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NIC PLUS™ NETWORK INFORMATION COMPUTER®

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.

The *NIC Plus* is the most compact and cost-effective DS0/64K through OC-192/STM-64—including ATM and POS—diagnostic platform on the market. An intuitive touch-sensitive GUI enables technicians of any experience level to effectively operate the *NIC Plus*, minimizing training costs. The *NIC Plus* is fully compatible with the entire *NIC* product line.

The *NIC Plus* can also be configured with 10 Gbps SONET/SDH optical quad receiver/transmit 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.

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)		AU-LOP, HP-RDI, HP-UNEQ
	Line code	NRZ	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 (per ITU-T 0.151)
	Mapping	<u>OC-192</u> : STS-48, STS-192c (per ANSI.T105.02) <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	APS Commands	Supports transmission/reception of linear & ring-mode command sequences for K1/K2 bytes (per G.841)
	Line Rate	Tx: N x 51.84 MHz, Rx: N x 51.84 MHz, ±50 Stratum III compliant, offset capability ±100 ppm	Pointer Control	New value, single adjustments (increment or decrement), burst 2-8 adjustments, increment-decrement, decrement-increment, NDF control, SPE offset, pointer sequences
	Input Signal Measurement	Optical power meter: 0 to -26 dBm, ±1.5 dB, Frequency meas. range: N x 51.84 MHz, ±200 ppm	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
	Synchronization	Internal, received SONET or SDH signal, BITS (1.544 Mbps), SETS (2.048 Mbps)	Intrusive / Non-intrusive Through Mode	Provides the ability to regenerate optical signal and optionally modify section and line overhead bytes
	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	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
	Level (Rx)	-7 dBm to -14 dBm, -20 typical min. at 10 ⁻¹⁰ BER with 2 ²³ -1 PRBS	Error Injection Rate	BIT: Single, 10 ⁻¹⁰ to 10 ⁻³ , user-programmable Other errors: Single, 10 ⁻¹⁰ to maximum, user-programmable
	Spectral Range (Rx)	1290-1600 nm	Switch to Protect Measurement	Measure on B1, SEF, OOF, AIS-L, MS-AIS, AIS-P, AU-AIS, and PRBS; 125 microsecond resolution
	Connectors	SC, FC-PC, ST	Round Trip Delay (RTD) Measurement	Measurement ranges: 125 microseconds resolution
	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,		

10G PACKET OVER SONET (POS) OPTION	No. of Ports/Modules	1		transmit protocol UDP, payload size, data rate - % bandwidth, pattern -32 bit user defined pattern or PRBS^31 or PRBS^31 inverted
	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)	Frame Length	Octet synchronous HDLC-like, framing (RFC1619 / 1662), variable from 40 bytes to 1.5 Kbytes
	Error Generation	FCS errors (CRC32), IP checksum and BIT errors	Maximum Packet Rate	1 flag between packets -> 29.22 million packets/sec @ 40 bytes
	Traffic Generation	Single signal traffic generators with configurable: source IP address (fixed), destination IP address (fixed), source port, destination port,	IP/UDP	Checksum
			PPP	LCP / IPCP / negotiation

10G OPTICAL QUAD RECEIVER OPTION	Line code	NRZ	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
	Mapping	<u>OC-192</u> : STS-192c (per G-253), <u>STM-64</u> : AU-4-64c (per ITU-T G.707)	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
	Input Signal Measurement	Optical power meter: 0 to -26 dBm, ±1.5 dB, Frequency measurement range: N x 51.84 MHz, ±200 ppm	APS Commands	Supports reception of linear & ring-mode command sequences for K1/K2 bytes per G.841
	Level (Rx)	0 dBm to -14 dBm, -15 typical min. at 10 ⁻¹⁰ BER with 2 ²³ -1 PRBS	Monitoring	Receive monitor: Transport OH: all bytes, path OH: all bytes
	Spectral Range (Rx)	1290-1600	Switch to Protect Measurement	Measure on B1, SEF, OOF, AIS-L, MS-AIS, AIS-P, AU-AIS, and PRBS; 125 microsecond resolution
	Level (Tx)	Utilizes OC-192/STM-64 module	Round Trip Delay (RTD) Measurement	Measurement ranges: 125 microseconds resolution
	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)			

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)		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)
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	Datacom Channel (DCC)	Tx and Rx: Any 8-bit value in any byte D1 to D12, PRBS 2 ⁻¹ normal or inverted on D1-D3, PRBS 2 ⁻¹ normal or inverted on D4-D12, DCC connector on D1-D3, DCC connector on D4-D12
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)	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
Framing	A1 and A2 bytes	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)
Line Rate	Tx: N x 51.84 MHz Stratum III-compliant; offset capability (OC-48/STM-16 only) ±100 ppm Rx: N x 51.84 MHz; offset capability ±50 ppm (OC-48/STM-16 only)	Patterns	2 ¹⁵ -1 PRBS, 2 ¹⁵ -1 PRBS inverted, 2 ²³ -1 PRBS*, 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)
Input Signal Measurement	Optical: Optical power meter: 0 to -26 dBm, ±1.5 dB; Electrical: Peak voltage range: +0.31 to +1.2 Vp; Frequency measurement range: N x 51.84 MHz ±50 ppm (STM-16/OC-48); N x 51.84 MHz ±100 ppm (up to STM-4)	APS Commands	Supports transmission and reception of linear and ring-mode command sequences - per G.841, (OC-48/STM-16 only)
Synchronization	Internal, received SONET/SDH signal, BITS (1.544 Mbps), SETS (2.048 Mbps)	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
Impedance	Electrical: 75 ohm +5% unbalanced	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
Automatic Configuration	Automatically configures test set to the incoming signal framing, line code, and pattern (per ITU-T G.707, G.703, 0.151)	Intrusive / Non-intrusive Through Mode	Provides the ability to regenerate optical signal and optionally modify section and line overhead bytes
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	Error Injection	B1, B2, REI-L, B3, REI-P, BIT, MS-REI, HP-REI, Line CV, Path FEBE, VT FEBE, pattern bit
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	Error Injection Rate	BIT: Single, 10 ⁻⁹ to 10 ⁻³ , user-programmable Other errors: Single, 10 ⁻⁹ to maximum, user-programmable
Level (Tx) Electrical	STS-1/STM-0e/1e: 1.03 Vp +10%	Switch to Protect Measurement	125 microseconds resolution (OC-48/STM-16 only)
Spectral Range	1290-1600 nm	Round Trip Delay (RTD) Measurement	Measurement ranges: 125 microseconds resolution (OC-48/STM-16 only)
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		

TECHNICAL SPECIFICATIONS

DS1/E1	Requirements	Meets the requirements of G.703 (E1)	Alarm Detection	<u>DS1</u> : OOF, pattern sync, LOS, AIS, Yellow, LOF, idle, clock, <u>E1</u> : AIS, LOF, LOS, pattern sync, yellow, RM-FAI, CASML
	Line code	<u>DS1</u> : AMI, B8ZS, <u>E1</u> : AMI, HDB3	Alarm Generation	<u>DS1</u> : AIS, yellow, idle, clock, LOS, LOF <u>E1</u> : AIS, LOF, RAI, RMRAI, CASMFL
	Framing	<u>DS1</u> : SF (D4), ESF, SLC 96, unframed; <u>E1</u> : PCM31, PCM31CRC, PCM30, PCM30CRC, unframed	Error Injection	<u>DS1</u> : BPV, BIT, frame, CRC, <u>E1</u> : BIT, frame, CRC, FEBE
	Line Rates	<u>DS1</u> : 1.544 MHz ±4.6 ppm (Tx), Stratum III-compliant, 1.544 MHz ±200 ppm (Rx) <u>E1</u> : 2.048 MHz (Tx), 2.048 MHz (Rx), offset capability ±100 ppm	Error Injection Rate	<u>DS1</u> : single, 10 ⁻⁷ to 10 ⁻³ , user-programmable <u>E1</u> : single, 10 ⁻⁷ to 10 ⁻³ , user-programmable
	Impedance	<u>DS1</u> : 100/120 ohm ±5% balanced <u>E1</u> : 75 ohm unbalanced, 100/120 ohm balanced	Patterns	<u>DS1</u> : 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 <u>Fractional T1</u> : QRSS, 2 ⁸ -1, 2 ⁹ -1, 2 ¹¹ -1 PRBS <u>E1</u> : 2 ⁸ -1, 2 ⁸ -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 <u>Fractional E1</u> : QRSS, 2 ⁸ -1, 2 ⁹ -1, 2 ¹¹ -1 PRBS
	Level (Tx)	<u>DS1</u> : 0 dBdsx ±1 dB, -7.5 dBdsx ±1 dB, -15 dBdsx ±1 dB <u>E1</u> : 0 dBdsx, -7.5 dBdsx, -15 dBdsx	Loop Codes Support	<u>DS0/64 Kbps</u> : DDS latching and non-latching <u>DS1</u> : 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 <u>E1</u> : payload, line, loop back
	Level (Rx)	<u>DS1</u> : Terminated: +6 to -26 dBdsx w/ EQ Monitor: 0 to -26 dBdsx w/ EQ Bridge: 1K ohm, 0 to -26 dBdsx w/ EQ <u>E1</u> : Terminated, 0-26 dBdsx w/ EQ Bridge: 1K ohm, 0 to -26 dBdsx w/ EQ	Loop Back	Line and payload loop back (manual)
	Connectors	<u>DS1</u> : Bantam; <u>E1</u> : BNC	DS0/64 Kbps Access	Contiguous/non-contiguous (Fractional T1), Transmit: Individual DS0/64 Kbps channels replaced with idle codes (0x7F) or AIS (0xFF); Receive: Monitor individual DS0/64 Kbps channel data, signaling bits, and VF drop to speaker
	Synchronization	<u>DS1</u> : Internal, received DS1 signal, BITS (1.544 Mbps); <u>E1</u> : Internal, received E1 signal, SETS (2.048 Mbps)	DS0/64 Kbps Signaling Monitor	AB (SF) and ABCD (ESF) all channels simultaneously
	Input Signal Measurement	<u>DS1</u> : Voltage range: ±0.1 Vp to ±7 Vp, Frequency measurement range: 1.544 MHz ±200 ppm; <u>E1</u> : Peak voltage range: +0.1 Vp to +7 Vp, Frequency measurement range: 2.048 MHz, ±200 ppm		
	Error Measurement	<u>DS1</u> : BPV, frame, CRC, BIT, excess 0's, <u>E1</u> : BIT, BPV, frame, CRC, FEBE (performance measurements per G.826, G.821, M.2100)		

DS3	Line code	B3ZS	Synchronization	Internal
	Mapping/Drop	DS1, E1 (up to 2)	Input Signal Measurement	Voltage range: ±0.31 Vp to ±1.2 Vp, Frequency measurement range: 44.736 MHz ±200 ppm
	Framing	M13, C-Bit parity, unframed	Error Measurement	BPV, BIT, frame, P-Parity, C-Parity, FEBE
	Line Rates	44.736 MHz ±12 ppm (Tx), 44.736 MHz ±200 ppm (Rx)	Alarm Detection	OOF, pattern sync, LOS, AIS, idle, X-Bit, yellow
	Impedance	75 ohm ±5% unbalanced	Alarm Generation	AIS, idle, yellow/X-Bit
	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	Error Injection	BPV, BIT, frame, P-Parity, C-Parity, FEBE
	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	Error Injection Rate	Single, 10 ⁻⁷ to 10 ⁻³ , user-programmable
Connectors	BNC	Patterns	2 ¹⁵ -1, 2 ²⁰ -1, 2 ²³ -1 PRBS*, 1100, 1010, all 1's, all 0's, 8-bit programmable, ATM (mapping)	
		FEAC Codes	Alarm/status codes, loopback codes	

E4	Requirements	Meets the requirements of G.703	Input Signal Measurement	Peak voltage range: ±0.3 Vp to ±7 Vp Frequency measurement range: 139.264 MHz ±200 ppm
	Line code	CMI	Frequency Offset Generation	±100 ppm in units of .1 ppm
	Mapping/Drop	E3, E1 (up to 2)	Error Measurement	Bit, frame, LCV (performance measurements per G.826, G.821, M.2100)
	Framing	Framed, unframed	Alarm Detection	LOS, LOF, pattern sync, AIS, RDI
	Line Rates	139.264 MHz ±20 ppm (Tx), -2 ppm/yr 139.264 MHz ±50 ppm (Rx)	Alarm Generation	LOS, LOF, AIS, RDI
	Impedance	75 ohm unbalanced	Error Injection	Bit, frame, LCV
	Level (Tx)	.5 vp ±.1vp	Error Injection Rate	Single, 10 ⁻⁷ to 10 ⁻³ , user-programmable
	Level (Rx)	Terminated: 160 m of RG-59, Monitor: -26 dBdsx	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)
	Connectors	BNC: 75 ohm unbalanced		
	Synchronization	Internal, recovered, BITS (1.544 Mbps), SETS (2.048 Mbps)		

TECHNICAL SPECIFICATIONS

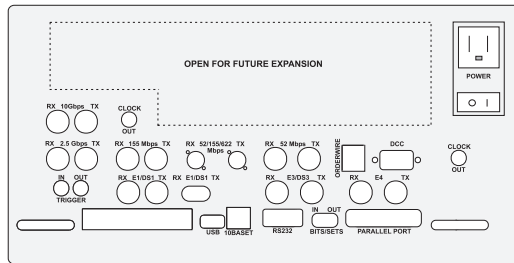
E3	Requirements	Meets the requirements of G.703	Frequency Offset Generation	±100 ppm in units of .1 ppm
	Line code	HDB3	Error Measurement	BPV, BIT, frame (performance measurements per G.821, G.826, M.2100)
	Mapping/Drop	DS1, E1 (up to 2)	Alarm Detection	LOS, LOF, pattern sync, AIS, RDI
	Framing	Framed, unframed	Alarm Generation	LOS, LOF, AIS, RDI
	Line Rates	34.368 MHz ±4.6 ppm (Tx), -2 ppm/yr 34.368 MHz ±50 ppm (Rx)	Error Injection	BPV, BIT, frame
	Impedance	100 ohm balanced, 75 ohm unbalanced	Error Injection Rate	Single, 10 ⁷ to 10 ⁻³ , user-programmable
	Level (Tx)	1.00 Vp ± .1 Vp	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)
	Level (Rx)	Terminated: 330 m of RG-59, Monitor: -26 dBds		
	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		

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)	Protocol Generation	AAL0 cell generation, AAL1/AAL5 protocol gen.
	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	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
	Adaptation Layers	AAL0, AAL1, AAL5	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)
	Header and Interface Support	Control of all cell header bits; UNI (3.0, 3.1, 4.0) and NNI support	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
	Channel Capacity	<u>Transmit</u> : 256 channels (independent AAL, service class, and bandwidth on all VCCs) <u>Receive</u> : 256 channels (cell count, bandwidth, AAL5 PDU counts and errors on all channels)	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)
	Test Traffic Generation	<u>VCC Channel Count</u> : Transmit foreground and background test channels <u>Traffic shaping</u> : 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 <u>Cell Generation</u> : 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; background VCC payload	Cell Payload Patterns	PRBS* 2 ¹⁵ -1, all 1's, 10101010, user-defined pattern
	Test Traffic Analysis	<u>VCC Channel Count</u> : Receive test channels: Bandwidth analysis, cell count/rate, CLP ratio, CLP indication, BERT analysis, 0.191 Rev0/Rev1 analysis, AAL1 analysis, AAL5 analysis <u>Cell Analysis / QoS</u> : 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	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
	Performance Analysis	CER, CLR, CMR, SECBR	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
	Protocol Analysis	<u>AAL0</u> : Cell count and bandwidth utilization, bit error count, pattern sync errors <u>AAL1</u> : AAL1 SAR PDU header SNP errors, lost cells, misinserted cells for AAL1 VCCs; cell count and bandwidth utilization, bit error count, pattern sync errors; <u>AAL5</u> : CPCS analysis, VCC simultaneous analysis, CRC, PDU length errors <u>Network Impairment</u> : Cell error generation, cell loss, cell misinsertion, CDV, cell reordering, test traffic insertion, VPI/VCI remapping, CLP tagging, CI setting, padding errors	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 modifications by user
			Number of Test Channels	240 Tx, 256 Rx

NIC PLUS NETWORK INFORMATION COMPUTER

PHYSICAL CHARACTERISTICS

NIC PLUS



CONNECTOR PANEL *

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

*Example configuration.

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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