

Technical specifications

Display

High visibility touchscreen TFT color display, 10.4 inches, LCD 800 x 600

Storage

| | |
|------------------------------|---|
| Internal memory | 8 Mb |
| Hard disk | Min 6 GB |
| Floppy disk drive (optional) | 3.5 inches |
| CD read/write (optional) | |
| Input/output interfaces | RS232C, 2 x USB, VGA, RJ-11 modem (optional), RJ-45 Ethernet, DIN external switch, compact flash* |

* Compact flash receptacle is used for the Transport Module application card

Optional Interfaces

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

Power Supply, Battery

| | |
|----------------|--|
| Battery type | Internal standard removable Li-Ion batteries |
| Operation time | Up to 1.5 hours at 10 Gb/s rates with one battery (two batteries possible) |

Internal charger

| | |
|---------------------|--|
| Power supply, AC/DC | Transport Module power adapter: 100-240 V, 50-60 Hz, 2A, Output: 24 V, 6.25 A To be used when operating a MTS-8000 with the Transport Module. |
| Charging Time | One battery, unit non operating: 3 hours One battery, unit in operation: up to 9 hours |
| Trickle charge | Yes |

General specifications

Module physical specifications

| | |
|--------|-----------------------|
| Height | 2.13 inches/5.41 cm |
| Width | 12.16 inches/30.88 cm |
| Depth | 9.96 inches/25.3 cm |
| Weight | 5.5 lbs/2.5 kg |

Combined physical specifications

for Transport Module when attached to the base unit a battery module with one battery installed.

| | |
|--------|-----------------------|
| Height | 5.8 inches/14.73 cm |
| Width | 12.16 inches/30.89 cm |
| Depth | 9.96 inches/25.3 cm |
| Weight | 14.69 lbs/6.6 kg |

Operating Temperature

| | |
|-------------------------|------------------|
| Operational temperature | 0° C to +40° C |
| Storage temperature | -20° C to +60° C |

Humidity 5% to 95% without condensation

Shock/Drop Height

Shock - Per IEC 60068-2-27 & 29: The unit resists the following test:
 - Three shocks per axis along each of the three axes, with power off
 - Impacts of 15 G, 1/2 sine, duration 11 ms, at 10 second intervals

Bumps - Per IEC 60068-2-27 & 29: The unit resists the following test:

- 1,000 jolts per axis along each of the three axes, with power off
- Jolts of 15 G, 1/2 sine, duration 6 ms, at 1 second intervals

Drop - Meets requirements as specified in IEC 721-3-7:
 - Total of six (6) impacts dropped from a height of 50 cm (20"). One (1) impact on each of its' six sides onto a flat plywood surface.

| | |
|---------|-----------------|
| EMI/ESD | CE Mark Class A |
|---------|-----------------|

Ethernet

10 GigE LAN/WAN* PHY

Connector Type

FC, SC, ST, LC, DIN
 10 GigE LAN/WAN Phy Rates 10.3 Gbps, 10 Gbps
 * For 10 Gbps WAN, SONET/SDH capability can be located in the SONET/SDH section of this datasheet.

Flow Control

Supported

Modes of Operation

Terminate, Monitor, Loopback

Configurations

Single and Dual Port*
 *Dual Port testing for 10 GigE requires two Transport Modules

Layer 2 (Ethernet) Traffic Generation

Constant, Bursty, Ramp, Flood Configurable Source and Destination Address, Frame Format, Type Field (for DIX), Frame Length (including Jumbo and Undersized), VLAN Tag, Pause Frames, Payload, Utilization %

Layer 3 (IP) Traffic Generation

Configurable Source and Destination IP Address, DNS Server Type, Tx Payload, TOS/DSCP/TTL, Packet Size Length (34 – 1500 bytes), Ping, Traceroute

Layer 2 (Ethernet) Traffic Filtering

MAC Source and Destination Address, Frame Type/Length, VLAN Tagged or Untagged Frames

Layer 3 (IP) Traffic Filtering

Source and Destination IP Address, TOS Type (TOS/DSCP)

Bit Error Rate Testing Patterns

Layer 1 (Unframed) Bit Error Testing Patterns

| | |
|-------------------------|---|
| Pattern Segments | <i>Per 802.3ae-2002, Section 52.9.1</i> |
| An | 0x3C8B44DCAB6804F |
| Bn | 0x34906BB85A38884 |
| Patterns | <i>Per 802.3ae-2002, Section 52.9.1</i> |
| BnBiBnBi | |
| AnAiAnAi | |
| PRBS31(B)* | |

*(B) This is the test pattern checker defined in 49.2.12 of 802.3ae-2002

Layer 2 (Framed) Bit Error Testing Patterns

PRBS (2²³-1, 2³¹-1 and inverted selections)
 All 1s
 All 0s
 User defined (32 bits)

Error Insertion

| | |
|-------------|---------------------|
| Code Errors | Single, Burst, Rate |
| Bit Errors | Single, Rate |
| FCS Errors | Single, Burst |
| IP Checksum | Single, Burst |
| ATP Payload | Single, Burst |

Key Results

LEDs

- Signal Status
- Sync Acquired
- Link Active
- Frame Detected
- VLAN Tagged Frame Detected
- Pause Frame Detect
- Acterna Frame Detect
- IP Packet Detect

Signal

- Optical Receive Level (dBm)
- Remote Fault Seconds
- Local Fault Seconds

L1 Errored Stats

- Code Violation Rate, Code Violation Seconds,
- Code Violations, Pattern Errors, Pattern Error Rate, Pattern Error Free Seconds, Pattern Error Free Seconds %, Pattern Errored Seconds, Bit Error Rate, Bit Errors

L2 Link Stats

- Delay, Frame Rate, Frame Size, Service Disruption (micro seconds), Total Utilization, Tx/Rx Mbps, Tx/Rx Mbps Data

L2 Link Counts

- Frame Lengths (Binning), Pause Frames, Rx/Tx Frames, Tx/Rx Acterna Frames, Tx/Rx Frame Bytes, Span Tree Frames, Unicast Frames, VLAN Frames, VLAN ID, VLAN Priority, Broadcast Frames, Multicast Frames

L2 Errored Stats

- Code Violation Rate, Code Violation Seconds, Code Violations, Errored Blocks (PCS), Errored Frames, FCS Errored Frames, Frame Loss Ratio, Jabbers, Lost Frames, Oos Frames, Runts, Undersized Frames

L2 BER Stats

Bit Error Count, Bit Error Rate, Error Free Seconds, Total Bits

L3 Errored Stats

Acterna Payload, Errored Frames, FCS Errored Frames, Frame Loss Ratio, IP Checksum, IP Packet Length, Jabbers, Lost Frames, Oos Frames, Runts, Undersized Frames

L3 Link Stats

IP Delay, Packet Rate, Packet Size, Tx/Rx Mbps, Total Utilization %

L3 Link Counts

Packet Length (Bins), Broadcast Packets, Multicast Packets, Tx/Rx Packets, Unicast Packets

L3/IP Config Status

Destination IP address, Destination MAC Address, DNS alternate server, DNS Server Type, IP Gateway, IP Subnet Mask, Source IP address

Ping/Traceroute

IP Delay, Lost Pings, Lost Pings %, Requests Rx, Requests Tx, Replies Rx, Traceroute map

10/100/1000 Mb/s and Gig Ethernet

Connector Type

RJ-45 - 10/100/1000 Mb/s Electrical
 FC, SC, ST, LC, DIN - 1 GigE Optical

Rates

10/100/1000 Mb/s and 1 GigE

Duplex Modes

Full/Half

Flow Control

Supported

Modes of Operation

Terminate, Monitor, Loopback

Configurations

Single and Dual Port

Layer 2 (Ethernet) Traffic Generation

Constant, Bursty, Ramp, Flood, Configurable Source and Destination Address, Frame Format, Type Field (for DIX), Frame Length (including Jumbo and Undersized), VLAN Tag, Frame Payload, Utilization %, Pause Frames

Layer 3 (IP) Traffic Generation

Configurable Source and Destination IP Address, DNS Type, Preferred DNS Server, Alternate DNS Server, Tx Payload (Acterna or Fill), TOS, TTL, Packet Length (34 – 1500 bytes), Ping, Traceroute

Layer 2 (Ethernet) Traffic Filtering

MAC Source and Destination address, Frame Type/length, VLAN Tagged or Untagged Frames

Layer 3 (IP) Traffic Filtering

Source and Destination IP Address, TOS Type (TOS/DSCP)

Bit Error Rate Testing Patterns

Layer 1 (Unframed) Bit Error Testing Patterns

Per IEE 802.3, 2000 Edition, Annex 36A:

High Frequency Test Pattern
 Low Frequency Test Pattern
 Mixed Frequency Test Pattern

Per NCITS TF-25-1999

Random Data Pattern (RPAT)
 Jitter Tolerance Test Pattern (JTPAT)
 Supply Noise Test Sequence (SPAT)

Layer 2 (Framed) Bit Error Testing Patterns

PRBS ($2^{23}-1$, $2^{31}-1$ and inverted selections)

All 1s

All 0s

User defined

Framed Pattern Test Per NCITS TF-25 1999

Long Continuous Random Test Pattern
 Long Contiguous Jitter Test Pattern
 Long Compliant Supply Noise Pattern (CSPAT)

Error Insertion

| | |
|--------------------|---------------|
| Code Errors | Single, Rate |
| Bit Payload Errors | Single, Rate |
| FCS Errors | Single, Burst |
| IP Checksum | Single, Burst |
| ATP Payload | Single, Burst |

Key Results

LEDs

Signal Status
 Sync Acquired
 Link Active
 Frame Detected
 VLAN Tagged Frame Detected
 Pause Frame Detect
 Acterna Frame Detect
 IP Packet Detect

Signal

Optical Receive Level (dBm)

L1 Errored Stats

Code Violation Rate, Code Violation Seconds, Code Violations, Pattern Errors, Pattern Error Rate, Pattern Error Free Seconds, Pattern Error Free Seconds %, Pattern Errored Seconds, Bit Error Rate, Bit Errors

L2 Link Stats

Delay, Frame Rate, Frame Size, Service Disruption (micro seconds), Total Utilization, Tx/Rx Mbps, Tx/Rx Mbps Data

L2 Link Counts

Frame Lengths (Binning), Pause Frames, Rx/Tx Frames, Tx/Rx Acterna Frames, Tx/Rx Frame Bytes, Span Tree Frames, Unicast Frames, VLAN Frames, VLAN ID, VLAN Priority, Broadcast Frames, Multicast Frames

L2 Errored Stats

Code Violation Rate, Code Violation Seconds, Code Violations, Errored Blocks (PCS), Errored Frames, FCS Errored Frames, Frame Loss Ratio, Jabbers, Lost Frames, Oos Frames, Runts, Undersized Frames

L2 BER Stats

Bit Error Count, Bit Error Rate, Error Free Seconds, Total Bits

L3 Errored Stats

Acterna Payload, Errored Frames, FCS Errored Frames, Frame Loss Ratio, IP Checksum, IP Packet Length, Jabbers, Lost Frames, Oos Frames, Runts, Undersized Frames

L3 Link Stats

IP Delay, Packet Rate, Packet Size, Tx/Rx Mbps, Total Utilization %

L3 Link Counts

Packet Length (Bins), Broadcast Packets, Multicast Packets, Tx/Rx Packets, Unicast Packets

L3/IP Config Status

Destination IP Address, Destination MAC Address, DNS Alternate Server, DNS Server Type, IP Gateway, IP Subnet Mask, Source IP Address

Ping/Traceroute

IP Delay, Lost Pings, Lost Pings %, Requests Rx, Requests Tx, Replies Rx, Traceroute map

SONET/SDH

Connector Type

FC, SC, ST, LC, DIN

Rates

51Mbps, 155Mbps, 622Mbps, 2.5Gbps, 10Gbps

Modes of Operation

Terminate, Monitor, Loopback

Transmit Timing Source

Internal, Recovered, External (BITs, SETs*)

*Reference Clock and Sine Wave are for 2.048MHz

Frequency Offset Tx

+/- 50ppm

Mappings

SDH

VC4 Bulk, AU-4-4c, AU-4-16c, AU-4-64c

VC4

VC3

VC12

E4

DS3

E3

E1

SONET

STS-1, STS-3c, STS-12c, STS-48c, STS-192c

VT1.5

DS3

T1

Test Patterns

PRBS

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*

Round Trip Delay

Programmable – 32 bit

*ANSI and ITU implementations are supported

Anomaly/Errors Generation and Analysis

B1 Single, Rate

B2 Single, Rate

B3 Single, Rate

HP-REI/REI-P, LP-REI/REI-V Single, Rate

MS-REI/REI-L, LP-BIP/BIP-V Single, Rate

FAS/Frame Word Count (1-32)

Defects/Alarms Generation and Analysis (SDH)

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

Defects/Alarms Generation and Analysis (SONET)

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

PLM-P, LOP-V, AIS-V, LOM-V, UNEQ-V, RDI-V, TIM-V, PLM-V, RFI-V

Key Results

Signal Category

LOS Count, LOS Seconds, Rx Frequency, Tx Frequency, Tx Timing

Source, Optical Rx Level (dBm), Optical Rx Overload, APS

Switchover Time (ms), Delay

RSOH/Section Overhead Category

LOF Count, LOF Seconds, OOF Count, OOF Seconds, FAS Word

Errors, FAS/Frame Word Error Rate, B1 Errors, B1 Error Rate, RS Trace (J0)

MSOH/Line Overhead Category

MS/Line-AIS Seconds, MS-RDI Seconds, B2 Errors, B2 Error Rate,

MS/Line-REI Errors, MS/Line-REI Rate, APS Message Count, ASP

K1 Bridge Request Code (Ring), APS K1 Destination Node ID

(Ring), APS K2 Source Node ID (Ring), APS K2 Path Code (Ring),

APS K2 Status (Ring), Sync Status (S1)

HP (High Path) Category

AU/Path-LOP Seconds, AU/Path-AIS Seconds, AU/Path Pointer

Adjustments, AU/Path Pointer Increments, AU/Path Pointer

Decrements, AU/Path-NDF Count, AU/Path Pointer Value, Tx

AU/Path Pointer Value, Tx AU/Path Pointer Size, B3 Errors, B3

Error Rate, HP/Path-REI Errors, HP/Path-REI Rate, HP/Path Trace

(J1), Signal Label (C2), HP/Path-UNEQ Seconds

LP (Low Path) Category

TU/VT-LOP Seconds, TU/VT-AIS Seconds, LP-RDI Seconds, TU/VT

Pointer Adjustments, TU/VT Pointer Increments, TU/VT-NDF

Count, TU/VT Pointer Size, Tx TU/VT Pointer Size, BIP-V Errors,

BIP-V Error Rate, LP-REI Errors, LP-REI Error Rate, LP-RFI

Seconds, TU/VT-LOM Seconds, LP Trace (J2), LP Signal Label

(V5), LP-UNEQ Seconds

SOH and POH Viewing and Manipulation (HP)

A1, A2, J0, J1, B1, E1, F1, B3, D1, D2, D3, C2, H1, H2, H3, G1, B2,

K1, K2, F2, D4, D5, D6, H4, D7, D8, D9, F3, D10, D11, D12, K3, S1,

Z1, Z2, E2, N1

BERT Category

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

Tandem Connection Monitoring HP (Forward/Backward)

TC-UNEQ, TC-LTC, TC-AIS, B3 Errors, TC-IEC, TC-DIFF, TC-APId Label

K1/K2 Event Log

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

APS Event Log

Date, Time, Trigger Type, Switchover Time

Performance Measures

G.826 (ISM/OOS), G.828 (ISM/OOS), G.829 (ISM/OOS), M.2101,

T1.231, T1.514

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

E4

Connector Type

BNC

Rates

140Mbps

Modes of Operation

Terminate, Monitor

Framing

Unframed, Framed

Test 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*

Round Trip Delay

Programmable – 32 bit

*ANSI and ITU implementations are supported

Mappings

E4

E3

E1

Anomaly/Error Insert

FAS

Single, 2, 3, 4

TSE/Bit Error

Single, Rate

Defect/Alarm Insert

LOS, LOF, AIS, RDI

Frequency Offset Tx

+/- 100ppm

National Bit Support

On, Off

Results

Signal Category

Receive Frequency, Receive Frequency Deviation, Receive

Frequency Maximum Deviation, Transmit Signal Loss Count,

Signal Loss Seconds, Rx Frequency, Rx Frequency Deviation

(ppm), Rx Frequency Maximum Deviation (ppm), Tx Frequency,

Tx Timing Source, Rx Level (Vpp)

Frame Category

Frame Sync Losses, Frame Sync Loss Seconds, FAS Bit Error

Count, FAS Bit Error Rate, FAS Bit Error Seconds, FAS Word Error

Count, FAS Word Error Rate, FAS Word Error Seconds, National

Bits

BERT Category

FAS TSE Count, FAS TSE Rate, FAS Word Error Count, FAS Word

Error Rate, Frame Synchronization Loss Pattern Sync Losses,

Pattern Sync Loss Seconds, TSE/Bit Error Count, TSE/Bit Error

Rate

Performance

G.821, G.826 (ISM/OOS), M.2100 (ISM/OOS)

DS3

Modes of Operation

Terminate, Monitor

Framing

Unframed, C-Bit, M13

Test Patterns

All 1s, All 0s, 2¹⁵-1* (Inverse), 2²⁰-1* (Inverse), 2²³-1* (Inverse), User Programmable (32 bits), Round Trip Delay, 100, 1100 (aka IDLE), 1010 (aka BLUE), Delay, User Bit (3 -32 bits), User Byte (2-129 Hex Digits)

*ANSI and ITU implementations are supported

Rx Input

Terminate, DSX-Monitor

LBO

High – 0 ft, Low - 900 ft, DSX – 450 ft

Mappings

T1

E1

Anomaly/Error Insert

DS3 BPV/Code Error Single

DS3 Frame/FAS Single, 2, 3

DS3 Parity Single

DS3 C-Bit Parity Single

DS3 TSE/Bit Error Single, Rate, Multiple

Defect/Alarm Insert and Detection

LOS, LOF, AIS, RAI

Frequency Offset

+/- 100 ppm

APS

Frame Synchronization

Results

Signal Category

Signal Loss/LOS Count, Signal Loss/LOS Seconds, Rx Frequency, Rx Frequency Deviation (ppm), Rx Freq Max Deviation (ppm), Tx Frequency, Tx Timing Source, Rx Level (Vp), Rx Level (dBdsx), BPVs, BPV Rate, BPV Error Second

Frame Category

LOF/Frame Sync Loss Count, LOF/Frame Sync Loss Seconds, Frame Error Count, Frame Error Rate, AIS Seconds, RAI Seconds, Near End OOF Seconds, Far End OOF Seconds, RX X-Bits, Tx X-Bits, FEAC Word, C-Bit Parity Error Count, C-Bit Parity Error Rate, C-Bit Parity Error Seconds, FEBE Count, FEBE Rate, FEBE Seconds, Parity Error Count, Parity Error Rate, Parity Error Seconds

BERT Category

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

Performance Measures

G.821, G.826 (ISM/OOS), M.2100 (ISM/OOS), T1.231, T1.510 (ISM/OOS)

E3

Modes of Operation

Terminate, Monitor

Framing

Unframed, Framed

Test Patterns

All Ones, All Zeroes, 2¹¹-1 (inverse), 2¹⁵-1* (Inverse), 2²⁰-1* (Inverse), 2²³-1* (Inverse), Round Trip Delay, User Programmable Bit (3 to 32 bits), Programmable Byte (2-128 Hex Digits), 1:1, 1:3, 1:4, 1:7

*ANSI and ITU implementations are supported

Mappings

E1

Rx Input

Terminate, Monitor

LBO

0 dB, -6dB

National Bit Support

0, 1

Anomaly/Error Insert

TSE/Bit Error Single, Rate, Multiple

FAS Single, 2, 3, 4

Code Single

Defect/Alarm Insert

LOS, LOF, AIS, RDI

Frequency Offset

+/- 100 ppm

Code

HDB3

Results

Signal Category

LOS/Signal Loss Count, LOS/Signal Loss Seconds, Rx Frequency, Rx Frequency Deviation (ppm), Rx Freq Max Deviation (ppm), Tx Frequency, Tx Timing Source, Rx Level (Vp), Line Code Errors, Line Code Error Rate, Line Code Error Seconds.

Frame Category

LOF/Frame Sync Loss Count, LOF/Frame Sync Loss Seconds, FAS/Frame Bit Error Count, FAS/Frame Bit Error Rate, FAS/Frame Word Error Count, FAS/Frame Word Error Rate, National Bit

BERT Category

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

Performance Measures

G.821, G.826 (ISM/OOS), M.2100 (ISM/OOS)

2M (E1)

Modes of Operation

Terminate, Monitor

Framing

Unframed, PCM30, PCM30C, PCM31, PCM31C

Test Patterns

All 1s, All 0s, 2¹¹-1 (inverse), 2¹⁵-1* (Inverse), 2²⁰-1* (Inverse), 2²³-1* (Inverse), Round Trip Delay, 1:1, 1:3, 1:4, 1:7, User Bit (3 -32 bits), User Byte (2-128 Hex Digits)

*ANSI and ITU implementations are supported

Anomaly/Error Insert

Code Single

CRC Single

E-bit Single

FAS 1, 2, 3, 4

MFAS 1, 2

TSE/Bit Error Single, Rate, Multiple

Defect/Alarm Insert

LOS, LOF, AIS, MF-AIS, MF-RAIS, RDI, REBE

Frequency Offset

+/- 100ppm

Tx LBO

0 dB, -6.0 dB, -12.0 dB

Results

Signal Category

LOS/Signal Loss Count, LOS/Signal Loss Seconds, Rx Frequency, Rx Frequency Deviation (ppm), Rx Frequency Max Deviation (ppm), Tx Frequency, Tx Timing Source, Rx Level (Vp), Line Code Errors, Line Code Error Rate, Line Code Error Seconds

Frame Category

LOF Count, LOF Seconds, FAS Bit Error Count, FAS Bit Error Rate, FAS Word Error Rate, Non-Frame Alignment Word, AIS Alarm Losses, AIS Alarm Seconds, MFAS Word Error Count, MFAS Word Error Rate, MF-AID Seconds, MF-RAIS Seconds, CRC Error Count, CRC Error Rate, CRC Sync Loss Count, MFAS Sync Loss Count, Remote End Block Error (REBE), Sa Bit Monitor

Logic Category

LSS/Pattern Sync Loss Count, LSS/Pattern Sync Loss Seconds, TSE/Bit Error Count, TSE/Bit Error Rate, Pattern Slips, Pattern Slip Seconds, Pattern Synchronization Loss Count, Pattern Synchronization Loss Seconds

Performance Measures

G.821, G.826 (ISM/OOS), M.2100 (ISM/OOS)

1.5M (T1)

Modes of Operation

Terminate, Monitor

Framing

D4, ESF, SLC-96, Unframed

Test Patterns

All 1s, All 0s, $2^{15}-1^*$, $2^{20}-1^*$, QRSS, User Bit (3 -32 bits), User Byte (2-128 Hex Digits), Round Trip Delay, 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

*ANSI and ITU implementations are supported

Error Insert

| | |
|-----------|------------------------|
| Bit Error | Single, Rate, Multiple |
| CRC | Single |
| BPV | Single |
| Frame | Single, 2 |

Frequency Offset

+/- 100ppm

Tx LBO

0 dB, -7.5 dB, -15.0 dB, -22.5 dB

Results

Signal Category

LOS/Signal Loss Count, LOS/Signal Loss Seconds, Rx Frequency, Rx Frequency Deviation, Rx Frequency Max Deviation, Tx Frequency, Tx Timing Source, Rx Level (Vpp), Rx Level (dBdsx), BPVs, BPV Rate, BPV Error Seconds, Ones Density State Count

Frame Category

LOF/Frame Sync Losses, LOF/Frame Sync Loss Seconds, Frame Error Count, Frame Error Rate, AIS Seconds, RAI Seconds, CRC Error Count, CRC Errored Seconds, CRC Error Rate

Logic Category

LSS/Pattern Sync Losses, LSS/Pattern Sync Loss Seconds, Bit Error/TSE Count, Bit Error/TSE Rate

Performance Results

G.821, G.826 (ISM/OOS), M.2100, T1.231, T.510 (ISM/OOS)

Optical Specifications for 10 Gb/s Port Bank

Technologies Include - STM-64, OC-192, and 10 GigE LAN/WAN

Connectors

- 1 - 1550nm Tx
- 1 - 1310nm Tx
- 1 - 1310nm and 1550 nm Rx
- 1 - 850nm Tx
- 1 - 850nm Rx

Connector types - FC, SC, ST, LC, DIN

Transmitter (1550 nm and 1310 nm)

Clock frequency accuracy Tx +/- 1.5 ppm +/- 1 ppm/year

Receiver (1550 nm and 1310 nm)

Rx wavelength range (1310nm, 1550nm Rx) 1100 to 1600 nm
 Rx clock measurement accuracy +/- 1.5 ppm +/- 1 ppm/year
 Rx level accuracy (all wavelengths, all rates) +/- 3dB

Transmitter (850 nm)

Clock frequency accuracy Tx +/- 1.5 ppm +/- 1 ppm/year

Receiver (850 nm)

Rx wavelength range 840 - 860 nm
 Rx clock measurement accuracy +/- 1.5 ppm +/- 1 ppm/year
 Rx level accuracy +/- 3 dB

Optical Specifications for Primary Port Bank

Interfaces Include - 2.5 Gb/s, GigE, 622 Mb/s, and 155 Mb/s

Connectors

- 1 - 1310 nm 2.5 Gb/s, 1 Gb/s, 622 Mb/s, 155 Mb/s Tx
- 1 - 1550 nm 2.5 Gb/s, 1 Gb/s, 622 Mb/s, 155 Mb/s Tx
- 1 - 1310/1550 nm 2.5 Gb/s, 1 Gb/s Rx
- 1 - 1310/1550 nm 622 Mb/s, 155 Mb/s Rx
- 1 - 850 nm 1 Gb/s Tx
- 1 - 850 nm 1 Gb/s Rx

Connector Types - FC, SC, ST, LC, DIN

Transmitter (1310 nm and 1550 nm)

Clock frequency accuracy Tx +/- 1.5 ppm +/- 1 ppm/year

Receiver (1310 nm and 1550 nm)

Rx wavelength range 1270 nm to 1600 nm range
 Rx clock measurement accuracy +/- 1.5 ppm +/- 1 ppm/year

Transmitter (850 nm)

Clock frequency accuracy +/- 1.5 ppm +/- 1 ppm/year

Receiver (850 nm)

Rx wavelength range 770 to 860 nm
 Rx clock measurement accuracy +/- 1.5 ppm +/- 1 ppm/year
 Rx level accuracy (all wavelengths, all rates) +/- 3 dB

Optical Specifications for Secondary Port Bank

Technologies Include - GigE

Connectors

- 1 - 1310 nm 1Gb/s Tx
- 1 - 1550 nm 1Gb/s Tx
- 1 - 1310/1550 nm 1G Rx
- 1 - 850 nm 1Gb/s Tx
- 1 - 850 nm 1Gb/s Rx

Connector Types - FC, SC, ST, LC, DIN

Transmitter (1310 nm and 1550 nm)

Clock frequency accuracy +/- 1.5 ppm +/- 1 ppm/year

Receiver (1310 nm and 1550 nm)

Rx wavelength range 1100 nm to 1600 nm
 Rx clock measurement accuracy +/- 1.5 ppm +/- 1 ppm/year
 Rx level accuracy (1310 nm and 1550 nm) +/- 3dB

Transmitter (850 nm)

Clock frequency accuracy +/- 1.5 ppm +/- 1 ppm/year

Receiver (850 nm)

Rx wavelength range 770 nm to 860 nm
 Rx clock measurement accuracy +/- 1.5 ppm +/- 1 ppm/year
 Rx level accuracy (1310 nm and 1550 nm) +/- 3dB

Electrical Specifications

Electrical rates supported by the Transport Module

| | |
|---------------------|---------|
| DS1 | 1.544 |
| DS3 | 44.736 |
| E1 | 2.048 |
| E3 | 34.368 |
| E4 | 139.264 |
| STS-1 | 51.84 |
| STM-1e | 155.52 |
| 10Base-T Ethernet | 10 |
| 100Base-T Ethernet | 100 |
| 1000Base-T Ethernet | 1000 |

| Input/Output optical power levels for the Transport module | | Primary Port Bank | | | | | | | | | | | |
|--|--|----------------------------------|-----------|----------------------------------|-------------|----------------------------------|-----------|--------------|-----------|-----|-------|-----|-----|
| Connector Function | | Tx | | Rx | | Tx | | Rx | | | | | |
| Wavelength | | 1550nm | 1310nm | 1310/1550nm | 1310/1550nm | 850nm | 850nm | 850nm | 850nm | | | | |
| Applicable Rates (note that all rates listed are not applicable to all configurations) | | 2.5Gb/s, 1Gb/s, 622Mb/s, 155Mb/s | | 2.5Gb/s, 1Gb/s, 622Mb/s, 155Mb/s | | 2.5Gb/s, 1Gb/s, 622Mb/s, 155Mb/s | | 1Gb/s, 1Gb/s | | | | | |
| Model # Short Configuration Description | | Max (dBm) | Min (dBm) | Max (dBm) | Min (dBm) | Max (dBm) | Min (dBm) | Max (dBm) | Min (dBm) | | | | |
| SONET/SDH modules | | | | | | | | | | | | | |
| C8301 | 622M-T1/E1, 1550/1310nm @ 622M | 2 | -4 | -8 | -16 | N/A | N/A | -8 | -28 | N/A | N/A | N/A | N/A |
| C8305 | 2.5G-T1/E1, 1550/1310nm @ 2.5G | 0 | -6 | 3 | -3 | -9 | -27 | -8 | -28 | N/A | N/A | N/A | N/A |
| C8310 | 10G SONET or SDH, 1550nm (IR) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8311 | 10G SONET or SDH, 1550nm (LR) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8312 | 10G SONET or SDH, 1550nm/1310nm (IR) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8313 | 10G SONET or SDH, 1550nm/1310nm (LR) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8314 | 10G SONET or SDH, 1310nm (SR) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8320 | 10G-T1/E1, 1550nm @ 10G (IR), 1550nm/1310nm @ 2.5G | 0 | -5 | 3 | -2 | -9 | -27 | -8 | -28 | N/A | N/A | N/A | N/A |
| C8321 | 10G-T1/E1, 1550/1310nm @ 10G (IR), 1550nm/1310nm @ 2.5G | 0 | -5 | 3 | -2 | -9 | -27 | -8 | -28 | N/A | N/A | N/A | N/A |
| C8325 | 10G-T1/E1, 1550nm @ 10G (LR), 1550nm/1310nm @ 2.5G | 0 | -5 | 3 | -2 | -9 | -27 | -8 | -28 | N/A | N/A | N/A | N/A |
| Ethernet modules | | | | | | | | | | | | | |
| C8401 | GigE single port, 1310nm | N/A | N/A | -3 | -12 | -3 | -19 | N/A | N/A | N/A | N/A | N/A | N/A |
| C8402 | GigE single port, 850nm | N/A | N/A | N/A | N/A | N/A | N/A | 0 | -12.5 | 0 | -17 | | |
| C8405 | GigE single port, 1310/850nm | N/A | N/A | -3 | -12 | -3 | -19 | N/A | N/A | 0 | -12.5 | 0 | -17 |
| C8403 | GigE single port, 1550nm | 0 | -6 | N/A | N/A | -9 | -27 | N/A | N/A | N/A | N/A | N/A | N/A |
| C8406 | GigE single port, 1310/1550nm | 0 | -6 | -3 | -12 | -9 | -27 | N/A | N/A | N/A | N/A | N/A | N/A |
| C8408 | GigE single port, 850/1310/1550nm | 0 | -6 | -3 | -12 | -9 | -27 | N/A | N/A | 0 | -12.5 | 0 | -17 |
| C8415 | GigE dual port, 1310/850nm | N/A | N/A | -3 | -12 | -3 | -19 | N/A | N/A | 0 | -12.5 | 0 | -17 |
| C8410 | GigE dual port, 1310nm | N/A | N/A | -3 | -12 | -3 | -19 | N/A | N/A | N/A | N/A | N/A | N/A |
| C8411 | GigE dual port, 850nm | N/A | N/A | N/A | N/A | N/A | N/A | 0 | -12.5 | 0 | -17 | | |
| C8418 | GigE dual port, 850/1310/1550nm | 0 | -6 | -3 | -12 | -9 | -27 | N/A | N/A | 0 | -12.5 | 0 | -17 |
| C8420 | 10GigE LAN, 1310nm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8421 | 10GigE LAN, 850nm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8422 | 10GigE LAN, 1550nm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8423 | 10GigE LAN, 850/1310nm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8424 | 10GigE LAN 1550/1310nm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8425 | 10GigE LAN 1550/1310/850nm | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8430 | 10GigE LAN 1310nm, GigE (850/1310nm) single port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8431 | 10GigE LAN 850/1310nm, GigE (850/1310nm) single port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8432 | 10GigE LAN 1550/1310nm, GigE (850/1310nm) single port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8433 | 10GigE LAN 1550/1310/850nm, GigE (850/1310nm) single port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8435 | 10GigE LAN (1310nm), GigE (850/1310nm) dual port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8436 | 10GigE LAN (850/1310nm), GigE (850/1310nm) dual port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8437 | 10GigE LAN 1550/1310nm, GigE (850/1310nm) dual port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8438 | 10GigE LAN 1550/1310/850nm, GigE (850/1310nm) dual port, 10/100M (e) | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8540 | 10GigE LAN/WAN (10G-IR, 1310/1550nm) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8541 | 10GigE LAN/WAN (10G-IR, 850/1310/1550nm) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8542 | 10GigE LAN/WAN (10G-SR, 1310nm) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8545 | 10GigE LAN/WAN (10G-LR, 1310/1550nm) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| C8546 | 10GigE LAN/WAN (10G-IR, 1310/1550nm), 1xGigE-850/1310nm | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8547 | 10GigE LAN/WAN (10G-IR, 1310/1550nm), 2xGigE-850/1310nm | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| C8548 | 10GigE LAN/WAN (10G-IR, 850/1310/1550nm), 1xGigE-850/1310nm | N/A | N/A | -3 | -11 | -3 | -19 | N/A | N/A | 0 | -9.5 | 0 | -17 |
| SONET/SDH and Ethernet modules | | | | | | | | | | | | | |
| C8501 | 622M-T1/E1 and GigE SP (850/1310nm) | -8 | -15 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8502 | 622M-T1/E1 and GigE DP (850/1310nm) | -8 | -15 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8505 | 2.5G-T1/E1 and GigE SP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8506 | 2.5G-T1/E1 and GigE DP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8510 | 10G-T1/E1 and GigE SP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8511 | 10G-T1/E1 and GigE SP (1310/1550) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8515 | 10G-T1/E1 and GigE DP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8520 | 10G-T1/E1 (LR) and GigE SP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8521 | 10G-T1/E1 (LR) and GigE DP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8525 | 10G-T1/E1 Dual @ 10G/2.5G and GigE SP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8526 | 10G-T1/E1 Dual @ 10G/2.5G and GigE DP (850/1310nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8530 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE SP | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8535 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE DP | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8550 | 10G-T1/E1 and 10GigE LAN (10G-LR, 1310/1550nm) and GigE SP (850/1310) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8551 | 10G-T1/E1 and 10GigE LAN (10G-LR, 1310/1550nm) and GigE DP (850/1310) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8555 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE SP (850/1310) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8556 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE DP (850/1310) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | 0 | -9.5 | 0 | -17 |
| C8557 | 10G-T1 or E1 and 10GigE LAN (10G-IR, 850/1310/1550nm) | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | N/A | N/A | N/A | N/A |
| C8581 | 2.5G-T1 or E1 (IR-Dual), 10GigE-SR/LR/ZR | 0 | -5 | 3 | -3 | -9 | -27 | -8 | -28 | N/A | N/A | N/A | N/A |

| Input/Output optical power levels for the Transport module | | 10Gb/s Port Bank | | | | |
|--|--|---------------------|---------------------|---------------------|---------------------|---------------------|
| Connector Function | | Tx | | Rx | | |
| Wavelength | | 1550nm | 1310nm | 1310/1550nm | 850nm | 850nm |
| Applicable Rates (note that all rates listed are not applicable to all configurations) | | 10.3Gb/s, 10Gb/s | 10.3Gb/s, 10Gb/s | 10.3Gb/s, 10Gb/s | 10.3Gb/s, 10Gb/s | 10.3Gb/s, 10Gb/s |
| Model # Short Configuration Description | | Max Min (dBm) | Max Min (dBm) | Max Min (dBm) | Max Min (dBm) | Max Min (dBm) |
| SONET/SDH modules | | | | | | |
| C8301 | 622M-T1/E1, 1550/1310nm @ 622M | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8305 | 2.5G-T1/E1, 1550/1310nm @ 2.5G | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8310 | 10G SONET or SDH, 1550nm (IR) | 2 -1 | N/A N/A | N/A N/A | -1 -14 | N/A N/A |
| C8311 | 10G SONET or SDH, 1550nm (LR) | 2 -1 | N/A N/A | -9 -24 | N/A N/A | N/A N/A |
| C8312 | 10G SONET or SDH, 1550nm/1310nm (IR) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8313 | 10G SONET or SDH, 1550nm/1310nm (LR) | 2 -1 | -1 -6 | -9 -24 | N/A N/A | N/A N/A |
| C8314 | 10G SONET or SDH, 1310nm (SR) | N/A N/A | -1 -6 | -1.0 -11 | N/A N/A | N/A N/A |
| C8320 | 10G-T1/E1, 1550nm @ 10G (IR), 1550nm/1310nm @ 2.5G | 2 -1 | N/A N/A | -1 -14 | N/A N/A | N/A N/A |
| C8321 | 10G-T1/E1, 1550/1310nm @ 10G (IR), 1550nm/1310nm @ 2.5G | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8325 | 10G-T1/E1, 1550nm @ 10G (LR), 1550nm/1310nm @ 2.5G | 2 -1 | N/A N/A | -9 -24 | N/A N/A | N/A N/A |
| Ethernet modules | | | | | | |
| C8401 | GigE single port, 1310nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8402 | GigE single port, 850nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8405 | GigE single port, 1310/850nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8403 | GigE single port, 1550nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8406 | GigE single port, 1310/1550nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8408 | GigE single port, 850/1310/1550nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8415 | GigE dual port, 1310/850nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8410 | GigE dual port, 1310nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8411 | GigE dual port, 850nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8418 | GigE dual port, 850/1310/1550nm | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8420 | 10GigE LAN, 1310nm | N/A N/A | -1 -6 | -1.0 -11 | N/A N/A | N/A N/A |
| C8421 | 10GigE LAN, 850nm | N/A N/A | N/A N/A | N/A N/A | -1 -7.3 | -1 -10 |
| C8422 | 10GigE LAN, 1550nm | 2 -1 | N/A N/A | -1 -14 | N/A N/A | N/A N/A |
| C8423 | 10GigE LAN, 850/1310nm | N/A N/A | -1 -6 | -1 -11 | -1 -7.3 | -1 -10 |
| C8424 | 10GigE LAN 1550/1310nm | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8425 | 10GigE LAN 1550/1310/850nm | 2 -1 | -1 -6 | -1 -14 | -1 -7.3 | -1 -10 |
| C8430 | 10GigE LAN 1310nm, GigE (850/1310nm) single port, 10/100M (e) | N/A N/A | -1 -6 | -1 -11 | N/A N/A | N/A N/A |
| C8431 | 10GigE LAN 850/1310nm, GigE (850/1310nm) single port, 10/100M (e) | N/A N/A | -1 -6 | -1 -11 | -1 -7.3 | -1 -10 |
| C8432 | 10GigE LAN 1550/1310nm, GigE (850/1310nm) single port, 10/100M (e) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8433 | 10GigE LAN 1550/1310/850nm, GigE (850/1310nm) single port, 10/100M (e) | 2 -1 | -1 -6 | -1 -14 | -1 -7.3 | -1 -10 |
| C8435 | 10GigE LAN (1310nm), GigE (850/1310nm) dual port, 10/100M (e) | N/A N/A | -1 -6 | -1 -11 | N/A N/A | N/A N/A |
| C8436 | 10GigE LAN (850/1310nm), GigE (850/1310nm) dual port, 10/100M (e) | N/A N/A | -1 -6 | -1 -11 | -1 -7.3 | -1 -10 |
| C8437 | 10GigE LAN 1550/1310nm, GigE (850/1310nm) dual port, 10/100M (e) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8438 | 10GigE LAN 1550/1310/850nm, GigE (850/1310nm) dual port, 10/100M (e) | 2 -1 | -1 -6 | -1 -14 | -1 -7.3 | -1 -10 |
| C8540 | 10GigE LAN/WAN (10G-IR, 1310/1550nm) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8541 | 10GigE LAN/WAN (10G-IR, 850/1310/1550nm) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8542 | 10GigE LAN/WAN (10G-SR, 1310nm) | N/A N/A | -1 -6 | -1 -11 | N/A N/A | N/A N/A |
| C8545 | 10GigE LAN/WAN (10G-LR, 1310/1550nm) | 2 -1 | -1 -6 | -9 -23 | N/A N/A | N/A N/A |
| C8546 | 10GigE LAN/WAN (10G-IR, 1310/1550nm), 1xGigE-850/1310nm | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8547 | 10GigE LAN/WAN (10G-IR, 1310/1550nm), 2xGigE-850/1310nm | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8548 | 10GigE LAN/WAN (10G-IR, 850/1310/1550nm), 1xGigE-850/1310nm | 2 -1 | -1 -6 | -1 -14 | -1 -7.3 | -1 -10 |
| SONET/SDH and Ethernet modules | | | | | | |
| C8501 | 622M-T1/E1 and GigE SP (850/1310nm) | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8502 | 622M-T1/E1 and GigE DP (850/1310nm) | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8505 | 2.5G-T1/E1 and GigE SP (850/1310nm) | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8506 | 2.5G-T1/E1 and GigE DP (850/1310nm) | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A N/A |
| C8510 | 10G-T1/E1 and GigE SP (850/1310nm) | 2 -1 | N/A N/A | -1 -14 | N/A N/A | N/A N/A |
| C8511 | 10G-T1/E1 and GigE SP (1310/1550) | 2 -1 | N/A N/A | -1 -14 | N/A N/A | N/A N/A |
| C8515 | 10G-T1/E1 and GigE DP (850/1310nm) | 2 -1 | N/A N/A | -1 -14 | N/A N/A | N/A N/A |
| C8520 | 10G-T1/E1 (LR) and GigE SP (850/1310nm) | 2 -1 | N/A N/A | -9 -23 | N/A N/A | N/A N/A |
| C8521 | 10G-T1/E1 (LR) and GigE DP (850/1310nm) | 2 -1 | N/A N/A | -9 -23 | N/A N/A | N/A N/A |
| C8525 | 10G-T1/E1 Dual @ 10G/2.5G and GigE SP (850/1310nm) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8526 | 10G-T1/E1 Dual @ 10G/2.5G and GigE DP (850/1310nm) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8530 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE SP | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8535 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE DP | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8550 | 10G-T1/E1 and 10GigE LAN (10G-LR, 1310/1550nm) and GigE SP (850/1310) | 2 -1 | -1 -6 | -9 -23 | N/A N/A | N/A N/A |
| C8551 | 10G-T1/E1 and 10GigE LAN (10G-LR, 1310/1550nm) and GigE DP (850/1310) | 2 -1 | -1 -6 | -9 -23 | N/A N/A | N/A N/A |
| C8555 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE SP (850/1310) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8556 | 10G-T1/E1 and 10GigE LAN (10G-IR, 1310/1550nm) and GigE DP (850/1310) | 2 -1 | -1 -6 | -1 -14 | N/A N/A | N/A N/A |
| C8557 | 10G-T1 or E1 and 10GigE LAN (10G-IR, 850/1310/1550nm) | 2 -1 | -1 -6 | -1 -14 | -1 -7.3 | -1 -10 |
| C8581 | 2.5G-T1 or E1 (IR-Dual), 10GigE-SR/LR/ZR | 2 -1 | -1 -6 | -1 -14 | -1 -7.3 | -1 -10 |