

 **Digital
Lightwave®**
Technology to reach inside the cloud®

Product Brochure

MPA®

Multi-Protocol Analyzer



Simultaneous Independent Multi-Port Testing

✓ Multi-Port ✓ Multi-Protocol ✓ Multi-User



Who needs an MPA[®]

Carriers & Service Providers

Embedded Network Monitoring
Equipment Verification Labs
Service Assurance

Network Equipment Manufacturers

Hardware & Software Verification
Manufacturing & Production
Automated Testing Environments

Enterprise

Data Centers
Network Testing and Monitoring
Storage Area Networks

Benefits

- **No Testing Restrictions** - Each port independently supports any rate and protocol
- **Save Valuable Time** - Simplified workflow and automated testing creation/maintenance
- **Flexible & Expandable Equipment** - Field upgradable, additional test ports and modules can be added to meet your changing requirements
- **Reduce Rack Space & Power** - The low power, compact form factor significantly reduces the amount of rack space
- **Eliminates Truck Rolls** - Convenient remote management and operation

Key Highlights

- Intuitive interface with a simple, consistent setup and workflow across all test modules
- Compact form factor system (1U x 19 in chassis)
- Low 400W max power dissipation, AC or -48VDC
- Field upgradable, rack-mounted platform with up to 5 x Test Modules
- All ports can be configured independently and operated simultaneously
- One single platform for multi-protocol testing requirements which will grow as needs change and expand, allowing modules to be easily added on-site and new capabilities to be downloaded

Every test feature accessible by remote GUI and automation scripting!

| | | | CFP4 | QSFP28 | QSFP+ | SFP/SFP+ | Electrical SFP |
|-----------|---------------|--------------------------------------|------|--------|-------|----------|----------------|
| Transport | Transport | OTU4 | ✓ | ✓ | | | |
| | | OTU3, OTU3e1/e2 | | | ✓ | | |
| | | OTU2, OTU1, OTU2e/1e, OTU2f/1f | | | | ✓ | |
| | | OC-768-STM256/STL-256.4 | | | ✓ | | |
| | | OC-192/STM-64 - OC1/STM-0 | | | | ✓ | |
| Packet | Ethernet | 100GbE | ✓ | ✓ | | | |
| | | 100GbE RS-FEC | ✓ | ✓ | | | |
| | | 40GbE | | | ✓ | | |
| | | 10GbE LAN/WAN, 2.5GbE, 1GbE, 100Mbps | | | | ✓ | |
| | | 10/100/1000BASE-T | | | | | ✓ |
| | Fibre Channel | 1/2/4/8/10 Gbps | | | | ✓ | |

What can the MPA[®] do for you?

✓ Secure

- Built on Linux OS for maximum security. System can be managed like a server!
- 24/7 uninterrupted testing - the MPA operates independently of an active remote graphical user interface or scripting session.
- Define specific users and permissions for secure access



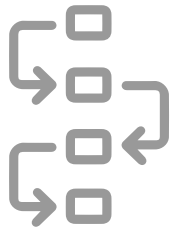
✓ Comprehensive Results

- Detailed instrument setting and result reports with user defined comments/image fields & screen captures, supports both PDF and text formats
- LED, summary, timestamped event logs, and graphical results for easy analysis
- Per port continuous and user defined test durations
- Synchronize MPA results with network equipment under test using system NTP



✓ Simplified Remote and Workflow

- All Test Status feature provides a top level view of all active tests
- Customizable tab view allows users to label the test port
- User defined status messages convey the current state of each test port
- Communicate between users with built-in messaging
- Multiple users can simultaneously view an active test port facilitating training and supervision
- Easy to use and maintain Remote Graphical user interface, automatically updates to the current MPA version eliminating manual updates.
- Built-in help



Centralized Network Monitoring and Asset Management

Network Impairment Observer

- Provides a snapshot of network health in real time
- Monitor the status of multiple MPAs simultaneously
- Allows correlation of network events
- View detailed reports of errors and alarms
- User-adjustable reporting thresholds
- Enables faster troubleshooting
- Reduces downtime
- Reduce the cost of network maintenance
- Operates on a standard PC or laptop, *dedicated server hardware not required*



Advanced Test Modules

License-based Test Options to cost-effectively meet today's requirements allowing features to be added as required

MPM-100G™

40G/100G Multi-Protocol Module™

| | CFP4 | QSFP28 | QSFP+ |
|--------------------------|------|--------|-------|
| 100GbE | ✓ | ✓ | |
| 100GbE RS-FEC | ✓ | ✓ | |
| OTU4 | ✓ | ✓ | |
| 40GbE | | | ✓ |
| OTU3, OTU3e2/e1 | | | ✓ |
| OC-768/STM-256/STL-256.4 | | | ✓ |

Supports multiple wavelength and range transceivers

- ✓ **Native support for CFP4, QSFP28, & QSFP+ Transceivers**
- ✓ **Field Transceiver Verification**
 - Qualify modules before deployment with the Module Health Check
- ✓ **Lab Transceiver Verification**
 - Complete CFP4 MDIO and QSFP28/QSFP+ I2C access with read/write capability
 - CFP4 and QSFP28/QSFP+ hardware control pin read/write access
 - Physical layer testing including multi-lane unframed BERT

Ethernet/IP

- 40/100G Ethernet
- 100G Ethernet IEEE 802.3bj RS-FEC with FEC stress test
- PCS layer generation and analysis
- Supports 32 independent IPv4/IPv6 test stream flows with up to 4 levels of VLAN/MPLS
- RFC2544 & Y.1564
- BER, throughput, latency, jitter, & service disruption measurements

OTN

- OTU4 OTL4.4
- OTU3 OTL3.4, OTU3e1, OTU3e2
- OTL layer generation and analysis
- Ethernet, SONET/SDH, & PRBS clients
- Service disruption and delay measurements

SONET/SDH

- STL256.4 40G SONET/SDH
- Pointer and APS generation and analysis
- Service disruption and delay measurements

Advanced Test Modules (cont.)

MPM-10G[™]

10G Multi-Protocol Module[™]

| | SFP/SFP+ | Electrical SFP |
|---|----------|----------------|
| OTU2, OTU1, OTU2e/1e, OTU2f/1f | ✓ | |
| 10GbE LAN/WAN, 2.5GbE, 1GbE, 100Mbps Ethernet | ✓ | |
| 1/2/4/8/10 Gbps Fibre Channel | ✓ | |
| OC-192/STM-64 - OC-1/STM-0 | ✓ | |
| 10/100/1000 BASE-T | | ✓ |

Supports multiple wavelength and range transceivers

- ✓ **Dual Port SFP/SFP+ Multi-Rate & Multi-Protocol Module up to 12.1G**
- ✓ **Both Ports can be configured independently and operated simultaneously**
- ✓ **Physical layer testing including unframed BERT**

Ethernet/IP

- 10G LAN/WAN, 2500BASE-X, 1G, 100M, & 10/100/1000BASE-T
- Supports 32 independent IPv4/IPv6 test stream flows with up to 4 levels of VLAN/MPLS
- RFC2544 & Y.1564
- BER, throughput, latency, jitter, & service disruption measurements
- Compliant with G.fast ID-337 FAST Certification Test Plan

OTN

- OTU2/2e/1e/2f/1f & OTU1 with G.709 FEC stress test
- Supports single and multistage ODU multiplexing with dual channel ODU1/ODU0; ODUflex
- Ethernet, GFP, Fibre Channel, SONET/SDH, and PRBS clients
- Service disruption and delay measurements

SONET/SDH

- SONET OC1/3/12/48/192 & SDH STM0/1/4/16/64
- All Path Testing – multi-channel generation, analysis, & service disruption measurements
- Pointer and APS generation and analysis
- Delay measurements

Fibre Channel

- 1/2/4/8/10G
- Switch Fabric and Name Server login
- Buffer to Buffer Credit analysis
- Latency and service disruption measurements

CPRI

- Unframed BER testing at 614.4M, 1.2288G, 2.4576G, 3.072G, 4.9152G, 6.144G, 9.8304G, 10.1376G, 12.16512G rates

MPM-100G™ 40G/100G Multi-Protocol Module

Native support for CFP4, QSFP28, & QSFP+ transceivers

Common features

- Module health check – simple pass/fail test for BER, skew, optical power, line frequency and optical power measurements
- Complete CFP4 MDIO and QSFP28/QSFP+ I2C access with read/write capability and formal display of commonly used fields
- Module hardware control pin read/write access
- Per lane User controllable swing and pre/post emphasis signal conditioning settings to stress transceiver interfaces
- Internal Stratium 3, recovered, chassis BITS/SETS & 1.544/2.048MHz transmit clock reference clock options
- Line frequency offset generation +/-120ppm, received line frequency analysis
- Per lane optical power level monitoring
- User defined pass/fail thresholds for optical power and line frequency
- Multi-lane Unframed BERT testing available for all rates
- Clock out: 1/80th 100G rates, 1/32nd 40G rates, 50 Ohm SMA

Ethernet/IP Testing

Multi-rate Ethernet from 41G & 103G

- 100GbE (103.125 Gbps)
- 100GbE RS-FEC with correctable and uncorrectable FEC error generation/analysis and stress test
- 40GbE (41.25 Gbps)
- PCS layer generation and analysis with errors, alarms, skew, and logical lane swapping/reordering
- 32 independent IPv4/IPv6 test stream flows with selectable PRBS payload pattern
- MAC/IP/UDP addressing
- Up to 4 levels of VLAN/MPLS tags
- Frame sizes 60 – 16K bytes
- Constant, burst and ramp traffic generation options
- Y.1564 Service Configuration and Performance tests
- RFC 2544 Throughput/Latency/Frame Loss/Back to Back Burst tests with graphical results
- Traffic/IP Reflection Modes with MAC and IP Source and Destination Address swapping, Thru Mode
- Per-port results include: packet counts/rates, byte count/rates, packet utilization statistics, VLAN QOS, MPLS, and packet size distribution
- Per-stream results include: packet counts/rates, byte count/rates, frame loss, Latency and jitter statistics
- Per test stream user defined Pass/Fail statistic thresholds

- Results filtering by VLAN TPID
- Flow control support with Pause frame generation and analysis
- Error/alarm generation and analysis
- Service Disruption Measurement

OTN Testing

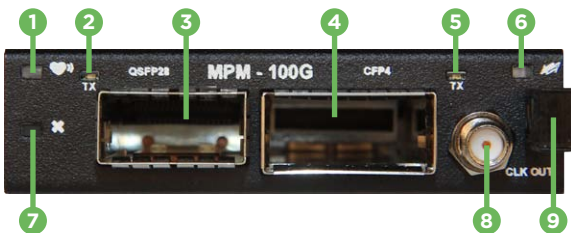
Multi-rate G.709 OTN rates from 43Gbps up to 111.8Gbps with G.709 FEC generation/analysis

- OTU4 (111.809 Gbps) OTL4.4
- OTU3 (43.018 Gbps) OTL3.4
- OTU3e1 (44.571 Gbps) & OTU3e2 (44.583 Gbps)
- OTL layer generation and analysis with alarms, skew, and logical lane swapping/reordering
- OTU4 ODU4 100GbE, PRBS, and Null clients
- OTU3 ODU3 40GbE, OC768/STM256 Sync/Async, PRBS, and Null clients
- GMP layer stressing and analysis with payload offset, error/alarm generation & monitoring and statistic counts
- OTU/ODU/OPU OTN overhead manipulation and analysis with byte capture, including trace and MSI bytes
- Intrusive and Non-Intrusive Pass Thru mode with byte and error/alarm overwrite
- OTU/ODU/OPU Error & alarm generation and analysis with single, rate and periodic burst insert options
- Service Disruption and Round Trip Delay measurements

SONET/SDH Testing

40G SONET/SDH rate testing

- STL256.4 OC-768/STM-256 (39.813 Gbps)
- Multi-lane generation and analysis with alarms, skew, and logical lane swapping/reordering
- SONET mappings: STS-768c, STS-192c, STS-48c, STS-12c, STS-3c, and STS-1 with PRBS client
- SDH mappings: AU-4-256c, AU4-64c, AU-4-16c, AU-4-4c, AU4/C-4, and AU3/C-3 with PRBS client
- Complete SONET/SDH overhead and trace manipulation/analysis with byte capture
- Intrusive and Non-Intrusive Pass Thru mode with byte and error/alarm overwrite
- Service Disruption, Round Trip Delay measurements, and APS Testing
- Performance Monitoring statistics, ITU G.821, G.826, G.828, G.829, M.2100, M.2101, M.2110, M.2120, ANSI T1.105, T1.231, & GR-253



- | | |
|----------------------------------|--------------------------|
| 1 Module Out-of-Service LED | 6 Module Hot Swap LED |
| 2 QSFP28 Port Activity Indicator | 7 Module Health LED |
| 3 QSFP28 Port | 8 Eye Clock Out |
| 4 CFP4 Port | 9 Module Hot Swap Handle |
| 5 CFP4 Port Activity Indicator | |

MPM-10G™ 10G Multi-Protocol Module

Dual port operation - SFP/SFP+ transceivers

Common features (for most interface rates)

- Internal Stratum 3, recovered, chassis BITS/SETS & 1.544/2.048MHz transmit clock reference clock options
- Line frequency offset generation +/-100ppm, received line frequency analysis
- Receive optical power level monitoring
- User defined pass/fail thresholds for optical power and line frequency
- Unframed BERT testing

Ethernet/IP Testing

Ethernet rates up to 11.1G

- 10GbE LAN, 10GbE WAN, 2500BASE-X, 1GbE, & 100M Optical; 10/100/1000BASE-T
- OTU2e/OTU1e
- MAC/IP/UDP addressing
- Up to 4 levels of VLAN/MPLS tags
- Frame sizes 60 - 16K bytes, G.fast ITU ID-337 EMIX frame size/ratio distribution
- Constant, burst and ramp traffic generation options
- Y.1564 Service Configuration and Performance tests
- RFC 2544 Throughput/Latency/Frame Loss/Back to Back Burst tests with graphical results
- Traffic/IP Reflection Modes with MAC and IP Source and Destination Address swapping, Thru Mode
- Per-port results include: packet counts/rates, byte count/rates, packet utilization statistics, VLAN QOS, MPLS, and packet size distribution
- Per-stream results include: packet counts/rates, byte count/rates, frame loss, Latency and jitter statistics
- Per test stream user defined Pass/Fail statistic thresholds
- Results filtering by VLAN TPID
- Flow control support with Pause frame generation and analysis
- Error/alarm generation and analysis
- Service Disruption Measurement
- Compliant with G.fast ITU ID-337 FAST Certification Test Plan

OTN Testing

G.709 OTN rates up to 11.3G with FEC generation and analysis including FEC stress test

- OTU2f/OTU1f, OTU2e/OTU1e, OTU2 and OTU1
- Single and multi-state multiplexing
- Dual ODU1/ODU0 PRBS client testing with service disruption and independent error/alarm generation
- OTU2 ODU2, ODU02, ODTU012, ODUflex & OTU1 ODU1, ODU01 structures, PT20/PT21
- OPU/client justification offset generation and analysis at all layers
- GFP-T/GFP-F/Ethernet, Fibre Channel, SONET/SDH Sync/Async, PRBS and Null clients
- Full payload rate GFP-f, ITU G.Sup43 7.3
- ODUflex with GFP, 4/8G Fibre Channel, and PRBS clients

- ODU0 with 1000BASE-X, STM1/4, STS3/STS1, and PRBS clients
- Complete OTN overhead manipulation and analysis with byte capture, including trace and MSI bytes
- Intrusive and Non-Intrusive Pass Thru mode with byte and error/alarm overwrite
- OTU/ODU/OPU Error & alarm generation and analysis with single, rate and periodic burst insert options
- Service Disruption and Round Trip delay measurements at any ODTU level per G.709

SONET/SDH Testing

SONET/SDH rates up to 10G

- STM-64/STM-16/STM-4/STM-1/STM-0; OC-192/OC-48/OC-12/OC-3/OC-1
- SONET mappings: STS-192c, STS-48c, STS-12c, STS-3c, STS-1, VT-6, VT-2 and VT-1.5
- SDH mappings: AU-4-64c, AU-4-16c, AU-4-4c, AU-4/C-4 and AU-4/AU-3 C-3/C-2/C-12/C-11
- All Path Testing™ - simultaneous testing of all HP/STS containers/SPEs with service disruption
- PRBS and GFP-T/GFP-F/Ethernet clients
- Complete SONET/SDH overhead and trace manipulation/analysis with byte capture
- Intrusive and Non-Intrusive Pass Thru mode with byte and error/alarm overwrite
- Service Disruption, Round Trip Delay measurements and APS testing
- Performance monitoring statistics
- Performance Monitoring statistics, ITU G.821, G.826, G.828, G.829, M.2100, M.2101, M.2110, M.2120, ANSI T1.105, T1.231, & GR-253

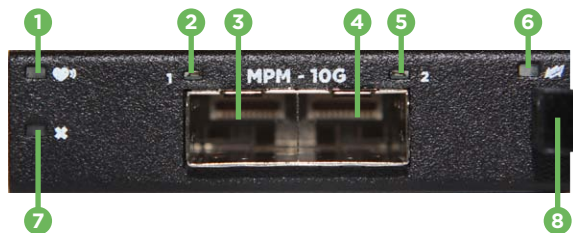
Fibre Channel Testing

Fibre Channel rates up to 11.3G

- 1/2/4/8/10G & OTU1f/OTU2f
- Class 3 Service
- Switch Fabric and Name Server login
- Test stream with user defined addressing, frame parameters, frame size, pattern and rate
- Error and alarm generation and analysis
- RFC 2544 like Throughput/Latency/Frame Loss/Performance test
- Buffer-to-buffer credit / flow control analysis
- Per-port results include: frame counts/rates, byte count/rates, & port utilization
- Per-stream results include: frame counts/rates, byte count/rates, port utilization, and latency statistics
- Per test stream user defined Pass/Fail statistic thresholds
- Service Disruption measurement for OTU1f/OTU2f and 10G

CPRI

- Unframed BER testing at 614.4M, 1.2288G, 2.4576G, 3.072G, 4.9152G, 6.144G, 9.8304G, 10.1376G, 12.16512G rates



- | | |
|-----------------------------|-----------------------------|
| 1 Module Out-of-Service LED | 5 Port 2 Activity Indicator |
| 2 Port 1 Activity Indicator | 6 Module Hot Swap LED |
| 3 SFP/SFP+ Port 1 | 7 Module Health LED |
| 4 SFP/SFP+ Port 2 | 8 Module Hot Swap Handle |

Front IO



- 1 Chassis Ground
- 2 Ethernet/LAN Management Port
- 3 External Clock Input/Output
- 4 Craft Port
- 5 Test Module Slot
- 6 Cooling Unit
- 7 Air Filter
- 8 DisplayPort
- 9 USB Port

Rear IO



- 1 Chassis Ground
- 2 Chassis On/Off Switch
- 3 Fuse
- 4 AC Power Input



- 1 Chassis Ground
- 2 Fuse
- 3 DC Power Input

MPA[®] Platform Specifications

| | | | | | |
|----------------------------|--|---|--|---|---|
| Hardware Platform | <ul style="list-style-type: none"> • Compliant to PICMG μTCA Base specification • Shielded steel case with 19" rack mounting brackets • Intelligent Platform Management Interface (IPMI) | Product Provides <ul style="list-style-type: none"> • 5x Advanced Mezzanine Card (AMC) single mid-size slots for plug-in test modules • 1x μTCA Carrier Hub slot (single full-size) • Active cooling • Hot-swappable cooling unit | μTCA Carrier Hub (MCH) <ul style="list-style-type: none"> • Serial Craft Interface over USB • Module and System • Status LEDs • Chassis synchronization includes BITS/SETS & 2.048MHz Input, BITS/SETS & 1.544/2.048MHz Output, RJ-48 Interface, \approx -30dBdsx receive level • (1x) 10/100/1000 BASE-T port | μProcessor <ul style="list-style-type: none"> • Quad Core i7 • (2x) 10/100/1000 • BASE-T ports • Status LEDs • Display port • Linux Operating System • Onboard SSD | Other Features <ul style="list-style-type: none"> • Simultaneous and independent operation of each module and port • μTCA architecture • Side to side cooling • Built-in mounting options |
| Power Supply | <ul style="list-style-type: none"> • Input voltage nominal 90-264 VAC, 50-60 Hz or optional -48VDC • Power Dissipation 400 W max. | | | | |
| Physical Dimensions | <ul style="list-style-type: none"> • Height 43.60 mm (1.72 in) (1U) • Width (with brackets) 482.60 mm (19.0 in) • Depth 301 mm (11.85 in) | | | | |
| Weight | <ul style="list-style-type: none"> • 5.9 kg (13 lbs) completely assembled with 5 test modules, MCH, and μProcessor | | | | |
| Environmental | <ul style="list-style-type: none"> • Operating Temperature 0°C to +40°C • Storage Temperature -40° C to +85° C • Humidity +5% to +95%, non-condensing | | | | |
| EMI | <ul style="list-style-type: none"> • Conducted Emissions EN 61326-1 Class A • Radiated Emissions EN 61326-1 Class A | | | | |

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