Spirent **fX2 100GbE Module**

High Performance & Scalability for High-Speed Ethernet Test

The Spirent fX2 100GbE Ethernet test module with Cloud Core processing enables performance and scalability testing of high-speed Ethernet networks. Targeting testing of high-density multi-terabit routers and high-speed Ethernet cloud infrastructure, the fX2 ensures dataplane QoS performance over realistic routing and cloud infrastructure topologies. With four 100GbE CFP2 ports per module, the fX2 100GbE delivers the most comprehensive set of features and performance at a very competitive price.

Solution overview

The Spirent fX2 100GbE test module delivers a high-density solution with the lowest total cost of ownership. It supports CFP2 optical modules which use a smaller form factor, use less power, and cost significantly less than CFP optics. The module also supports smart power control and fast boot to reduce test time and eliminate wasted power.

The Spirent fX2 100GbE Ethernet modules are available in a 4-port 100GbE CFP2 configuration. With the combination of Cloud Core processing and the deep real-time analysis that Spirent is known for, these modules deliver on realistic testing of complex multiprotocol topologies. Spirent also offers other CFP2 modules to address different levels of emulation performance requirements.

The fX2 offers the ONLY industry module supporting four form factors in the same module, CFP2, CFP4, QSFP28 and CPAK using optional adapters listed in ordering information section. The modules also support RS-FEC, Auto-Negotiation and associated PMD's such as SR10,CR4, SR4, LR4, Active Optical Cables and various Direct Access Copper cable lengths for the supported form factors CFP2, CFP4 and QSFP28.

Applications

- **High Scale Terabit Routers**—100GbE Ethernet core routers with multi-protocol topologies and line rate traffic

- **Data Center Fabrics**—Validate the forwarding performance and functional capabilities of ultra high-scale, high-density next-generation multi-terabit cloud data center fabrics

- **Enterprise Switches**—Validate forwarding performance and functional capabilities of large, next-generation enterprise campus and data center switches with ultra low-latency, high port density and FCoE capabilities

Features & Benefits

Testing 100 GbE Ethernet-enabled routers or data center switches requires a tester that can emulate multiple layers of network protocols and scale to perform real-time cause/effect analysis on millions of statistics while putting the system through realistic scenarios, such as fail-overs. The Spirent fX2 100 GbE module's Cloud Core processing and real-time cause/ effect analysis enables testing terabit networks and devices. Cloud Core is based on several patent-pending technologies designed to add elastic computing to the Spirent Layer 1-7 performance software platform. Cloud Core optimizes testing tasks across parallel processes, pooling processes across multiple processor cores and threads. Test beds built on Cloud Core provide an exceptional combination of scalable performance and realism and are ideal for testing the most complex converged IP systems, such as cloud data centers and high-performance core networks.

- Spirent Cloud Core combined with Intel® Inside maximizes performance and scale of emulated topologies and stateful application traffic

- Available test packages and integrated configuration wizards simplify and accelerate configuration of data center, mobile backhaul, routing, access and application test cases

Productivity

- Intelligent Results™

- When creating test beds at the scale that Spirent fX 2100 GbE can achieve, the amount of data that is produced is astronomical. An advanced, and highly efficient distributed database processes billions of real-time results to validate tests and identify problems, giving engineers the immediate feedback they need to debug problems and accelerate development

- Delivers more results with tight correlation, and more information to find those obscure bugs. With more coverage and more information, Spirent answers questions faster and in a single test run where multiple runs are necessary with other test tools

- Interesting streams uses real-time results data mining to dynamically filter through mountains of data and display the results that matter

- Powerful automation with Command Sequencer (Visual Programming) and GUI to Script empowers the test operator to:

  - Construct sophisticated, stressful, automated test cases without programming experience

  - Combine numerous individual test cases into a single run to save regression test time

  - Develop a catalog of broad automated test cases in a fraction of the time

  - Export automated test cases to run from a command line for headless test execution that can be integrated with any automated regression system

Technical Specifications	
Spirent 100 GbE test modules	
Optical Transceiver	CFP2 MSA Optical
Operational Modes	100GbE
Timing	• Common tx clock synchronized to chassis-based source, adjustable by ±100 ppm; optionally synchronized to GPS or CDMA timing source for inter-chassis synchronization
	• Highly accurate module timestamp for clock synchronized to chassis; inter-chassis timestamp clock synchronized via direct cable, GPS, or CDMA timing source
	• 1588v2
Port CPU	Stackable multi-core CPU
User Reservation	100GbE per port
User Interface	Windows-based GUI and Tcl API
Max Ports per Chassis	48 100GbE ports SPT-N11U, eight 100GbE ports SPT-N4U
Layer 1	
Layer 1 Features	1 MDI0 register access with CFP2 optics Adjustable PPM, internal or external clock
Layer 2/3 generator and analyzer	
Number of Streams	16383 transmit and 16383 trackable receive streams; stream fields can be varied to create billions of flows
Frame Transmit Modes	Port based (rate per port), stream based (rate per stream), burst, timed
Min/Max Frame Size (w/CRC)	60 to 8192 (Data plane)
Min/Max Tx Rates	5 packet per seconds to 101% of line rate

Technical Specifications (continued)	
Layer 2/3 generator and analyzer (continued)	
Real-Time Tx Stream Adjustments	Change rate and frame length settings without stopping the generator or analyzer for truly interactive, cause and effect analysis
Advanced Per-Stream Statistics Available in Real-Time	Over 40 measurements tracked in real-time for each received stream including: • Advanced sequencing: In-order, lost, reordered, late and duplicate • Latency: Avg, min, max and short-term avg; first/last frame arrival timestamp • Latency modes: LILO (forwarding delay per RFC 4689), LIFO (store and forward devices per RFC 1242) and FIFO (bit forwarding devices per RFC 1242) • Data integrity: IP checksum, TCP/UDP checksum, frame CRC, embedded CRC and PRBS bit errors
Measurement Timestamp Resolution	2.5ns generator/analyzer
Supported Encapsulations	• Layer 2: 802.3, Ethernet II, 802.1Q, 802.1ad, 802.1ah, 802.1Qay, FCoE, PPP • Layer 3/4: IPv4, IPv6, TDP, LDP • Tunneled: GRE, L2TP, MPLS, PWE3
Advanced Per-Stream Statistics Available in Real-Time	Identify, display and filter by: Transmit stream ID, IPv4/v6 SA/DA, MAC SA/DA, IP TOS/DiffServ, TCP/UDP port, VLAN ID, VLAN priority, MPLS label, MPLS exp plus more
Capture Triggers/Filters	Oversize, jumbo, undersize, CRC error, checksum error, sequence number error, PRBS bit error • Trigger, oversize, jumbo, undersize, CRC error, checksum error, sequence number error, PRBS error
Capture Memory	1MB
Layer 4-7 applications and security	
IP Version Supported	
Encapsulation Protocols	802.1Q and 802.1 Q-in-Q
Transport Protocols	TCP, UDP
Data Protocols	HTTP, SIP and FTP, Unicast/Multicast RTSP and RAW TCP
Authentication Protocols	802.1x
Voice Protocols	SIP
Voice Quality Measurement	MOS R-factor
Video Protocols	RTSP/RTP, Multicast Streaming, IGMPv2, IGMPv3 and MLDv2
Video Quality Measurement	MDI measurements along with additional statistics to detect picture quality
Protocol Emulations Enterprise and Data Center Switch Protocol Support	Routing, multicast and bridging: All major IPv4 and IPv6 unicast and multicast routing protocols, IGMPv1/v2/v3, MLDv1/v2, LACP, STP, RSTP and MSTP • Data center: DCBX, FCoE, FIP, 802.1Qbb
Service Provider	• Routing and MPLS: All major IPv4 and IPv6 unicast and multicast routing protocols, RSVP-TE, LDP, VPLS-LDP, VPLS-BGP, BGP/MPLS-VPN, Fast Re-route, mVPN, P2MP-TE, BFD, TWAMP and PWE3 (RFC4447) • Access: ANCP, PPPoE, DHCP, L2TP, IGMPv1/v2/v3, MLDv1/v2, DHCPv6 and PPPoEv6 • Carrier Ethernet and bridging: LACP, STP, RSTP and MSTP
Layer 4-7 Applications and Security	• TCP, UDP • HTTP, SIP and FTP, Unicast/Multicast RSTP and RAW TCP • 801.1x • SIP • MOS R factor • RSTP/RTP, MulticastStreaming, IGMPv2, IGMPv3, and MLDv2 • MDI measurement along with additional statistics to detect picture quality

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About Spirent Communications

Spirent Communications (LSE: SPT) is a global leader with deep expertise and decades of experience in testing, assurance, analytics and security, serving developers, service providers, and enterprise networks.

We help bring clarity to increasingly complex technological and business challenges.

Spirent's customers have made a promise to their customers to deliver superior performance. Spirent assures that those promises are fulfilled.

For more information, visit: www.spirent.com

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Ordering Information			
Description	Spirent N-11U chassis support	Spirent N-4U chassis support	Part number
4-port 100 GbE (100 GbE only)	X	X	FX2-100GO-P4
Accessories			
Optical Transceiver CFP2 100GBASE-LR4 1310NM-SMF			ACC-6083A
Optical Transceiver CFP2 100GBASE-SR10 850NM-MMF			ACC-6084A
Optical transceiver QSFP28 100GBASE-SR4 MMF 850NM (requires ACC-6094A)			ACC-6095A
Adapter CFP2 to CFP4			ACC-6091A
Adapter CFP2 to QSFP28			ACC-6094A
COPPER DAC QSFP28 100GBASE-CR4 1M			ACC-1034A
COPPER DAC QSFP28 100GBASE-CR4 3M			ACC-1035A
COPPER DAC QSFP28 100GBASE-CR4 5M			ACC-1038A
CVR-CFP2-CPAK10 (SR10 CFP2 to CPAK adapter order direct from Cisco)			74-102215-01
CVR-CFP2-CPAK4 (LR4 CFP2 to CPAK adapter order direct from Cisco)			74-102214-01
CPAK-100G-SR10 Transceiver (order direct from Cisco)			800-41495-01
CPAK-100G-LR4_A0 Transceiver (order direct from Cisco)			800-39910-06
Spirent chassis			
Spirent N11U Chassis and controller with 110V AC power supply			SPT-N11U-110
Spirent N11U Chassis and controller with 220V AC power supply			SPT-N11U-220
Spirent N4U Chassis and controller with 110V AC power supply			SPT-N4U-110
Spirent N4U Chassis and controller with 220V AC power supply			SPT-N4U-220