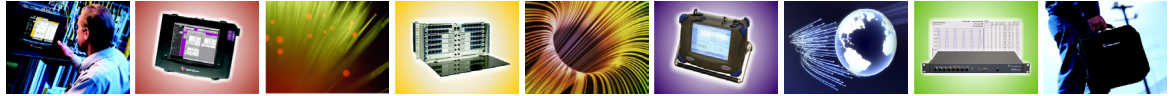




# Single Module for Advanced Telecom and Datacom Testing...



## MSA 2030 (Multi-Service Analyzer) Module for NIC Platform

SONET/SDH/OTN, NextGeneration and Ethernet Testing in the Industry's Most Flexible Module

### All these testing technologies in a single module:

- 10GigE
- GigE (2ports)
- 10/100/1000BaseT (2ports)
- SONET/SDH
- Simultaneous dual Ethernet testing + SONET/SDH/OTN
- OTN
- GFP
- VCAT
- LCAS



## The MSA 2030!

The MSA 2030 is available with SONET/SDH testing from 51Mbps up to 155Mbps, 622Mbps, 2.5Gbps or 10Gbps. Ethernet testing options available include 10/100/1000BaseT (dual ports), GigE (dual ports) and 10GigE LAN/WAN interfaces.

Additional license-based Test Options available for the MSA 2030 include OTN testing at 2.6 and 10.7Gbps, Generic Framing Procedure (GFP), Virtual Concatenation (VCAT), Link Capacity Adjustment Scheme (LCAS), 10GigE WAN, 10GigE over OTN and ODU-1 to ODU-2 multiplexing with additional capabilities available soon. Test Options can be added at the time of initial purchase or at a future time with only a license key.

### PLATFORMS



NIC®



NIC Plus®



NIC EP™

### KEY FEATURES

- 52M/155M/622M/2.5G/2.6G/10G/10.7G/11.049G/11.095G SONET/SDH/OTN interfaces plus 10/100/1000BaseT(dual port), GigE(dual port) and 10GigE Ethernet options
- Telecom and Datacom testing capability with one module\*
- Cost effective!: With "Test Options", order only the features you need today and add additional capabilities as required.
- GFP, VCAT and LCAS Test Options  
*(see separate NextGeneration datasheets for more information)*
- Flexible 10G Ethernet testing — 10G LAN (10.3G), 10G WAN (9.953G), 10G Ethernet FEC (11.049/11.095G)\*
- ODU-1 to ODU-2 Mapping\*
- Hot-swappable SFP/XFP optical transceiver modules
- Time saving!:. Run SONET/SDH/OTN plus two Ethernet tests at the same time with multiple/simultaneous testing
- Investment protection!:. Existing NIC products can be upgraded with MSA 2020 module

\* Requires the addition of Test Options. See Ordering Information section.

# MSA 2030 (Multi-Service Analyzer) Module for NIC Platform

SONET/SDH/OTN, NextGeneration and Ethernet Testing in the Industry's Most Flexible Module

## CONNECTOR PANEL LAYOUTS



## MSA 2030 GUI

M...	Chan	Seq #	Delay (ms)	Fr Delay	Ptr Delay	Operation
1	3	0	0.00000	0	0	
2	23	1	0.00000	0	0	
3	27	2	0.06242	0	391	
4	30	3	0.00000	0	0	
5	34	4	0.00000	0	0	
6	36	5	3.00000	24	0	
7	41	6	0.00000	0	0	
8	44	7	0.00000	0	0	
9	45	8	55.00000	440	0	
10	48	9	0.00000	0	0	
11	51	10	0.00000	0	0	
12	52	11	255.00000	2040	0	
13	56	12	0.00000	0	0	
14	59	13	0.00000	0	0	
15	61	14	0.12484	0	782	
16	64	15	0.00000	0	0	
Add						

## SPECIFICATIONS

NOTE: For Ethernet Packet Specifications, see NIC Ethernet Modules Technical Specifications Datasheet

### OPTICAL INTERFACES

Connector Type LC; Adapters available (e.g. LC to SC, ST or FC)

Modules All optical interfaces are hot-swappable modules:  
SFP for 51/155/622Mbps and 1/2.5/2.66 Gbps  
XFP for 10/10.7/11.049/11.095 Gbps (See Note 1)

Power Levels Typical specifications for SFP/XFP modules:

9.953/10.3/10.7/11.049/11.095 Gbps (1550nm Intermediate Range)  
Optical Level (Rx) -1 dBm to -14 dBm with a BER of 1e-12  
Optical Level (Tx) -1 dBm to +2 dBm  
Input Pwr. Meas. -1 dBm to -14 dBm, accuracy ±1.5 dB

9.953/10.3/10.7/11.049/11.095 Gbps (1310nm Intermediate Range)  
Optical Level (Rx) 0 dBm to -14 dBm with a BER of 1e-12  
Optical Level (Tx) -6 dBm to -1 dBm  
Input Pwr. Meas. -1 dBm to -14 dBm, accuracy ±1.5 dB

9.953/10.3/10.7/11.049/11.095 Gbps (850nm Intermediate Range)  
Optical Level (Rx) -1 dBm to -8 dBm with a BER of 1e-12  
Optical Level (Tx) -5 dBm to -1 dBm  
Input Pwr. Meas. -1 dBm to -8 dBm, accuracy ±1.5 dB

52/155/622 Mbps and 1/2.5 Gbps/2.66 Gbps (1310nm & 1550nm)  
Optical Level (Rx) -9 dBm to -27 dBm with a BER of 1e-10  
Optical Level (Tx) -2 dBm to +3 dBm  
Input Pwr. Meas. -9 dBm to -28 dBm, accuracy ±1.5 dB

52/155/622 Mbps and 1/2.5 Gbps/2.66 Gbps (850nm)  
Optical Level (Rx) 0 dBm to -14 dBm with a BER of 1e-10  
Optical Level (Tx) -2 dBm to +3 dBm  
Input Pwr. Meas. 0 dBm to -14 dBm, accuracy ±1.5 dB  
Line code Optical: NRZ, scrambled

### SONET/SDH ELECTRICAL INTERFACES

Connector Type 75-ohm BNCs – 51 Mbps and 155 Mbps

Line code EC-3(STS-3)/STM-1e: CMI  
EC-1(STS-1)/STM-0e: B3ZS

Electrical Level (Tx) 0.5 Vpk ±10%

Electrical Level (Rx) Terminate and monitor mode meet ITU-T G.772

### ETHERNET ELECTRICAL INTERFACES

Connector Type RJ-45

Data Rate 10 Mbps/100 Mbps/1 Gbps; Duplex Mode: Full or half duplex

Duplex Mode Full or half duplex

Note 1: 1, 10.7, 11.049, and 11.095 Gbps rates available only with the addition of Test Options; see "Ordering Information"

# MSA 2030 (Multi-Service Analyzer) Module for NIC Platform

SONET/SDH/OTN, NextGeneration and Ethernet Testing in the Industry's Most Flexible Module

## INTERFACE MISC. SPECIFICATIONS

Timing	Internal, external, recovered
Internal Clock	Stratum III compliant ( $\pm 4.6$ ppm)
External Clock	1.544/2.048 Mbps (BITS/SETS), 1.544/2.048 MHz via Bantam connector (balanced); 8KHz/1.544/2.048/10 MHz via 75-ohm TTC BNC (unbalanced)
Frequency Offset	Tx timing $\pm 100$ ppm, in 0.1 ppm increments
Interface Rates	<b>OC-192/STM-64:</b> 9.953 Gbps <b>OC-48/STM-16:</b> 2.488 Gbps <b>OC-12/STM-4:</b> 622.80 Mbps <b>EC-3/OC-3/STM-1/STM-1e:</b> 155.08 Mbps <b>EC-1/OC-1/STM-0/STM-0e:</b> 51.84 Mbps <b>OTU-2:</b> 10.71 Gbps (See Note 1) <b>OTU-1:</b> 2.66 Gbps (See Note 1)  <b>Ethernet:</b> 10/100 Mbps/1/1.25/9.953/10.3/11.049/11.095  <b>Unframed:</b> 10.71/9.953/2.66/2.488 Gbps, 622.80/155.08/51.84 Mbps
Input Freq. Meas.	$\pm 200$ ppm
<b>FUNCTIONS</b>	
NextGen Support (See Note 1)	<b>GFP:</b> Supports High-order SONET/SDH for Bulk Fill, Framed and Transparent GFP mappings  <b>For more information on GFP Test Option, see separate NextGeneration datasheets</b>
SONET Mapping (See Note 2)	<b>EC-1/3, OC-1/3/12/48/192:</b> STS-192c Bulk, STS-48c Bulk, STS-12c Bulk/ATM, STS-3c Bulk/ATM, STS-1 Bulk/ATM, VT-6 Bulk/ATM, VT-2 Bulk/ATM, VT-1.5 Bulk/ATM, Unframed Bulk, Dual DS3 (optional). <b>With PDH module:</b> E4 Bulk/ATM, DS3 Bulk/ATM, DS1#1 Bulk/ATM, DS1#2 Bulk/ATM, E1#1 Bulk/ATM, E1#2 Bulk/ATM
SDH Mapping (See Note 2)	<b>STM-0e/1e, STM-0/1/4/16/64:</b> AU-4-64c Bulk, AU-4-16c Bulk, AU-4-4c Bulk/ATM, AU-4/C-4 Bulk/ATM, AU-4/C-3 Bulk/ATM, AU-4/C-2 Bulk/ATM, AU-4/C-12 Bulk/ATM, AU-4/C-11 Bulk/ATM, AU-3/C-3 Bulk/ATM, AU-3/C-2 Bulk/ATM, AU-3/C-12 Bulk/ATM, AU-3/C-11 Bulk/ATM, Unframed Bulk. <b>With PDH module:</b> E4 Bulk/ATM, E3 Bulk/ATM, E1#1 Bulk/ATM, E1#2 Bulk/ATM, DS3 Bulk/ATM, DS1#1 Bulk/ATM, DS1#2 Bulk/ATM
OTN Mapping (See Note 1)	<b>OTU-1/OTU-2:</b> Unfr. BERT, Fr. BERT, Null Client, Sync SONET/SDH, Async SONET/SDH, 10G WAN (OTU-2), ODTU-12 feature enables mux/demux of 4 ODU-1 signals within ODU-2 on OTU-2 interface; OTU-2 supports GFP Framed and Bulk mappings, OTU-1 supports GFP Transparent, Framed and Bulk mappings
Ethernet Mapping (See Note 1)	1G LAN (1G), 10G LAN (10.3G), 10G WAN (9.953G), FEC (11.049/11.095G), 1GigE, 10/100/1000BaseT
Test Patterns	PRBS 9, PRBS 9 inverted, PRBS 11, PRBS 11 inverted, PRBS 15, PRBS 15 inverted, PRBS 20, PRBS 20 inverted, PRBS 23, PRBS 23 inverted, PRBS 31, PRBS 31 inverted, user-defined (32-bit), all 0's, all 1's
Automatic Protection Switching	Support for SONET/SDH transmission/reception of linear and ring-mode command sequences for K1/K2 bytes (per G.841); Measurement accuracy is one-frame duration; Results displayed in summary column format and decoded tabular format

Overhead Control	<b>Section/RS, Line/MS OH:</b> A1, A2, J0(Trace)/Z0/C1, D1-D12, E1, E2, F1, K1, K2, S1, M0/M1, Z1, Z2, E2; <b>Path/HP OH:</b> C2, F2, G1, H4, J1 (Trace), Z3/F3, Z4/K3, Z5/N1(TCM); <b>VT/LP OH:</b> V5, J2 (Trace), Z6/N2(TCM), Z7/K4
Overhead Monitor	<b>Section/RS, Line/MS OH:</b> all bytes; <b>Path/HP OH:</b> all bytes; <b>VT/LP OH:</b> all bytes
Pointer Control	<b>SONET STS/VT and SDH AU/TU:</b> Increment/decrement single, increment/decrement burst 2-8, new value with NDF, new value without NDF, Pointer sequences (per standards), Payload frequency offset $\pm 100$ ppm
Pointer Monitor	<b>SONET STS/VT and SDH AU/TU:</b> Positive Pointer Justification counts, Negative Pointer Justification counts, Pointer Justification seconds, NDF counts, Pointer value (decimal and hexadecimal formats)
Performance Monitoring	Calculates network performance with programable in accordance with international standards GR-253, T1.231, G.821, G.826, G.828, G.829, M.2100, M.2101, M.2110, M.2120 (with graphs)
Alarm Detection	<b>SONET:</b> LOS, Power Hot, Power Warm, Power Low, Frequency Wide, OPU Generic AIS, LOF, AIS-L, APS(K1/K2 Change), SEF, RDI-L, PATT SYNC, PLM-P, CONCAT, AIS-P, LOP-P, UNEQ-P, RDI-P, TIM-P, TIM-S, AIS-V, LOP-V, LOM-V, UNEQ-V, RDI-V, RFI-V, TIM-V, PLM-V, TC-RDI-P, TC-ODI-P, TC-AIS-P, TC-UNEQ-P, TC-LOF-P, TC-TIM-P, TC-RDI-V, TC-ODI-V, TC-AIS-V, TC-UNEQ-V, TC-LOF-V, TC-TIM-V, SS MISMATCH  <b>SDH:</b> LOS, Power Hot, Power Warm, Power Low, Frequency Wide, OPU Generic AIS, LOF, MS-AIS, APS(K1/K2 Change), OOF, MS-RDI, PATT SYNC, HP-PLM, CONCAT, AU-AIS, AU-LOP, HP-UNEQ, HP-RDI, HP-TIM, RS-TIM, TU-AIS, TU-LOP, TU-LOM, LP-UNEQ, LP-RDI, LP-RFI, LP-TIM, LP-PLM, HP-TC-RDI, HP-TC-ODI, HP-TC-AIS, HP-TC-UNEQ, HP-TC-LOF, HP-TC-TIM, LP-TC-RDI, LP-TC-ODI, LP-TC-AIS, LP-TC-UNEQ, LP-TC-LOF, LP-TC-TIM, SS MISMATCH  <b>G.709 OTN:</b> (See Note 1) LOS, Power Hot, Power Warm, Power Low, LOF, OOF, OOM, LOM, OTU:IAE, OTU:BDI, OTU:SAPI, OTU:DAPI, OTU: BIAE, ODU:AIS, ODU:OCI, ODU:LCK, ODU:BDI, ODU:SAPI, ODU:DAPI, TCM(1-6):BDI, TCM(1-6): SAPI, TCM(1-6):DAPI, TCM(1-6):BIAE, OPU:PLM
Error Detection	<b>SONET:</b> BPV/LCV, Frame (A1, A2), B1, B2, REI-L, B3, REI-P, BIP-V, REI-V, BIT, TC-IEC-P, TC-REI-P, TC-OEI-P, TC-BIP-V, TC-REI-V, TC-OEI-V, NDF-P, NDF-V  <b>SDH:</b> BPV/LCV, Frame (A1, A2), B1, B2, MS-REI, B3, HP-REI, LP-BIP, LP-REI, BIT, HP-TC-IEC, HP-TC-REI, HP-TC-OEI, LP-TC-BIP, LP-TC-REI, LP-TC-OEI, AU-NDF, TU-NDF  <b>G.709 OTN:</b> (See Note 1) Frame (OA1, OA2), MFAS, FEC errors, Uncorrectable FEC errors, OTU:BIP8, OTU:BEI, ODU:BIP8, ODU:BEI, BIT, TCM(1-6):BIP8, TCM(1-6):BEI
<b>Note 1:</b> Requires the addition of Test Options, see "Ordering Information" <b>Note 2:</b> Requires module configuration with ATM	

# MSA 2030 (Multi-Service Analyzer) Module for NIC Platform

SONET/SDH/OTN, NextGeneration and Ethernet Testing in the Industry's Most Flexible Module

## FUNCTIONS, CONTINUED

Alarm Generation	<b>SONET:</b> LOS, LOF, AIS-L, RDI-L, LOP-P, AIS-P, RDI-P, UNEQ-P, UNEQ-V, RDI-V, RFI-V, AIS-V, LOP-V, LOM-V, TC-RDI-P, TC-ODI-P, TC-AIS-P, TC-UNEQ-P, TC-LOF-P, TC-RDI-V, TC-ODI-V, TC-AIS-V, TC-UNEQ-V, TC-LOF-V <b>SDH:</b> LOS, LOF, MS-AIS, MS-RDI, AU-LOP, AU-AIS, HP-RDI, HP-UNEQ, LP-UNEQ, LP-RDI, LP-RFI, TU-AIS, TU-LOP, TU-LOM, HP-TC-RDI, HP-TC-ODI, HP-TC-AIS, HP-TC-UNEQ, HP-TC-LOF, LP-TC-RDI, LP-TC-ODI, LP-TC-AIS, LP-TC-UNEQ, LP-TC-LOF <b>G.709 OTN:</b> (See Note 1) LOS, LOF, OOF, LOM, OOM, OTU:AIS, OTU:IAE, OTU:BDI, ODU:AIS, ODU:OCI, ODU:LCK, ODU:BDI, TCM(1-6):BDI
Error Injection	<b>SONET:</b> B1, B2, REI-L, B3, REI-P, BIT, TC-IEC-P, TC-REI-P, TC-OEI-P, TC-BIP-V, TC-REI-V, TC-OEI-V <b>SDH:</b> B1, B2, MS-REI, B3, HP-REI, BIT, HP-TC-IEC, HP-TC-REI, HP-TC-OEI, LP-TC-BIP, LP-TC-REI, LP-TC-OEI <b>G.709 OTN:</b> (See Note 1) Frame (OA1, OA2), MFAS, FEC errors, Uncorrectable FEC errors, OTU:BIP8, OTU:BEI, ODU:BIP8, ODU:BEI, BIT, TCM(1-6):BIP8, TCM(1-6):BEI
Error Injection Rate	<b>BIT/Frame:</b> Single, $10^{-10}$ to $10^{-3}$ , user-programmable; <b>Other errors:</b> Single, $10^{-10}$ to maximum, user-programmable
Periodic Burst Rate	<b>G.709 OTN Errors:</b> FRAME, MFAS, OTU:BIP8, OTU:BEI, ODU:BIP8, ODU:BEI, TCM(1-6):BIP8, TCM(1-6):BEI; <b>G.709 OTN Alarms:</b> OTU:IAE, OTU:BDI, ODU:BDI, TCM(1-6):BDI; Burst Size: 0 to 65535 Frames, 0 to 3209.35ms; Burst Period: 0 to 1048575 Frames, 0 to 51350.39ms
Intrusive Through Mode	Provides the ability to regenerate optical signal and optionally modify Section and Line overhead bytes
Service Disruption/ Automatic Protection	Supported for all mappings; SONET measures on: LOS, LOF, B1, SEF, AIS-L, AIS-P, AIS-V, BIT errors;
Switching Measurement	resolution is 125 microseconds; SDH measures on: LOS, LOF, B1, OOF, AIS-L, AIS-P, AIS-V, BIT errors; resolution is 125 microseconds; G.709 OTN measures on: LOS, LOF, OOF, OTU:AIS, OTU:BIP8, ODU:AIS, ODU:BIP8, BIT errors; OTU-1 resolution is 49 microseconds; OTU-2 resolution is 12 microseconds; Simultaneous measurements for all supported processors displayed in convenient table format
Round-Trip Delay	Supported for OTN and SONET/SDH signals; SONET/SDH resolution is 125 microseconds; OTU-1 resolution is 49 microseconds; OTU-2 resolution is 12 microseconds
Tandem Connection Monitor	In accordance with G.707/Annex D for High Order Path (via N1), Errors/Alarms: TC-IEC, TC-REI, TC-OEI, TC-AIS, TC-UNEQ, TC-RDI, TC-ODI, TC-LOF, TC-API

Note 1: Requires the addition of Test Options, see "Ordering Information"

## ORDERING INFORMATION

### Base Modules:

MSA 2020 155M to 52M, 1310nm SFP standard - **N51**(no ATM), **N52**(w/ATM)  
MSA 2020 622M to 52M, 1310nm SFP standard - **N61**(no ATM), **N62**(w/ATM)  
MSA 2020 2.5G to 52M, no ATM - **N71**(1310 SFP), **N71b**(1550 SFP)  
MSA 2020 2.5G to 52M, with ATM - **N72**(1310 SFP), **N72b**(1550 SFP)  
MSA 2020 2.5G to 52M, for use with Jitter Module - **N78**(no ATM), **N79**(w/ATM)  
MSA 2020 2.5G only - **N73**(1310 SFP), **N73b**(1550 SFP)  
MSA 2020 10G to 52M, no ATM, including SFP/XFP as indicated  
- **N81**(1310/1310), **N81b**(1310/1550), **N81c**(1550/1550)  
MSA 2020 10G to 52M, w/ATM, 10G to 52M, no ATM, with indicated SFP/XFP  
- **N82**(1310/1310), **N82b**(1310/1550), **N82c**(1550/1550)  
MSA 2020 10G to 52M, for use with Jitter Module - **N88**(no ATM), **N89**(w/ATM)  
MSA 2020 10G only - **N84**(1310 XFP), **N44b**(1550 XFP)

### Test Options\*:

OTU-1 (2.66G) test option  
OTU-2 (10.7G) test option  
Generic Framing Procedure (bulk/framed) test option  
Generic Framing Procedure-Transparent test option  
Virtual Concatenation (VCAT)  
Link Capacity Adjustment Scheme (LCAS)  
1G Ethernet (1G) test option (enables 10/100/1000 on N41e)  
10G Ethernet FEC (11.049/11.095G) test option  
10G Ethernet LAN (10.3G) test option  
10G Ethernet WAN (9.9953G) test option  
ODU-1 to ODU-2 Mapping test option  
GFP over OTN Mapping test option

For GigE(dual port) and 10/100/1000BaseT(dual port) select Ethernet Test Option at:

•850nm	•1310nm	•1550nm
•850/1310nm	•850/1310nm	•1310/1550nm
•Electical only		

\*Test Options can be included with initial purchase of NGMR module or can be added in the future by secure license key

For more information or a sales quote, contact any Digital Lightwave location or email [dlisales@lightwave.com](mailto:dlisales@lightwave.com)



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