VIAVI Solutions

Data Sheet

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
16 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
Recovered from External Interface
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 (0-65535)
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 16k)
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
CVLAN Priority
Supports up to 8 stacked VLAN Tags

VPLS

VPLS Parameters - MAC Addresses

VPLS Parameters - Frame Type

VPLS Parameters - EtherType

VPLS Tunnel and VC Label - Label, CoS, TTL

VPLS Control Word - Reserved Bits, Sequence Number

MAC in MAC/PBT/PBB

Parameters - MAC Address

B-Tag - TPI, VID, Priority, DEI

I-Tag - TPI, SID, Priority, DEI, NCA, Res1, Res2

MPLS

Single Label Support

Stacked Label Support - Up to 2

Editable Parameters/Results - Label

Editable Parameters/Results - CoS

Editable Parameters/Results - TTL

MPLS-TP

MPLS-TP Label Support (Tunnel and VC)

VLAN Tag Support

Linerate Traffic Generation

Traffic Analysis

Editable Parameters/Results - Label

Editable Parameters/Results - Priority

Editable Parameters/Results - TTL

Rx Filters

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

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

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

Simultaneous OAM and background traffic generation

Ethernet OAM

Y.1731 Service OAM and 802.1ag CFM

CCM Messages

Programmable CCM Rate

CCM Type - Unicast, Multicast

MEG ID End Point

Maintenance Domain Level

AIS Tx/Rx

RDI Tx/Rx

LBR/LBM (Ping) - Unicast, Multicast

LTM/LTR (Trace)

MEP Discovery

802.3ah Link OAM

Mode - Passive/Active

Vendor OUI

Vendor Specific Info

Max PDU Size

Unidirectional Links

Remote Loopback

Link Events

Variable Retrieval

Dying Gasp

Link Fault

Critical Event

Errored Symbol Period Event

Errored Frame Event

Errored Frame Period Event

Errored Frame Second Summary Event

IP Packet Generator

IP

IPv4 Frame Format

IPv6 Frame Format

TCP Port Number

UDP Port Number

IP Addressing

Destination IP Address - User Defined

Source IP Address - User Defined

IPv4 Editable Fields

ToS

DSCP

Flags

Protocol

TTL

IPv6 Editable Fields

Traffic Class

Flow Label

Next Header

Hop Limit

IP Ping

Fast Ping

IP TraceRoute

Traffic Generator

Number of Traffic Engines

Bandwidth Controlled

Bandwidth Specification in Mbps or kbps

Bandwidth Granularity

Bandwidth Specification in %

Bandwidth Utilization Accuracy - 0.1%

Burst Mode - Burst Size - 1 to 2M frames

Bandwidth Specified - Definable

Continuous Tx

Once Tx - Definable frames/burst

Traffic generation in LBM frames at line rate

Analysis of LBR frames at line rate

Traffic Profiles

Constant B/W

Ramp B/W

Bursty B/W

Flood B/W

Traffic generation in Mbps, kbps, or % utilization

B/W configurable based on L1 or L2

TCP Throughput

10/100/1000M Linerate Stateful Emulation

1GigE Linerate Stateful Emulation

10GigE Linerate Stateful Emulation

Configurable Src and Dest IP address

Packet length

TCP/UDP Traffic Modes

Source Port

Destination Port

Listen Port

Configurable TCP Window Size

Measures TCP Efficiency

Measures Buffer Delay

TCP Client Emulation

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

eCPRI

10GE Tx/Rx

Constant, Burst and Ramp Traffic

Encapsulation Supported - None, VLAN

Frame Size: Configurable, Random, EMIX, Jumbo, User Defined

Source MAC Address: Configurable, Per stream and Single

Streams: 10 independent streams

Message Type: IQ Data, Bit Sequence, Real-Time Control Data, Generic Data Transfer, Remote Memory Access, Remote Reset, Event Indication, Vendor Specific, eCPRI One-Way-Delay

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 (1GE & 10GE)

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
Recovered from External Interface
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	
Timing	
Internal	
Recovered from External Interface	
External	
Selectable Rx - Descramble	
Selectable Tx - Scramble	
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
FEC Uncorrectable
FEC Correctable
TCM1-6 BIP
TCM1-6 BEI
Bit Error
Code Word Errors (Corr/Incorrect)
OTU Alarm Tx/Rx
LOF
OOF
LOM
OOF
OOM
SM-IAE
SM-TIM
SM-BDI
SM-BIAE
PM-TIM
PM-BDI
FTFL Fwd Sig Fail
FTFL Fwd Sig Degr.
FTFL Bwd Sig Fail
FTFL Bwd Sig Degr
TCM1-6 IAE
TCM1-6 TIM
TCM 1-6 BDI
TCM1-6 BIAE
ODU Errors Tx/Rx
FAS

MFAS
PM BIP/BEI
TCM BIP/BEI
Bit Error
ODU Alarms Tx/Rx
LOF
OOF
LOM
OOM
AIS
OCI
LCK
PM-TIM
PM-BDI
FTFL
FTFL Fwd Sig Fail
FTFL Fwd Sig Degr.
FTFL Bwd Sig Fail
FTFL Bwd Sig Degr
TCM1-6 IAE
TCM1-6 TIM
TCM 1-6 BDI
TCM1-6 BIAE
OPU Errors/Alarms Tx/Rx
PT Label Mismatch
Client Loss
Bit Error
ODU Mappings
Bulk
ODU0
ODU1
ODU2
SDH Mappings
VC4 Bulk, AU-4-4c, AU-4-16c, AU-4-64c
VC4
VC3
SONET Mappings
STS-1, STS-3c, STS-12c, STS-48c, STS-192c
Ethernet Mappings
10GigE
1GigE
Results
LEDS
Signal Present
Frame Sync

Pattern Sync
LOS
LOF
LSS
Interface
Invalid Rx Signal Seconds
LOS Count
Optical Rx Level (dBm)
Reference Frequency
Round Trip Delay
Rx Frequency Max Deviation (ppm)
Rx Frequency (Hz)
Rx Frequency Deviation (ppm)
Signal Losses Count
Tx Clock Source
Tx Freq Max Deviation (ppm)
Tx Frequency (Hz)
Tx Frequency Deviation (ppm)
FEC
Uncorrected Word Errors
Uncorrected Word Error Rate
Corrected Word Errors
Correctable Word Errors
Corrected Word Errors Rate
Correctable Word Error Rate
Corrected Bit Errors
Corrected Bit Errors Rate
Correctable Bit Errors
Correctable Bit Error Rate
Framing
Frame Sync Loss Seconds
Frame Sync Losses
OOF Seconds Count
FAS Errors
FAS Error Rate
LOF
LOF Seconds
Multiframe Sync Loss Seconds
OOM Seconds Count
MFAS Errors
MFAS Error Rate
OTU
OTU-AIS
OTU AIS Seconds
SM-IAE

SM-IAE Seconds
SM-BIP Error Counts
SM-BIP Error Rate
SM-BDI Seconds
SM-BDI Count
SM-BIAE Seconds
SM-BIAE Count
SM-BEI Count
SM-BEI Error Rate
SM-TIM Count
SM-TIM Seconds
SM-SAPI
SM-DAPI
SM-Operator Specific
GCC BERT Bits
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)
Recovered 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)
Recovered 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)
Recovered 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
Recovered from External Interface
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
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)
Recovered 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)
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
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
Recovered from Rx (Slave)
Internal (Master)
Recovered from External Interface (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 Version
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
Recovered from Rx (Slave)
Internal (Master)
Recovered from External Interface (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 1GE and 10GE 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 1GE/10GE 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, Galileo, 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	
One-Way-Delay	
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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