

# VIAVI

## SmartClass 4800

### 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

##### 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
<b>Remote Operation</b>
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
<b>Warranty</b>
The Product shall support a 1 year warranty
<b>Included Items</b>
User manual
AC Power Source
AC Power cords
<b>Optical Fiber Microscope</b>
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.
<b>Saved Configurations</b>
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

<b>General</b>
Line Rate Traffic Tx and RX for all Interfaces
Single Stream Generation/Analysis
10 Streams Generation/Analysis
Auto Discovery of Test Sets
<b>Modes of Operation</b>
Terminate
Monitor
Thru (Intrusive)
Loopback
Half Duplex
Full Duplex
<b>Timing</b>
Recovered from Rx
Internal (Stratum 3)
Recoverd from External (BITs/SETs)
Freq Offset Transmit/Receive
<b>Ethernet Features</b>
<b>Layer 1 (Unframed) Bit Error Testing Patterns</b>
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)
<b>Layer 2 (Framed) Bit Error Testing Patterns</b>
Compliant Random Data Pattern (CRPAT)
Compliant Jitter Tolerance Pattern (CJPAT)
Compliant Supply Noise Pattern (CSPAT)
<b>Framed Pattern Test</b>
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
<b>MAC Frame Payload</b>
PRBS Pattern
Editable Digital Word
<b>Flow Control</b>
Emulation On/Off
<b>Pause Frames</b>
Tx Insert
Pause Quanta - Definable
Pause Frame Analysis (counts etc)

<b>Ethernet Generator</b>
<b>Frame Type</b>
802.3
DIX
VPLS with inner and outer MAC
MAC in MAC 802.1ah
EtherType Field-Editable
<b>MAC Addressing</b>
Destination MAC Address - Unicast
Destination MAC Address - Broadcast
Destination MAC Address - Multicast
Source MAC Address - User Defined
Source MAC Address - Auto Increment
<b>MAC Frame Size</b>
64, 128, 256, 512, 1024, 1280, 1518
User defined
Jumbo (to 10k)
EMIX
Random
<b>VLAN</b>
VLAN Tagging 802.1q
VLAN Tag Editable Fields
<ul style="list-style-type: none"> <li>Priority</li> <li>VID</li> <li>VLAN Scan</li> </ul>
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
<b>VPLS</b>
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
<b>MAC in MAC/PBT/PBB</b>
Parameters - MAC Address
B-Tag - TPI, VID, Priority, DEI
I-Tag - TPI, SID, Priority, DEI, NCA, Res1, Res2
<b>MPLS</b>
Single Label Support
Stacked Label Support - Up to 2
Editable Parameters/Results - Label
Editable Parameters/Results - CoS

Editable Parameters/Results - TTL
<b>MPLS-TP</b>
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 <ul style="list-style-type: none"> <li>Common Header Label - PW, LSP, Section</li> <li>CCM Generation and Analysis</li> <li>LBM/LBR Generation and Analysis</li> <li>AIS Generation and Analysis</li> </ul>
OAM Alert Label (Label 14) from ITU-T G.8114 <ul style="list-style-type: none"> <li>Common Header Label - PW, LSP, Section</li> <li>CCM Generation and Analysis</li> <li>LBM/LBR Generation and Analysis</li> <li>AIS Generation and Analysis</li> </ul>
OAM Alert Label (Label 14) from ITU-T Y.1711 Common Header Label - PW, LSP, Section <ul style="list-style-type: none"> <li>CCM Generation and Analysis</li> <li>FFD Generation and Analysis</li> <li>BDI Generation and Analysis</li> <li>FDI Generation and Analysis</li> </ul>
Simultaneous OAM and background traffic generation
<b>Ethernet OAM</b>
<b>Y.1731 Service OAM and 802.1ag CFM</b>
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
<b>802.3ah Link OAM</b>
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
<b>IP Packet Generator</b>
<b>IP</b>
IPv4 Frame Format
IPv6 Frame Format
TCP Port Number
UDP Port Number
<b>IP Addressing</b>
Destination IP Address - User Defined
Source IP Address - User Defined
<b>IPv4 Editable Fields</b>
ToS
DSCP
Flags
Protocol
TTL
<b>IPv6 Editable Fields</b>
Traffic Class
Flow Label
Next Header
Hop Limit
<b>IP Ping</b>
<b>Fast Ping</b>
<b>IP TraceRoute</b>
<b>Traffic Generator</b>
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
<b>Traffic Profiles</b>
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
<b>TCP Throughput</b>
10/100/1000M Linerate Stateful Emulation
1-10GE 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
<b>RFC 2544</b>
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 <ul style="list-style-type: none"> <li>Sequential MAC Addresses</li> <li>Suppression of OOS Frames</li> </ul>
Report formats
Graphical Results
Total Test Time Display
<b>ITU-T Y.1564</b>
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 <ul style="list-style-type: none"> <li>Sequential MAC Addresses</li> <li>Suppression of OOS Frames</li> </ul>
<b>IETF RFC 6349</b>
Supported on 10/100/1000 M Electrical and 1/10G 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: <ul style="list-style-type: none"> <li>T-BERD/MTS instruments</li> <li>QT-600 Ethernet Probes</li> <li>TrueSpeed VNF Server</li> </ul>	
<b>Layer 2 Transparency Testing</b>	
Send/Receive Ethernet Control Plane Traffic	
Encapsulation supported <ul style="list-style-type: none"> <li>VLAN</li> <li>Q-in-Q</li> <li>Spanning Tree</li> <li>Cisco Protocols (Discovery etc.)</li> <li>GARP</li> <li>STP</li> </ul>	
Send/Receive Ethernet Control Plane Traffic <ul style="list-style-type: none"> <li>Spanning Tree Frames Tx/Rx</li> <li>Cisco Discovery Protocol</li> <li>LDP Frames Tx/Rx</li> <li>Link Aggregation LACP</li> <li>Cisco UDLD, ISL, PagP, DTP, PVST-PVST+</li> <li>MAC Bridging 802.1d</li> <li>VLAN-BRDGSTP</li> <li>Custom Frame Builder</li> </ul>	
<b>Synchronous Ethernet</b>	
1000M/100M/10M Electrical Tx/Rx	
100M/1000M Optical Tx/Rx	
G.826x Compliant	
Frequency offsets $\pm 100$ 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	
<b>IEEE 1588v2 PTP</b>	
1/10G Tx/Rx	
1588v2 Master Emulation	
1588v2 Slave Emulation	
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	
Layer 2 1588v2 Messaging	
Layer 4 1588v2 Messaging	
Message rates Multicast: fastest 2/16/64/64 (DelayResponse/Announce/Sync/DelayRequest) ; slowest one message every 16 seconds	
Message rates Unicast: fastest 2/16/16/16 (DelayResponse/Announce/Sync/DelayRequest); 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 Delay, PDV and Time Error
Single- & Dual Step operation in both slave and master modes
Master Mode Clock Classes Supported <ul style="list-style-type: none"> <li>Primary</li> <li>Primary Holdover</li> <li>Arbitrary</li> <li>Arbitrary Holdover</li> <li>Primary A</li> <li>Arbitrary A</li> </ul>
<b>NTP Features</b>
Capture
Analyze
Monitor
<b>PDV Analysis</b>
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
<b>Loopback</b>
Manual (LLB)
Automatic
Local
Far End
Auto Discovery of Test Sets
<b>Delay</b>
Round Trip Delay
Acterna Test Protocol Version 3 (default) <ul style="list-style-type: none"> <li>GE Optical High Precision - low delay</li> </ul>
Acterna Test Protocol Version 2 with Fill byte <ul style="list-style-type: none"> <li>High Precision - low delay</li> <li>Lower Precision — high delay</li> </ul>
Round-Trip Delay Measurement

<b>CAT-5 Testing</b>
Link speed
Link status
Cable status
Crossover/straight (MDI/MDIX)
Distance to fault
Pin mapping
Pair length
Polarity
Skew
<b>Traffic Profiling</b>
Detect and display up to 128 streams of live traffic
Specify Filters for stream detection
Stream Classification
<b>Network Discovery</b>
Automatically detect networks, domains, devices, and hosts
<b>Traffic Filtering</b>
<b>Ethernet (Layer 2) Traffic Filtering</b>
MAC source and destination address
Frame Type/Length
VLAN ID
VLAN Priority
VLAN Discovery
<b>VLAN (Layer 2.5) Tags - 802.1q</b>
TPI
Priority
CFI/DEI
VID
<b>VLAN (Layer 2.5) Tags - QnQ, 802.1ah</b>
SVLAN ID
SVLAN Priority
SVLAN TPI
CVLAN ID
CVLAN Priority
<b>IP (Layer 3) Traffic Filtering</b>
Source and destination IP address
Subnet mask
IPv6 Traffic Class
TOS/DSCP Fields
<b>TCP/UDP (Layer 4) Traffic Filtering</b>
ATP Listen Port
<b>Errors Tx/Rx</b>
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
<b>Alarms Tx/Rx</b>
Local Fault Tx/Rx
Remote Fault Tx/Rx
<b>Ethernet Results</b>
<b>Custom Results</b>
<b>Histogram and Graphical Results Script</b>
<b>Link Status</b>
Loss of signal
Link active
Frame detected
Sync obtained
VLAN tagged frame detected
<b>Auto-negotiation status</b>
Link configuration ack
Link advertisement status
Pause capable
Remote fault
Destination MAC address when using ARP
<b>Link counts/statistics</b>
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
<b>Errored Counts</b>
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
<b>QoS Measurements</b>
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
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
<b>Event Log</b>
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

## PDH

Test Interfaces
E1 Balanced
E1 Unbalanced
T1
Interface Type
RJ48
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 <sup>15-1</sup> (Inverse)	
2 <sup>20-1</sup> (Inverse)	
2 <sup>23-1</sup> (Inverse)	
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
E1
Modes of Operation
Terminate
Monitor
Thru (Intrusive)
Timing
Recovered from Rx
Internal (Stratum 3)
Recovered from External (BITS/SETs)

Framing	
Unframed	
PCM30	
PCM30C	
PCM31	
PCM31C	
Test Patterns	
All 1s	
All 0s	
2 <sup>15-1</sup> (Inverse)	
2 <sup>20-1</sup> (Inverse)	
2 <sup>23-1</sup> (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 <sup>15-1</sup> (Inverse)	
2 <sup>20-1</sup> (Inverse)	
2 <sup>23-1</sup> (Inverse)	
QRSS	
User Programmable (3 <sub>user</sub> 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 $\pm 100$ 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	
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	



<b>HDLC</b>
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)
<b>PPP (PPP Ping Only)</b>
PPP Status
Local IP
IP Subnet Mask
Remote IP
Preferred & Alternate DNS Server
Destination IP Address
Resolved Host Name
<b>Ping (PPP Ping Only)</b>
Ping Requests Tx
Ping Replies Rx
Lost Pings
Lost Ping %
Delay (ms)
Ping Requests Rx
Ping Replies Tx

## Jitter O.172

General Features	
Generate and measure Jitter on electrical interfaces	DS1, E1
Automatic Measurement Sequences <ul style="list-style-type: none"> <li>Maximum Tolerable Jitter (MTJ)</li> <li>Measure Intrinsic Jitter</li> <li>Jitter Transfer Function (JTF)</li> </ul>	
Support different Measurement Bands <ul style="list-style-type: none"> <li>High Band</li> <li>Wide Band</li> <li>Extended Band</li> <li>Ability to set user definable band</li> </ul>	
Common Jitter mask selectable	
Ability to create user definable masks	
Results	
Jitter Results per measurement band	
Current peak to peak jitter [UI] <ul style="list-style-type: none"> <li>Peak to peak jitter [UI]</li> <li>Positive peak jitter [UI]</li> <li>Negative peak jitter [UI]</li> </ul>	

Maximum peak to peak jitter [UI] <ul style="list-style-type: none"> <li>Peak to peak jitter [UI]</li> <li>Positive peak jitter [UI]</li> <li>Negative peak jitter [UI]</li> </ul>
Phase Hits
Percentage of mask
RMS Jitter [UI]
Jitter Graphs

## Services

VoIP Testing
10/100/1000M Electrical Ethernet Interfaces
1/10G 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 & 31K 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: <ul style="list-style-type: none"> <li>G.711 A Law</li> <li>G.711 U Law</li> <li>G.723 5.3 K</li> <li>G.723 6.3 K</li> <li>G.729A</li> <li>G.726</li> <li>G.722</li> </ul>
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	
1/10G Optical Ethernet Interface	
<ul style="list-style-type: none"> <li>Over 11,000 simulated calls with configurable Codec and sampling rate</li> <li>Configurable voice call or tone with configurable silence suppression, sampling rate and jitter buffer</li> <li>Up to 250 simulated SDTV channels with configurable frame size and MPEG-2/4 compression</li> <li>Up to 52 simulated HDTV channels with configurable frame size and MPEG-2/4 compression</li> <li>2 configurable data streams with individual constant or ramp traffic and configurable frame sizes including random frames</li> </ul>	
IPTV	
10/100/1000M Electrical Ethernet Interfaces	
1/10G Optical Ethernet Interface	
<ul style="list-style-type: none"> <li>Single Program Transport Stream (SPTS) and Multiple Program Transport Stream (MPTS) formats</li> <li>Video explorer capable of detecting 512 SPTS and 32 MPTS and a video analyzer that supports 16 SPTS and 1 MPTS</li> <li>Supported measurements include bandwidth utilization, packet loss, packet jitter, PCR jitter, continuity error bit and error bit indicator</li> <li>TR 101 290 priority 1 errors such as program identification (PID), program association table (PAT) and program map table (PMT)</li> <li>Loss distance and period errors per RFC3357, results per transport stream and per PID</li> <li>Media Delivery Index (MDI) measurements</li> <li>Measure ICC latency and R-UDP latency</li> <li>Microsoft Television (MSTV) Support</li> <li>Internet Group Management Protocol (IGMP) support</li> </ul>	
Primary Rate ISDN	
Test Access	T1
TE Emulation	
NT Emulation	
D-Channel Signaling Decodes	
Call Control	National SESS 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	
<b>Primary Rate E1 ISDN</b>	
Test Access	E1
TE Emulation	
NT Emulation	
D-Channel Signaling Decodes	
Codec $\mu$ -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	
<b>Signaling—Place/Receive Call</b>	
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	
<b>Fractional T1/E1</b>	
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	
<b>Voice Frequency</b>	
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