seconds

Pattern Slips

Pattern Slip Seconds

Pattern Synchronization Loss Count

Pattern Synchronization Loss Seconds

Channel

DSO Channel Payload View

ABCD Bit Signaling View

DS1 Dual HDLC Monitor and PPP Ping

Modes of Operation

Bridge

Terminate

DSX Monitor

Line Code

B8ZS

AMI

Clock Source (PPP Ping Only)

Internal

Recovered

External

Selectable Clock Offset

Transmit LBO (PPP Ping only)

0 dB

−7.5 dB

−15.0 dB

−22.5 dB

Framing

Unframed

ESF

D4 (SF)

SLC-96

Payload

Bulk

Fractional Rate

HDLC

Normal or inverted HDLC Mode

CRC16 or CRC32

PPP (PPP Ping Only)

PPP Mode (Client or Server)

IP Mode (Static or Auto)

Optional Authentication

IP (PPP Ping Only)

IPv4 Frame Format

Local IP

Remote IP

Destination IP Address - User Defined

Subnet Mask

Preferred & Alternate DNS Server

IPv4 Editable Fields

ToS

DSCP

TTL

IP Ping

Editable Packet Length (46 - 1500 bytes)

Single

Multiple

Continuous

Fast

Alarms/Errors Generation and Analysis (PPP Ping only)

LOS

LOF

AIS

RAI

BPV

Frame

Results

Interface

Signal Losses

Signal Loss Seconds

Rx Level (Vpp)

Rx Level (dBsx)

Rx/Tx Frequency (Hz)

Rx/Tx Frequency Deviation (ppm)

Rx/Tx Frequency Max Deviation (ppm)

Bi-Polar Violations (BPVs)

BPV Rate

Excess Zeros State Count

Ones Density State Count

DS1

Frame Sync Losses

Frame Sync Loss Seconds

AIS Alarms

AIS Seconds

T1 Alarm Seconds

Frame Errors

Frame Error Rate

Frame Error Seconds

Excess Zeros

Maximum Consecutive Zeros

HDLC

Rx/Tx Frame Count

Rx/Tx Octet Count

Frame Aborts

Short Frames

FCS Errored Frames

Percent Utilization (Average, Current, Maximum)

Throughput (Average, Current, Maximum)

Average Frame Rate (frames/sec)

Average Frame Size (octets)

PPP (PPP Ping Only)

PPP Status

Local IP

IP Subnet Mask

Remote IP

Preferred & Alternate DNS Server

Destination IP Address

Resolved Host Name

Ping (PPP Ping Only)

Ping Requests Tx

Ping Replies Rx

Lost Pings

Lost Ping %

Delay (ms)

Ping Requests Rx

Ping Replies Tx

Capture/Decode

Wirespeed Capture

Integrated Wireshark on the TestSet

256MB Capture Buffer

Triggers

Frame Slicing

DS3 HDLC Dual Monitor

Modes of Operation

DSX-MON

Terminate

Framing

Unframed

M13

C-Bit

HDLC

Normal or Inverted HDLC Mode

CRC16 or CRC32

Results

Interface

Signal Losses

Signal Loss Seconds

Rx Level (Vpeak)

Rx Level (dBdsx)

Rx Frequency (Hz)

Rx Frequency Deviation (ppm)

Rx Frequency Max Deviation (ppm)

Bi-Polar Violations (BPVs)

BPV Rate

BPV Error Seconds

Excess Zeros Count

Excess Zeros Seconds

DS3

Frame Sync Losses

Frame Sync Loss Seconds

Near End OOF Seconds

Far End OOF Seconds

AIS Seconds

RAI Seconds

FEAC Word

Frame Errors

Frame Error Rate

Parity Errors

Parity Error Bit Rate

C-Bit Errors

C-Bit Error Rate

C-Bit Error Seconds

C-Bit Frame Mismatch Seconds

C-Bit Sync Loss Seconds

FEBEs

FEBE Rate

FEBE Seconds

Rx X-Bits

HDLC

Rx Frame Count

Rx Octet Count

Frame Aborts

Short Frames

FCS Errored Frames

Percent Utilization (Average, Current, Maximum)

Throughput (Average, Current, Maximum)

Average Frame Rate (frames/sec)

Average Frame Size (octets)

CPRI

Test Interfaces/Bit Rates	
614 Mbps optical (Rate 1)	Dual Port Capable
1.2 Gbps optical (Rate 2)	Dual Port Capable
2.4 Gbps optical (Rate 3)	Dual Port Capable
3.1 Gbps optical (Rate 4)	Dual Port Capable
4.9 Gbps optical (Rate 5)	Dual Port Capable
6.1 Gbps optical (Rate 6)	Dual Port Capable
9.8 Gbps optical (Rate 7)	Dual Port Capable
10.137 Gbps optical (Rate 8)	Dual Port Capable
12.2 Gbps Optical (Rate 9)	Dual Port Capable

Laser Type

SFP

SFP+

SFP+ Tuneable

Modes of Operation

Terminate

Monitor/Thru

Timing

Recoverd from Rx (Slave)

Internal (Stratum 3) (Master)

Recoverd from External (BITs/SETs) (Master)

Recoverd from 10MHz clock (Master)

CPRI Automation

CPRI Service Activation automated workflow

CPRI Features

Optical/Electrical Power Level

Freq Offset Transmit/Receive

CPRI Startup Sequence - Normal or Bypass

Signal Generation and Monitoring

L1 - PRBS Pattern Inserted in Hyperframe Structure

L2 - PRBS Pattern Inserted in CPRI Basic Frame

L2 - PRBS Pattern Inserted in CPRI Antenna-carrier (AxC) Group

L2 Test Waveform Inserted in CPRI Antenna-carrier (AxC) Group

Interface Type

Master

Slave

Selectable CPRI Protocol Verion

Control and Management (C&M) Channel

Ethernet

HDLC

Selectable C&M Channel Rate

Service Disruption Measurements

SD Separation/Debounce Time Setting

SD Threshold Time Settings

Round-Trip Delay Measurement

RTD Measurement Accuracy

PRBS Patterns

2^15-1, 2^15-1 Inverse

2^20-1, 2^20-1 Inverse

2^23-1, 2^23-1 Inverse

2^31-1, 2^31-1 Inverse

Delay

Live

Digital Word

ANSI and ITU implementations

Anomaly/Errors Generation

Bit/TSE

Code

K30.7

Running Disparity

Insert - Single

Insert - Rate

CPRI AxC Mapping

Mapping Method: Method 1

Sample Width

Bandwidth

 AxC Group Number

Offset

Test Waveform Selections

Continuous Wave (CW)

LTE-FDD TM1.1

LTE-FDD TM1.2

LTE-FDD TM2

LTE-FDD TM3.1

LTE-FDD TM3.2

LTE-FDD TM3.3

Loopback AxC (ALU/Nokia RRH)

Set Power levels and Bands (ALU/Nokia RRH)

Defects/Alarms Generation/Analysis

LOS

LOF

SDI

RAI

Results

Results Accuracy

1ns

Signal Category

Signal Losses

Sync Loss Seconds

Optical Rx Overload

Optical Rx Level (dBm)

Receive Frequency

Receive Frequency Deviation

Receive Frequency Maximum Deviation

Transmit Frequency

Tx Frequency Deviation (Hz)

Tx Frequency Deviation (ppm)

Tx Frequency Max Deviation (ppm)

CPRI Inband Protocol

Tx/Rx Protocol Version

Tx/Rx C&M HDLC Rate

Tx/Rx C&M Ethernet Subchannel Number

Port Type (Master/Slave)

Start-up State

CPRI Counts

Code Word Count Tx/Rx

Frame Count Tx/Rx

Error Stats

Word Sync Loss Events

Word Sync Loss Seconds

Code Violations

Code Violation Rate

Code Violation Seconds

K30.7 Words

Frame Sync Loss Events

Frame Sync Loss Seconds

Pattern Sync Losses

Pattern Sync Loss Seconds

Bit Error Rate

Bit Errors

Errored Seconds

Error-Free Seconds

Error Free Seconds, %

Total bits Received

Round Trip Delay Current (ms)

Round Trip Delay Average (ms)

Round Trip Delay Minimum (ms)

Round Trip Delay Maximum (ms)

Remote LOS

Remote LOS Seconds

Remote LOF

Remote LOF Seconds

RAI

RAI Seconds

SDI

SDI Seconds

Running Disparity Errors

Running Disparity Error Rate

RRH Testing (available for ALU RRH)

RRH SW version

RRH serial number

RRH SFP information

RRH CPRI Reset

RRH Alarm Insertion

OBSAI

Test Interfaces/Bit Rates	
768 Mbps Optical	Dual Port Capable
1.5 Gbps Optical	Dual Port Capable
3.1 Gbps Optical	Dual Port Capable
6.1 Gbps Optical	Dual Port Capable

Laser Type
SFP
SPF+
SFP+ Tunable

Modes of Operation
Terminate
Monitor/Thru

Timing
Recoverd from Rx (Slave)
Internal (Stratum 3) (Master)
Recoverd from External (BITs/SETs) (Master)
Recoverd from 10MHz clock (Master)

OBSAI Features
Optical/Electrical Power Level
Freq Offset Transmit/Receive

PRBS Generation and Monitoring
Unframed
L1 - Pattern Inserted in Frame Structure
L2 - Pattern Inserted in OBSAI Message

OBSAI Interface
Selectable Port Type (Master or Slave)
LOS Enable (On or Off)
Force Tx Idle (On or Off)
Definable RP3 Address
Selectable RP3 Type (WCDMA/FDD, GSM/EDGE, WiMAX 802.16, LTE)
Selectable Number of Message Groups in Master Frame

Selectable Number of Message Slots in Message Group

Selectable Number of Idle Bytes After Message Group

FCB Message Generation

Round Trip Delay Measurement

RTD Measurement Accuracy

PRBS Patterns

2^15-1, 2^15-1 Inverse

2^20-1, 2^20-1 Inverse

2^23-1, 2^23-1 Inverse

2^31-1, 2^31-1 Inverse

D6.6 D25.6

Delay

Live

Digital Word

Anomaly/Errors Generation

Bit

Code

Insert - Single

Insert - Rate

Results

Signal Category

Signal Losses

Sync Loss Seconds

Optical Rx Overload

Optical Rx Level (dBm)

Receive Frequency

Receive Frequency Deviation

Receive Frequency Maximum Deviation

Transmit Frequency

Tx Frequency Deviation (Hz)

Tx Frequency Deviation (ppm)

Tx Frequency Max Deviation (ppm)

OBSAI Counts

Code Word Count Tx/Rx

Frame Count Tx/Rx

Message Group Counts Tx/Rx

Receive Message Counts: Control, Measurement, WCDMA/FDD, WCDMA/TDD, GSM/EDGE, TETRA, CDMA2000, WLAN, Loopback, Frame Clock Burst, Ethernet, RTT, WiMAX, Virtual HW Reset, LTE, Generic Packet, Multi-hop RTT

Error Stats

Word Sync Loss Events

Word Sync Loss Seconds

Code Violations

Code Violation Rate
Code Violation Seconds
K30.7 Words
Frame Sync Losses
Frame Sync Loss Seconds
Pattern Sync Losses
Pattern Sync Loss Seconds
Bit Error Rate
Bit Errors
Errored Seconds
Error-Free Seconds
Error Free Seconds, %
Total bits Received
Round Trip Delay Current (ms)
Round Trip Delay Average (ms)
Round Trip Delay Minimum (ms)
Round Trip Delay Maximum (ms)
Tx/Rx OBSAI State

Jitter O.172

General Features	
Generate and measure Jitter on electrical interfaces	DS1, E1, DS3, E3, E4, STM1e
Automatic Measurement Sequences · Maximum Tolerable Jitter (MTJ) · Measure Intrinsic Jitter · Jitter Transfer Function (JTF)	
Support different Measurement Bands · High Band · Wide Band · Extended Band · Ability to set user definable band	
Common Jitter mask selectable	
Ability to create user definable masks	
Results	
Jitter Results per measurement band	
Current peak to peak jitter [UI] · Peak to peak jitter [UI] · Positive peak jitter [UI] · Negative peak jitter [UI]	
Maximum peak to peak jitter [UI] · Peak to peak jitter [UI] · Positive peak jitter [UI] · Negative peak jitter [UI]	
Phase Hits	
Percentage of mask	
RMS Jitter [UI]	
Jitter Graphs	

Wander

General Features
Measure Wander on 1PPS Signal
Measure Wander on 1G Optical SyncE Interface
Measure Wander on T1, E1, & unframed 2.048 MHz Signals
Measure Wander on 10 MHz Signal
Selectable Peak Time Offset Threshold
Resolution 1 ns
Sample Rate 1, 30, 60 samples per second
Internal Data Storage - 256M
External Data Storage on USB stick
Start Stop via key

Results	
Time Interval Error (TIE) · Current TIE(s) · Maximum TIE(s) · Minimum TIE(s)	
Maximum Peak-to-Peak TIE (MTIE) [s]	
Offset Between Test Signal and Reference · Current Offset (µs) · Minimum Offset (µs) · Maximum Offset (µs)	
Pass/Fail Result	
TIE Graph	
Reference Clock for 1 pps wander	1 pps reference signal
Reference Clock for 1G SyncE Optical, T1, E1, 2 MHz, & 10 MHz wander	2 MHz or 10 MHz reference signal
Cables for 1 pps Wander	

Wander Analysis Tool
Offline analysis of captured/imported TIE measurements
Maximum Peak-to-Peak TIE (MTIE) [s]
TDEV (Time Deviation)
Frequency Offset (ppm)
Drift Rate (ppm/s)

Masks	
ANSI	SMC holdover (T1.105.109)
ETSI	SEC (ETS 300 462-5-1) SEC network IF (ETS 300 462-3-1) SSU (ETS 300 462-4-1) SSU network IF (ETS 300 462-3-1)
GR253	SMC transient

ITU	G.8261 SEC network IF (G.832, G.825) SEC option 1 (G.813) SEC option 2 (G.813) SEC holdover option 2 (G.813) SEC trans. option 2 (G.813) SSU network IF (G.823, G.825) SSU Type I (G.812) SSU Type II, III (G.812) SSU Type IV (G.812) PRC (G.811) EEC-1 Noise Generation (G.8262 constant temp.) EEC-1 Noise Generation (G.8262 with temp. effects) EEC-2 Noise Generation (G.8262 constant temp.) EEC-1 Noise Tolerance (G.8261) EEC-1 Noise Tolerance (G.8262) PRC (G.811) DTE Network Limit (G.8271.1) Wander Generation (G.8272) DTE Noise Generation (G.8273.2 constant temp.) DTE Noise Generation (G.8273.2 variable temp.)

Masks
PRC/SSU/SEC: Masks for G.811/G.812/G.813 clocks (ETS 300 462-2)
Networks: According to G.823/G.824
SyncE: According to G.8261, G.8262
ANSI-Standard: DS1 masks

Services

VoIP Testing
10/100/1000M Electrical Ethernet Interfaces
1GigE Optical Ethernet Interface
10GigE Optical Ethernet Interface
SIP, Cisco SCCP and H.323 Fast Connect
Supported SIP Parameters
Dial by phone/URL/e-mail
Nortel & Huawei SIP emulation
Proxy login and proxyless operation
Supported SCCP Parameters
Selectable Cisco Phone emulation supporting at least 15 models
Configurable device name
Supported H.323 Parameters
H.323 ID
Bearer Capability including Unrestricted Digital, Speech & 3.1K Audio
Configurable Calling & Called Party Number Plans and Number Types

Static, auto-discoverable and no gatekeeper operation

Configurable Local and Gatekeeper RAS port and Call Control Port

Configurable Time Zone

Configurable RTP port range

General Parameters

Auto answer on/off

Codecs:
· G.711 A Law
· G.711 U Law
· G.723 5.3 K
· G.723 6.3 K
· G.729A
· G.726
· G.722

Configurable Call Manager port

Selectable silence suppression

Configurable jitter buffer and speech per frame parameters

ACR or G.107 MOS Scoring

Configurable Jitter, Loss, Delay and Content Threshold pass/fail

Mean Opinion Score Results (MOS)

Graphical Summary Results including Ethernet, transport & Content

Transaction Log including call log and protocol signaling

Phone book of last 10 numbers and IP addresses called

DTMF Digits

Triple Play Automated Test Script

10/100/1000M Electrical Ethernet Interfaces

1GigE Optical Ethernet Interface

10GigE Optical Ethernet Interface
· Over 11,000 simulated calls with configurable Codec and sampling rate
· Configurable voice call or tone with configurable silence suppression, sampling rate and jitter buffer
· Up to 250 simulated SDTV channels with configurable frame size and MPEG-2/4 compression
· Up to 52 simulated HDTV channels with configurable frame size and MPEG-2/4 compression
· 2 configurable data streams with individual constant or ramp traffic and configurable frame sizes including random frames

IPTV

10/100/1000M Electrical Ethernet Interfaces

1GigE Optical Ethernet Interface

10GigE Optical Ethernet Interface
· Single Program Transport Stream (SPTS) and Multiple Program Transport Stream (MPTS) formats
· Video explorer capable of detecting 512 SPTS and 32 MPTS and a video analyzer that supports 16 SPTS and 1 MPTS
· Supported measurements include bandwidth utilization, packet loss, packet jitter, PCR jitter, continuity error bit and error bit indicator
· TR 101 290 priority 1 errors such as program identification (PID), program association table (PAT) and program map table (PMT)
· Loss distance and period errors per RFC3357, results per transport stream and per PID
· Media Delivery Index (MDI) measurements
· Measure ICC latency and R-UDP latency
· Microsoft Television (MSTV) Support
· Internet Group Management Protocol (IGMP) support

Primary Rate ISDN

Test Access	T1

TE Emulation

NT Emulation

D-Channel Signaling Decodes

Call Control	National 5ESS NI-1
D-Channel Rate	64 k 56 k
Call Type	Data Voice 3.1 k audio
Channel Number	1 to 24
D-Channel Rate	56 k

DTMF digits

Primary Rate E1 ISDN

Test Access	E1

TE Emulation

NT Emulation

D-Channel Signaling Decodes

Codec µ-law, A-law

Call Control	1TR6 1TR67 EDSS-1 VN3 VN4 VN6 TPH1962 Q.SIG Q.931 TN-1R6 SwissNet-3 CorNet-N CorNet-NQ DREX Alcatel QSIG
Services	Speech 3.1 KHz Data Fax G4 Teletex Videotex Speech BC Data BC Data 56Kb Fax 2/3

Channel Number - 1 to 31

DTMF Digits

Signaling—Place/Receive Call

Test access	T1

E&M Signaling

Loop Start Signaling

Ground Start Signaling

Audio Drop/Insert

Signaling Bits

Place Call

Receive Call

MF Digits

DTMF Digits

Event Log

VF Tone Insertion

Fractional T1/E1

Test Access	T1
Fractional T1	n x 64 k
Fractional T1	n x 56 k

Contiguous Channels

Non Contiguous Channels

V.54 Loop Codes Support

Voice Frequency

Test Access - T1

Listed to an Audio Call

Insert VF Tones	404, 1004, 1804, 2713, and 2804 Hz

| User Frequency |
| Quiet Tone |
| Holding Tone |
| Three Tone |
| Frequency Sweep |
| Impulse Noise |
| Rx Frequency |
| Level (dBm) |
| DC Offset mV |

Fiber Inspection

Optical Fiber Microscope

The Test Equipment shall be able to accept an optical video microscope.

The connector image shall be displayed on the Test Equipment and saved into a .JPEG file format.

The microscope shall offer a switchable 200/400x magnification capability.

It shall be provided with the dedicated tips to inspect fiber connectors on the patch panel and the patch cords.

The microscope shall be capable of automatically centering the fiber image

The microscope shall be capable of performing on-board Pass/Fail analysis

The microscope shall be compatible with Android tablets/smartphones

OTDR

OTDR Solution for Troubleshooting from Central Offices

Wavelengths: 1310 & 1550nm

Connector type: UPC or APC (Note: Only one should be selected)

Adapter type: FC or SC (Note: Only one should be selected)

Dynamic Range:
· at 1310nm: 35dB
· at 1550nm: 33dB

Event Dead Zone:
· at 1310nm/1550nm: 1.5m maximum

Attenuation Dead Zone:
· at 1310nm/1550nm: 6m maximum

Pulse width: 5ns to 20msPulse width: 5ns to 20ms

Number of data points: up to 128,000

Light source:
· On the OTDR port
· Wavelength: same as the OTDR
· Output power: -3.5 dBm typical

Test results shall be stored in SOR format (Telcordia GR-196-CORE) as well as in PDF format

The test result page shall display the graphical OTDR trace and event table

The test solution shall be able to convert automatically the OTDR trace into an icon-based map that makes OTDR results interpretation quick and easy

OTDR Solution for FTTA & DAS Singlemode & Multimode Network Testing

Wavelengths: 850, 1300, 1310, 1550 nm

Connector type: UPC or APC for 1310nm/1550nm (Note: Only one should be selected) and UPC for 850/1300nm

Adapter type: FC, SC, LC or ST (Note: One or several can be selected)

Dynamic Range:
· at 850nm: 26 dB
· at 1300nm: 24 dB
· at 1310nm: 37 dB
· at 1550nm: 35 dB

Event Dead Zone:
· at 850nm/1300nm: 0.8m maximum
· at 1310nm/1550nm: 0.9m maximum

Attenuation Dead Zone:
· at 850nm/1300nm: 4m maximum
· at 1310nm/1550nm: 4m maximum

Pulse width:
· at 850nm/1300nm: 3ns to 1ms
· at 1310nm/1550nm: 3ns to 20µs

Number of data points: up to 128,000

Light source:
· On the OTDR port
· Wavelength: same as the OTDR
· Output power: -3.5 dBm typical

Power meter:
· On the OTDR port
· Calibrated wavelengths: 850, 1300, 1310, 1490, 1550, 1625, 1650 nm
· Power level range (MM/SM): -3 to -30dBm / -2 to -50 dBm

The test result page shall display the graphical OTDR trace and event table

The test solution shall be able to convert automatically the OTDR trace into an icon-based map that makes OTDR results interpretation quick and easy

The test solution shall be able to identify and label network elements

OTDR Solution for Cloud RAN & Access/ Backhaul Network Testing

Wavelengths: 1310, 1550, 1625 nm (Note: 1625nm is optional)

Connector type: UPC or APC (Note: Only one should be selected)

Adapter type: FC, SC, LC or ST (Note: One or several can be selected)

Dynamic Range:
· at 1310nm: 40 dB
· at 1550nm: 38 dB
· at 1625nm : 37 dB

Event Dead Zone:
· at 1310/1550/1625nm: 0.9m maximum

Attenuation Dead Zone:
· at 1310/1550/1625nm: 4m maximum

Pulse width: 3ns to 20ms
Number of data points: up to 128,000

Light source:
· On the OTDR port
· Wavelength: same as the OTDR
· Output power: -3.5 dBm typical

Power Meter:
· On the OTDR port
· Calibrated wavelengths: 1310, 1490, 1550, 1625, 1650 nm
· Power level range: 0 to -50 dBm

The test result page shall display the graphical OTDR trace and event table

The test solution shall be able to convert automatically the OTDR trace into an icon-based map that makes OTDR results interpretation quick and easy

OTDR Solution for Metro & Access/ Backhaul Network Testing

Wavelengths: 1310, 1550, 1625 nm (Note: 1625nm is optional)

Connector type: UPC or APC (Note: Only one should be selected)

Adapter type: FC, SC, LC or ST (Note: One or several can be selected)

Dynamic Range:
· at 1310nm: 43 dB
· at 1550nm: 43 dB
· at 1625nm : 41dB

Event Dead Zone:
· at 1310/1550/1625nm: 0.8m maximum

Attenuation Dead Zone:
· at 1310/1550/1625nm: 4m maximum

Pulse width: 3ns to 20ms

Number of data points: up to 256,000

Light source:
· On the OTDR port
· Wavelength: same as the OTDR
· Output power: -3.5 dBm typical

Power Meter:
· On the OTDR port
· Calibrated wavelengths: 1310, 1490, 1550, 1625, 1650 nm
· Power level range: 0 to -50 dBm

The test result page shall display the graphical OTDR trace and event table

The test solution shall be able to convert automatically the OTDR trace into an icon-based map that makes OTDR results interpretation quick and easy

OTDR Solution for CWDM Network Testing

8 CWDM wavelengths should be available on 1 optical port

Wavelengths:1471, 1491, 1511, 1531, 1551, 1571, 1591, 1611nm

Connector type: UPC or APC (Note: Only one should be selected)

Adapter type: FC, SC or LC (Note: One or several can be selected)

Dynamic Range: 35dB

Event Dead Zone:
· at 1310/1550/1625nm: 1.5m maximum

Attenuation Dead Zone:
· at 1310/1550/1625nm: 5m maximum

Pulse width: 10ns to 20ms

Number of data points: up to 256,000

Light source:
· On the OTDR port
· Wavelength: same as the OTDR
· Output power: -3.5 dBm typical

The test result page shall display the graphical OTDR trace and event table

The test solution shall be able to convert automatically the OTDR trace into an icon-based map that makes OTDR results interpretation quick and easy

Optical Spectrum Analyzer

Optical Spectrum Analyzer Solution for Mobile Backhaul Service Activation

Connector type: PC

Adapter type: FC, SC, LC or ST (Note: One or several can be selected)

Spectral measurement

Wavelength range: From 1260 to 1625 nm

Wavelength accuracy: ±0.5 nm

Readout resolution: 0.001nm

Resolution bandwidth FWHM: 4nm

Minimum channel spacing: 8 nm

Power measurement

Dynamic range: −55 to +10 dBm

Noise floor RMS -55 dBm

Absolute accuracy: ±0.5 dB

Linearity: ±0.1 dB

Readout resolution: 0.01 dB

Scanning time (1260 to 165 nm): <4 sec

Maximum total safe power: +15 dBm

Optical return loss: > 35 dB

The Optical Spectrum Analyzer shall be equipped with a bay for up to 2 SFPs (optional)

Precision Timing Reference

Precision Timing Reference for Mobile Backhaul (PTP) Service Activation

Connector types:
· SMA for GPS Antenna,
· SMB for 1PPS and
· 10 MHz Timing Inputs and Outputs

Integral GPS Receiver

Support for GNSS tuning including GPS, GLONASS, Beidou, and SBAS

Support for Cable/Antenna Calibration factor

GPS Synchronization Modes; Dynamic, Static, and Survey

Capable of savings surveyed locations and recalling saved locations

Capable of powering external antenna with 5 VDC or 3.3 VDC

Capable of detecting short circuit and open circuit fault conditions with external antenna

Capable of providing accurate timing with only a single satellite visible in static timing mode

Support for user tuning of minimum satellite elevation angle

Provides realtime satellite constellation sky plot identifying potential visible satellites and those being used

Provides realtime bar graph of satellite Carrier to Noise Ratio (CNR) for all visible satellites

Support for 72 channels; 32 for satellite tracking, 40 for acquisition aiding and noise estimation

Rubidium Clock

Support for two 1PPS inputs and capable of measuring phase difference between them down to 5nsec

Support for measuring ToD offset for a device under test with NMEA and G.8271 (draft) formats

Support for a 10MHz input

Support for a 1PPS output disciplined to the Rubidium clock

Support for a 10MHz output disciplined to the Rubidium clock

Selectable auto-power on for the Rubidium clock upon instrument power-up

Minimum holdover of 7 usec over 24 hours over full temperature range

Minimum oscillator stability of 1.5E-11 over 2 hours.

GPS Results

Number of satellites used

UTC Time

Estimated position error

Sky plot

Carrier to Noise bar graph

Carrier to Noise (C/No) measurement per satellite

Mean C/No measurement (current and average)

C/No Bar Chart

Mean 3D Accuracy

Position Dilution of Precision (current and average)

Leap seconds

Event Log

Rubidium Clock Results

Total holdover time elapsed

Holdover time remaining (for selectable clock accuracy)

Synchronization state (Course tune, Intermediate Tune, Fine Tune)

Event Log

C37.94

Test Interfaces/Bit Rates	
2.048Mhz	Dual Port Capable

Laser Type
SFP

Modes of Operation
Terminate

Framing
Framed

Payload
N x 64 kbps

Test Patterns
2^11 -1 (INV)
2^15 -1 (INV)
2^20 -1 (INV)
2^23 -1 (INV)
QRSS
All Ones
All Zeros
Delay
Live
ANSI and ITU

Performance
G.826
G.821
M.2100

Alarms
LOF
RDI

Errors
FAS

Results
Interface
Signal Losses
Signal Loss Seconds
Optical Rx Overload
Optical Rx Level (dBm)
Optical Tx Level (dBm)
Laser Bias Current (mA)
Rx Frequency (Hz)
Rx Frequency Deviation (ppm)
Rx Frequency Maximum Deviation (ppm)
Tx Clock Source
Tx Frequency (Hz)
Tx frequency Deviation (ppm)
Tx Frequency Maximum Deviation (ppm)
C37.94 – Frame
Frame Sync Losses
Frame Sync Loss Seconds
LOFs
LOF Seconds
RDI Alarms
RDI Seconds
FAS Word Errors
FAS Word Error Rate
FAS Bit Errors
FAS Bit Error Rate
N x 64 kbps
Payload – BERT
Pattern Sync Losses
Pattern Sync Loss Seconds
Round Trip Delay (ms)
Round Trip Delay Avg (ms)
Round Trip Delay Minimum (ms)
Round Trip Delay Maximum (ms)

VIAVI Solutions

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