Test & Measurement

- sales
- rentals
- calibration
- repair
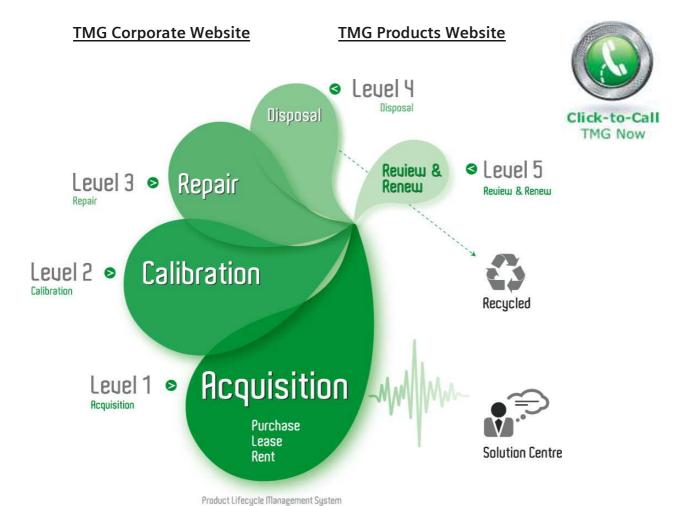- disposal

Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

TMG offers a wide range of test equipment solutions, from renting short to long term, buying refurbished and purchasing new. Financing options, such as Financial Rental, and Leasing are also available on application.

TMG will assist if you are unsure whether this model will suit your requirements.

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SCALABLE TESTING PLATFORM FOR GLOBAL SONET/SDH, PDH, ATM AND POS NETWORKS

Digital Lightwave's NIC *Plus* Network Information Computer is a scalable solution for verifying and qualifying the performance of today's global communications networks. With flexible software/firmware-based architecture, the multifunctional NIC *Plus* combines in a single platform the multitude of traditional hardware based test sets required to install, maintain, and monitor high-speed multi-protocol networks. The NIC *Plus* is designed to grow as your network needs change.

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The NIC *Plus* can also be configured with 10 Gbps SONET/SDH optical quad receiver/trans-mit technology modules, providing equipment manufacturers and service providers with a high-speed, high-density solution—in the same compact, portable NIC *Plus* platform.

Combining innovative features, functionality, performance and scalability into a single lightweight portable unit suitable for global networks, the NIC *Plus* is the most versatile testing platform available today.

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MAJOR FEATURES:

- Simultaneous and independent testing of SONET/SDH, T-Carrier, PDH, ATM and POS. Separate protocol processors for PDH (DS1/E1, DS3/E3, E4), ATM and SONET/SDH (OC-1/STM-0 through OC-192/STM-64)
- Internal DS1/DS3 and E1/E3 drop/insert from SONET/SDH, built-in M13/E13
- OC-192/STM-64 throughmode with overhead manipulation
- OC-192/STM-64 1310 or 1550 nm
- OC-48/STM-16 1310 nm, 1550 nm or switchable wavelength laser option
- Packet over SONET/SDH (POS) for 10G rates (optional)
- 10 Gbps optical quad receiver technology for high-density multi-port configurations
- Round trip delay measurement capabilities at 2.5 Gbps / 10 Gbps
- Support for AAL0, AAL1, AAL5, traffic shaping, PVC/SVC, OAM, QoS measurements, HEC error generation
- Alarm/error generation and analysis
- Auto configuration to pattern level
- Trouble scan
- A 12.1-inch active matrix color display with touch screen
- Dual slot PCMCIA interface
- Built-in optical power and frequency measurement
- Remote control GUI
- Software/firmware upgradeable via web connection
- GPIB or SCPI control
- Multiple slots for future expansion
- Available in over 35 configurations

TECHNICAL SPECIFICATIONS

SONET/SDH OC-192 STM-64

Requirements	Meets the requirements of GR-253 (OC-192) and ITU-T G.707 (STM-64)
Line code	NRZ
Mapping	<u>OC-192</u>: STS-48, STS-192c (per ANSI T.105.02) <u>STM-64</u>: AU-4-64c, AU-4-16c (per ITU-T G.707); Configuration dependent support of additional mappings listed in the OC-1/STM-0 through OC-48/STM-16 section
Line Rate	Tx: N x 51.84 MHz, Rx: N x 51.84 MHz, ±50 Stratum III compliant, offset capability ±100 ppm
Input Signal Measurement	Optical power meter: 0 to -26 dBm, ±1.5 dB, Frequency meas. range: N x 51.84 MHz, ±200 ppm
Synchronization	Internal, received SONET or SDH signal, BITS (1.544 Mbps), SETS (2.048 Mbps)
Level (Tx)	<u>1310 nm</u>: singlemode, Intermediate reach-compliant, 1290-1330 nm, 1310 nm typical <u>1550 nm</u>: Intermediate reach-compliant, singlemode, 1530-1565 nm, 1550 nm typical
Level (Rx)	-7 dBm to -14 dBm, -20 typical min. at 10^{-10} BER with 2^{23} -1 PRBS
Spectral Range (Rx)	1290-1600 nm
Connectors	SC, FC-PC, ST
Error Measurement	<u>OC-192</u>: B1, B2, REI-L, B3, REI-P, BIT, NDF errors <u>STM-64</u>: B1, B2, MS-REI, B3, HP-REI, Bit, NDF errors (performance meas. per G.821, G.826, M.2101.1)
Alarm Detection	<u>OC-192</u>: LOF, LOS, SEF, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, UNEQ-P, pattern sync, concatenation: RS-TIM, HP-TIM, HP-PLM; <u>STM-64</u>: LOF, LOS, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, RS-TIM, HP-TIM, HP-PLM, pattern sync, concatenation
Alarm Generation	<u>OC-192</u>: LOF, LOS, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, UNEQ-P; <u>STM-64</u>: LOF, LOS, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ
Patterns	PRBS* (normal & inverted): 2^{15}-1 PRBS, 2^{23}-1PRBS, 2^{31}-1 PRBS, all 0's, all 1's, user-defined 32-bit pattern (per ITU-T 0.151)
APS Commands	Supports transmission/reception of linear & ring-mode command sequences for K1/K2 bytes (per G.841)
Pointer Control	New value, single adjustments (increment or decrement), burst 2-8 adjustments, increment-decrement, decrement-increment, NDF control, SPE offset, pointer sequences
Control and Monitoring	<u>OC-192</u>: Overhead: Transmit control over bytes: Transport OH: A1, A2, C1, Z0, D1-D12, E1, E2, F1, K1, K2, J0 (Trace) Z1, Z2; Path OH: C2, F2, G1, J1 (Trace), Z3, Z4, Z5; Receive monitor: Transport OH: all bytes; Path OH: all bytes <u>STM-64</u>: Overhead: Transmit control over bytes: Section OH: A1, A2, Z0, D1-D12, E1, E2, F1, K1, K2, J0 (Trace), Z1, Z2; HP OH: C2, F2, G1, J1 (Trace), F3, K3, N1; Receive monitor: Section OH: all bytes HP OH: all bytes
Intrusive / Non-intrusive Through Mode	Provides the ability to regenerate optical signal and optionally modify section and line overhead bytes
Error Injection	<u>OC-192</u>: B1, B2, REI-L, B3, REI-P, BIT <u>STM-64</u>: B1, B2, MS-REI, B3, HP-REI, BIT
Error Injection Rate	BIT: Single, 10^{-10} to 10^{-3}, user-programmable Other errors: Single, 10^{-10} to maximum, user-programmable
Switch to Protect Measurement	Measure on B1, SEF, OOF, AIS-L, MS-AIS, AIS-P, AU-AIS, and PRBS; 125 microsecond resolution
Round Trip Delay (RTD) Measurement	Measurement ranges: 125 microseconds resolution

(Also at top right: AU-LOP, HP-RDI, HP-UNEQ)

10G PACKET OVER SONET (POS) OPTION

No. of Ports/Modules	1
Packet Statistics	<u>Counts, seconds</u>: all sent frames, all received frames, all received bytes, all destuffed bytes, all PPPs, valid PPPs, all IPs, valid IPs, all UDPs, valid UDPs; <u>Counts, avg rate, current rate, seconds</u>: invalid frame check (CRC-32), invalid UDP, BIT errors for a specified substream (destination IP address, pattern, protocol)
Error Generation	FCS errors (CRC32), IP checksum and BIT errors
Traffic Generation	Single signal traffic generators with configurable: source IP address (fixed), destination IP address (fixed), source port, destination port, transmit protocol UDP, payload size, data rate - % bandwidth, pattern -32 bit user defined pattern or PRBS^31 or PRBS^31 inverted
Frame Length	Octet synchronous HDLC-like, framing (RFC1619 / 1662), variable from 40 bytes to 1.5 Kbytes
Maximum Packet Rate	1 flag between packets -> 29.22 million packets/sec @ 40 bytes
IP.UDP	Checksum
PPP	LCP / IPCP / negotiation

10G OPTICAL QUAD RECEIVER OPTION

Line code	NRZ
Mapping	<u>OC-192</u>: STS-192c (per G-253), <u>STM-64</u>: AU-4-64c (per ITU-T G.707)
Input Signal Measurement	Optical power meter: 0 to -26 dBm, ±1.5 dB, Frequency measurement range: N x 51.84 MHz, ±200 ppm
Level (Rx)	0 dBm to -14 dBm, -15 typical min. at 10^{-10} BER with 2^{23} -1 PRBS
Spectral Range (Rx)	1290-1600
Level (Tx)	Utilizes OC-192/STM-64 module
Connectors	SC, FC-PC, ST; custom available
Error Measurement	<u>OC-192</u>: B1, B2, REI-L, B3, REI-P, BIT, NDF errors <u>STM-64</u>: B1, B2, MS-REI, B3, HP-REI, Bit, NDF errors (performance measurements per G.821, G.826, M.2101.1)
Alarm Detection	<u>OC-192</u>: LOF, LOS, SEF, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, UNEQ-P, RS-TIM, HP-TIM, HP-PLM, pattern sync, concatenation; <u>STM-64</u>: LOF, LOS, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, RS-TIM, HP-TIM, HP-PLM, pattern sync, concatenation
Patterns	PRBS* (normal & inverted): 2^{15}-1 PRBS, 2^{23} -1 PRBS, 2^{31}-1 PRBS, all 0's, all 1's, user-defined 32-bit pattern
APS Commands	Supports reception of linear & ring-mode command sequences for K1/K2 bytes per G.841
Monitoring	Receive monitor: Transport OH: all bytes, path OH: all bytes
Switch to Protect Measurement	Measure on B1, SEF, OOF, AIS-L, MS-AIS, AIS-P, AU-AIS, and PRBS; 125 microsecond resolution
Round Trip Delay (RTD) Measurement	Measurement ranges: 125 microseconds resolution

TECHNICAL SPECIFICATIONS

SONET/SDH OC-1/STM-0 THROUGH OC-48/STM-16

Requirements	Meets the requirements of GR-253 (SONET) and ITU-T G.707 (SDH)
Line interface	STS-1, OC-1, OC-3, OC-12, OC-48, STM-0, STM-1, STM-4, STM-16, STM-0e, STM-1e
Line code	SONET: NRZ, STS-1: B3ZS SDH: NRZ, scrambled, STM-0e: B3ZS; STM-1e: CMI
Mapping	SONET: STS-48c VT1.5 (async), DS3, STS-3c/Bulk fill,STS-12c/Bulk fill, STS-48c/Bulk fill, ATM/STS-1, ATM/STS-3c, ATM/STS-12c, Full SPE/Bulk fill, VT1.5/Bulk fill (per ANSI T.105.02); SDH: STM-16: AU-4-16c, AU-4-4c, STM-4/1/0: AU-4-4c, AU-4/C-4, AU-4/C-3, AU-4/C-2, AU-4/C-12, AU-4/C-11, AU-3/C-3, AU-3/C-2, AU-3/C-12, AU-3/C-11, Full SPE/Bulk fill, VT1.5/Bulk fill (per ITU-T G.707)
Framing	A1 and A2 bytes
Line Rate	Tx: N x 51.84 MHz Stratum III-compliant; offset capability (OC-48/STM-16 only) $\pm$100 ppm Rx: N x 51.84 MHz; offset capability$\pm$50 ppm (OC-48/STM-16 only)
Input Signal Measurement	Optical: Optical power meter: 0 to -26 dBm, $\pm$1.5 dB; Electrical: Peak voltage range: +0.31 to +1.2 Vp; Frequency measurement range: N x 51.84 MHz $\pm$50 ppm (STM-16/OC-48); N x 51.84 MHz $\pm$100 ppm (up to STM-4)
Synchronization	Internal, received SONET/SDH signal, BITS (1.544 Mbps), SETS (2.048 Mbps)
Impedance	Electrical: 75 ohm +5% unbalanced
Automatic Configuration	Automatically configures test set to the incoming signal framing, line code, and pattern (per ITU-T G.707, G.703, 0.151)
Level (Tx)	STM-16 / OC-48: 1310 nm: singlemode, Long Reach-compliant, 1260-1360 nm, 1308 nm typical STM-16 / OC-48: 1550 nm: Long Reach-compliant, singlemode, 1480-1580 nm, 1554 nm typical STM-16 / OC-48 switchable 1310/1550 nm:: Long Reach-compliant, comprised of 1310 nm and 1550 nm laser options listed above and additional 1dB power reduction STM-0/1/4, OC-1/3/12 1550: 0 dBm typical, single mode, Long Reach, 1480-1580 nm, 1554 nm typical 1310 nm: -5 dBm typical, singlemode, Intermediate/Long Reach, 1260-1360 nm, 1308 nm typical
Level (Rx)	STM-16 / OC-48: -7 dBm to -26 dBm typical, -30 dBm typical minimum at 10^{-10} BER with 2^{23}-1 PRBS STM-0/1/4, OC-1/3/12: -7 to -26 dBm, -30 dBm typical min @ 10^{-10} BER @ 2^{23} -1 PRBS STM-1/STM-0e: -15 dBdsx flat loss and terminated: 900 ft of RG-59 STM-1e: STM-1 terminated mode per G.703 1998 (Section 3.1, 3.2, 3.3): up to 12.7 dB of cable loss
Level (Tx) Electrical	STS-1/STM-0e/1e: 1.03 Vp +10%
Spectral Range	1290-1600 nm
Connectors	Optical: FC-PC, SC, ST Electrical: STM-0e/STM-1e: BNC 75 ohm
Error Measurement	B1, B2, REI-L, B3, REI-P, HP-REI , BIT, NDF errors LP-BIP, MS-REI, LP-REI, BPV, AU-NDF errors, TU-NDF

	errors, Section CV, Line CV, Line FEBE, Path CV, VT CV, Path FEBE, VT FEBE, pattern bit, STSX-1 BPV (performance measurements per G.821, G.826, M.2101.1)
Datacom Channel (DCC)	Tx and Rx: Any 8-bit value in any byte D1 to D12, PRBS 2^7-1 normal or inverted on D1-D3, PRBS 2^7-1 normal or inverted on D4-D12, DCC connector on D1-D3, DCC connector on D4-D12
Alarm Detection	Pattern sync, LOF, LOS, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, RS-TIM, HP-TIM, HP-PLM, TU-AIS, TU-LOP, LP-RDI, LP-PLM, LP-UNEQ, LP-TIM
Alarm Generation	LOF, LOS, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, UNEQ-P, MS-AIS, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, TU-AIS, TU-LOP, LP-RDI, LP-UNEQ, LP-RFI, FERF, Yellow, VT (SONET: LOM-V, LOP-V, AIS-V, RFI-V, RDI-V, UNEQ-V; SDH: TU-LOM, TU-LOP, TU-AIS, LP-REI, LP-RDI, LP-UNEQ)
Patterns	2^{15}-1 PRBS, 2^{15}-1 PRBS inverted, 2^{23}- 1PRBS*, 2^{23}-1 PRBS inverted, 2^{31}-1 PRBS, 2^{31}-1 PRBS inverted, all 0's, all 1's, user defined 32-bit pattern, C4-16c, AU-4-4c, C-4: PRBS (normal & inverted): 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{31}-1, any 32-bit user pattern; C-3, C-2, C-12, C-11: PRBS (normal & inverted): 2^9-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, any 32-bit user pattern (per ITU-T 0.151)
APS Commands	Supports transmission and reception of linear and ring-mode command sequences - per G.841, (OC-48/STM-16 only)
Pointer Control	AU: New value, single adjustments (increment or decrement), burst 2^{-8} adjustments, increment-decrement, decrement-increment, NDF control, AU frequency offset: +100 ppm; TU: New value, single adjustments (increment or decrement), NDF control, TU frequency offset: +100 ppm
Control and Monitoring	Overhead: Transmit and receive any 8-bit pattern in all slots for any overhead byte specified Transmit control over bytes: Tx/Rx Transport, Section OH: A1, A2, C1, D1-D12, E1, E2, F1, K1, K2, S1, M1, Z1, Z2; Path OH: C2, F2, G1, J1 (Trace), Z3, Z4, Z5, K3, N1 Receive monitor: Transport OH: all bytes; Section OH: all bytes; HP OH: all bytes; Path OH: all bytes; LP OH: V5, J2 (Trace), N2, K4; VT OH: V1, V2
Intrusive / Non-intrusive Through Mode	Provides the ability to regenerate optical signal and optionally modify section and line overhead bytes
Error Injection	B1, B2, REI-L, B3, REI-P, BIT, MS-REI, HP-REI, Line CV, Path FEBE, VT FEBE, pattern bit
Error Injection Rate	BIT: Single, 10^{-9} to 10^{-3}, user-programmable Other errors: Single, 10^{-9} to maximum, user-programmable
Switch to Protect Measurement	125 microseconds resolution (OC-48/STM-16 only)
Round Trip Delay (RTD) Measurement	Measurement ranges: 125 microseconds resolution (OC-48/STM-16 only)

TECHNICAL SPECIFICATIONS

DS1/E1

Requirements	Meets the requirements of G.703 (E1)
Line code	DS1: AMI, B8ZS, E1: AMI, HDB3
Framing	DS1: SF (D4), ESF, SLC 96, unframed; E1: PCM31, PCM31CRC, PCM30, PCM30CRC, unframed
Line Rates	DS1: 1.544 MHz ±4.6 ppm (Tx), Stratum III-compliant, 1.544 MHz ±200 ppm (Rx) E1: 2.048 MHz (Tx), 2.048 MHz (Rx), offset capability ±100 ppm
Impedance	DS1: 100/120 ohm ±5% balanced E1: 75 ohm unbalanced, 100/120 ohm balanced
Level (Tx)	DS1: 0 dBdsx ±1 dB, -7.5 dBdsx ±1 dB, -15 dBdsx ±1 dB E1: 0 dBdsx, -7.5 dBdsx, -15 dBdsx
Level (Rx)	DS1: Terminated: +6 to -26 dBdsx w/ EQ Monitor: 0 to -26 dBdsx w/ EQ Bridge: 1K ohm, 0 to -26 dBdsx w/ EQ E1: Terminated, 0-26 dBdsx w/ EQ Bridge: 1K ohm, 0 to -26 dBdsx w/ EQ
Connectors	DS1: Bantam; E1: BNC
Synchronization	DS1: Internal, received DS1 signal, BITS (1.544 Mbps); E1: Internal, received E1 signal, SETS (2.048 Mbps)
Input Signal Measurement	DS1: Voltage range: ±0.1 Vp to ±7 Vp, Frequency measurement range: 1.544 MHz ±200 ppm; E1: Peak voltage range: +0.1 Vp to +7 Vp, Frequency measurement range: 2.048 MHz, ±200 ppm
Error Measurement	DS1: BPV, frame, CRC, BIT, excess 0's, E1: BIT, BPV, frame, CRC, FEBE (performance measurements per G.826, G.821, M.2100)

Alarm Detection	DS1: OOF, pattern sync, LOS, AIS, Yellow, LOF, idle, clock, E1: AIS, LOF, LOS, pattern sync, yellow, RM-FAI, CASML
Alarm Generation	DS1: AIS, yellow, idle, clock, LOS, LOF E1: AIS, LOF, RAI, RMRAI, CASMFL
Error Injection	DS1: BPV, BIT, frame, CRC, E1: BIT, frame, CRC, FEBE
Error Injection Rate	DS1: single, 10^{-7} to 10^{-3}, user-programmable E1: single, 10^{-7} to 10^{-3}, user-programmable
Patterns	DS1: QRSS, 2^{15} -1, 2^{20} -1, 2^{23} -1 PRBS*, 3 in 24, all 1's, all 0's, 1 in 8, 1010, or 24-bit user-programmable, 55 Daly, T1-2, T1-3, T1-5, 55 octet, ATM (mapping), DDS 1-6, Multi-pattern, Bridge tap Fractional T1: QRSS, 2^6 -1, 2^9 -1, 2^{11} -1 PRBS E1: 2^6 -1, 2^6 -1 inverted, 2^9 -1, 2^9 -1 inverted, 2^{11} -1, 2^{11} -1 inverted, 2^{15} -1, 2^{15} -1 inverted, 2^{20} -1, 2^{20} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, user patterns Fractional E1: QRSS, 2^6 -1, 2^9 -1, 2^{11} -1 PRBS
Loop Codes Support	DS0/64 Kbps: DDS latching and non-latching DS1: Transmit: in-band, out-of-band, line loopback, payload loopback, 4-bit smart jack, 5-bit smart jack, 16-bit user-programmable; Receive: Auto response on/off, display of current loopback status E1: payload, line, loop back
Loop Back	Line and payload loop back (manual)
DS0/64 Kbps Access	Contiguous/non-contiguous (Fractional T1), Transmit: Individual DS0/64 Kbps channels replaced with idle codes (0x7F) or AIS (0xFF); Received: Monitor individual DS0/64 Kbps channel data, signaling bits, and VF drop to speaker
DS0/64 Kbps Signaling Monitor	AB (SF) and ABCD (ESF) all channels simultaneously

DS3

Line code	B3ZS
Mapping/Drop	DS1, E1 (up to 2)
Framing	M13, C-Bit parity, unframed
Line Rates	44.736 MHz ±12 ppm (Tx), 44.736 MHz ±200 ppm (Rx)
Impedance	75 ohm ±5% unbalanced
Level (Tx)	DS3 High: 0.95 Vp ±1.0 dB, DSX3: 0.48 Vp ±1.2 dB DS3 Low: 0.35 Vp ±1.0 dB
Level (Rx)	Terminated: 75 ohm, +6 to -12 dB relative to DSX3 w/ EQ, Monitor: 75 ohm, -15 to -26 dB relative to DSX3 w/ EQ
Connectors	BNC

Synchronization	Internal
Input Signal Measurement	Voltage range: ±0.31 Vp to ±1.2 Vp, Frequency measurement range: 44.736 MHz ±200 ppm
Error Measurement	BPV, BIT, frame, P-Parity, C-Parity, FEBE
Alarm Detection	OOF, pattern sync, LOS, AIS, idle, X-Bit, yellow
Alarm Generation	AIS, idle, yellow/X-Bit
Error Injection	BPV, BIT, frame, P-Parity, C-Parity, FEBE
Error Injection Rate	Single, 10^{-7} to 10^{-3}, user-programmable
Patterns	2^{15} -1, 2^{20} -1, 2^{23} -1 PRBS*, 1100, 1010, all1's, all 0's, 8-bit programmable, ATM (mapping)
FEAC Codes	Alarm/status codes, loopback codes

E4

Requirements	Meets the requirements of G.703
Line code	CMI
Mapping/Drop	E3, E1 (up to 2)
Framing	Framed, unframed
Line Rates	139.264 MHz ±20 ppm (Tx), -2 ppm/yr 139.264 MHz ±50 ppm (Rx)
Impedance	75 ohm unbalanced
Level (Tx)	.5 vp ± .1vp
Level (Rx)	Terminated: 160 m of RG-59, Monitor: -26 dBdsx
Connectors	BNC: 75 ohm unbalanced
Synchronization	Internal, recovered, BITS (1.544 Mbps), SETS (2.048 Mbps)

Input Signal Measurement	Peak voltage range: ±0.3 Vp to ±.7 Vp Frequency measurement range: 139.264 MHz ±200 ppm
Frequency Offset Generation	±100 ppm in units of .1 ppm
Error Measurement	Bit, frame, LCV (performance measurements per G.826, G.821, M.2100)
Alarm Detection	LOS, LOF, pattern sync, AIS, RDI
Alarm Generation	LOS, LOF, AIS, RDI
Error Injection	Bit, frame, LCV
Error Injection Rate	Single, 10^{-7} to 10^{-3}, user-programmable
Patterns	2^{20} -1, 2^{20} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, any user-defined pattern up to 32 bits (per ITU-T 0.151)

TECHNICAL SPECIFICATIONS

E3

Requirements	Meets the requirements of G.703
Line code	HDB3
Mapping/Drop	DS1, E1 (up to 2)
Framing	Framed, unframed
Line Rates	34.368 MHz ±4.6 ppm (Tx), -2 ppm/yr 34.368 MHz ±50 ppm (Rx)
Impedance	100 ohm balanced, 75 ohm unbalanced
Level (Tx)	1.00 Vp ± .1 Vp
Level (Rx)	Terminated: 330 m of RG-59, Monitor: -26 dBdsx
Connectors	BNC: 75 ohm
Synchronization	Internal, recovered, SETS (2.048 Mbps)
Input Signal Measurement	Peak voltage range: ±0.31 Vp to ±1.2 Vp Frequency measurement range: 34.368 MHz ±200 ppm
Frequency Offset Generation	±100 ppm in units of .1 ppm
Error Measurement	BPV, BIT, frame (performance measurements per G.821, G.826, M.2100)
Alarm Detection	LOS, LOF, pattern sync, AIS, RDI
Alarm Generation	LOS, LOF, AIS, RDI
Error Injection	BPV, BIT, frame
Error Injection Rate	Single, 10^{-7} to 10^{-3}, user-programmable
Patterns	2^9 -1, 2^9 -1 inverted, 2^{11} -1, 2^{11} -1 inverted, 2^{15} -1, 2^{15} -1 inverted, 2^{20} -1, 2^{20} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, any user-defined pattern up to 32 bits, ATM (mapping). Pass through with Drop & Insert: E3 pass thru with Drop/Insert of a single E1 for test (per ITU-T 0.151)

ATM

Physical Interfaces	SONET: STS-1, OC-1, OC-3, OC-12, DS1, DS3 SDH: STM-0, STM-1, STM-4, E1 (HEC, PLCP), E3 (HEC, PLCP)
Physical Layer Structure	SONET: STS-1, STS-3c, DS3 HEC Delineation, DS3 PLCP DS1 Delineation, DS1 PLCP, SDH: SDH bulk filled; C-3 (into VC-3), C-4 into VC-4, C4-4c into VC-4-4c
Adaptation Layers	AAL0, AAL1, AAL5
Header and Interface Support	Control of all cell header bits; UNI (3.0, 3.1, 4.0) and NNI support
Channel Capacity	Transmit: 256 channels (independent AAL, service class, and bandwidth on all VCCs) Receive: 256 channels (cell count, bandwidth, AAL5 PDU counts and errors on all channels)
Test Traffic Generation	VCC Channel Count: Transmit foreground and background test channels Traffic shaping: Foreground traffic shaping: Constant Bit Rate (CBR), real time/non real time Variable Bit Rate (rt VBR, nrt VBR), Unspecified Bit Rate (UBR), Available Bit Rate (ABR); foreground transmit resolution; background traffic shaping Cell Generation: Foreground VCC payload: 2^{15} - 1 (cross cell PRBS) + INV, user-defined 32-bit pattern, full cell, 0.191 test cell, special OAM generation/ test feature, and burst cell transmission; back-ground VCC payload
Test Traffic Analysis	VCC Channel Count: Receive test channels: Bandwidth analysis, cell count/rate, CLP ratio, CLP indication, BERT analysis, 0.191 Rev0/Rev1 analysis, AAL1 analysis, AAL5 analysis Cell Analysis / QOS: Cell bandwidth analysis (count/rate) - 256 channels; correctable HEC errors; uncorrectable HEC errors; BERT analysis (count/rate); 0.191 analysis 1.356 (CER, CMR, CLR, Cell Transfer Delay-CTD, SECB, MTBO, 2-point Cell Delay Variation-CDV); 1-point CDV; Cell misinsertion ration for AAL1; cell inter-arrival analysis; real-time analysis channels (bandwidth, BERT, 0.191, AAL1, AAL5) and CLP monitoring
Performance Analysis	CER, CLR, CMR, SECBR
Protocol Analysis	AAL0: Cell count and bandwidth utilization, bit error count, pattern sync errors AAL1: AAL1 SAR PDU header SNP errors, lost cells, misinserted cells for AAL1 VCCs; cell count and bandwidth utilization, bit error count, pattern sync errors; AAL5: CPCS analysis, VCC simultaneous analysis, CRC, PDU length errors Network Impairment: Cell error generation, cell loss, cell misinsertion, CDV, cell reordering, test traffic insertion, VPI/VCI remapping, CLP tagging, CI setting, padding errors
Protocol Generation	AAL0 cell generation, AAL1/AAL5 protocol gen.
Error Measurement	HEC correctable and uncorrectable error counts and rates, AAL5 CRC errors, AAL5 length errors; PRBS bit error measurement, loss of PRBS sync; AAL1 SN/SNP error, lost cells, misinserted cell counts and rates; PLCP framing errors, PLCP BIP, PLCP FEBE counts and rates, PLCP B1 CNT, PLCP Framing Error Cnt, cell overflow, BERT analysis
Error Injection	HEC-correctable and uncorrectable errors, HEC error rate from continuous to 10^{-9}, HEC error burst from 1 to 10 on consecutive cells; PLCP B1, PLCP FEBE, PLCP POI, PLCP Frame (A1A2), PLCP (POI)
Error Measurement	HEC correctable and uncorrectable error counts and rates, AAL5 CRC errors, AAL5 length errors; PRBS bit error measurement, loss of PRBS sync; AAL1 SN/SNP error, lost cells, misinserted cell counts and rates; PLCP framing errors, PLCP BIP, PLCP FEBE counts and rates
Alarm Detection	Cell synchronization loss, F4 and F5 AIS OAM flow (end-to-end/segment), F4 and F5 RDI OAM flow (end-to-end/segment); PLCP yellow alarm (RAI)
Cell Payload Patterns	PRBS* 2^{15} -1, all 1's, 10101010, user-defined pattern
Error injection	HEC-correctable and uncorrectable errors, HEC error rate from continuous to 10^{-9}, HEC error burst from 1 to 10 on consecutive cells; PRBS bit error rates from 10^{-2} to 10^{-9}, PLCP framing errors, BIP, FEBE
Alarm Generation	Cell synchronization loss, F4 and F5 AIS OAM flow (end-to-end/segment), F4 and F5 RDI flow (end-to-end/segment), PLCP yellow alarm
SVC Support	Calling SVCs, called SVCs, load test-call setup, load test-cyclic calls
SVC Signalling Analysis	Channel set up time, channel tear down, SSCOP link status indication, Tx/Rx attempted calls, Tx/Rx connected calls, Tx/Rx rejected calls, Tx/Rx cleared calls, call reference value
SVC Monitoring	Call statistics, UNI signalling, ATM layer, AAL-5, Signaling filters, UNI signaling errors, SSCOP errors, port, errors/alarms
OAM Support (Generate & Analyze)	1.610 OAM support: F4 AIS, F5 AIS, F4 RDI, F5 RDI, F4 loopback, F5 loopback, PM OAM support (generate PM OAM with test traffic, receive and analyze PM OAM, forward monitoring PM OAM, backward reporting PM OAM)
Cell Capture Support	Capture buffer size, capture filter-based on VPI/VCI, sending of captured data after optional modifica-tions by user
Number of Test Channels	240 Tx, 256 Rx

NIC *PLUS*
NETWORK INFORMATION COMPUTER

PHYSICAL CHARACTERISTICS

NIC *PLUS*

13.7"

13.0"

7.9"

GENERAL SPECIFICATIONS

Operating Temp: 0° to 40° C @ 85% RH

Storage Temp: -20° to 60° C @ 95% RH

Power Req: 100-120 and 200-240 VAC, 50-60 Hz

Dimensions: 13.7" H x 13.0" W x 7.9" D
(348 mm x 330 mm x 201 mm)

Weight: 14.5-25 pounds, depending on configuration

AUXILIARY INTERFACES

RS-232 Async: DB-9	2.5G Clock Out
Parallel Port: DB-25	BITS/SETS Clock: Bantam
USB	PCMCIA: Dual Slot: 2-Type II or 1-Type III
Input/Output Trigger: SMA	
10G Clock Out	10 BaseT: RJ-45
Orderwire: Handset jack (A-law)	DCC: RS-499, DB-15 pin

*Example configuration.

CONNECTOR PANEL*

OPEN FOR FUTURE EXPANSION

POWER

RX_10Gbps_TX CLOCK OUT

RX_2.5 Gbps_TX RX_155 Mbps_TX RX_52/155/622_TX Mbps RX_52 Mbps_TX ORDERWIRE DCC CLOCK OUT

IN OUT RX_E1/DS1_TX RX_E1/DS1_TX RX_E3/DS3_TX RX E4 TX
TRIGGER

IN OUT
USB 10BASET RS232 BITS/SETS PARALLEL PORT

ORDERING INFORMATION

Specifications are subject to change without notice.

NIC *PLUS*

The NIC *Plus* is available in over 35 different configurations. Example configurations include DS1 through OC-192, 64K through STM-64, and OC-192/STM-64 with OC-3/STM-1. For complete feature availability, ordering and pricing information, call your Digital Lightwave sales representative, toll free at 1.800.548.9283 or 727.442.6677, or visit our Web site at www.lightwave.com

Digital Lightwave serves the growing global fiber-optic networking industry with products and technology that monitor, maintain and facilitate the management of high-speed communication networks. The company's product families include Network Information Computers® (NICs®), the industry's leading high-speed portable analyzers for fiber-optic network installation and maintenance testing, and Network Access Agents™ (NAAs™), which provide network-integrated, centralized performance monitoring and analysis for optical networks, including remote multi-channel DWDM. Digital Lightwave also provides embedded optical diagnostic subsystems for OEM applications and custom automated test systems.

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Technology to reach inside the light ®

ISO 9001 CERTIFIED

NICPLUS-102C