Spirent **fX3 HSE Modules**

Quint-Speed 4-Port High Speed Ethernet Test Modules

The Spirent fX3 family of multi-speed High Speed Ethernet (HSE) test modules support quint-speed operation, Spirent was the first test vendor to release 5 speeds on a single test module.

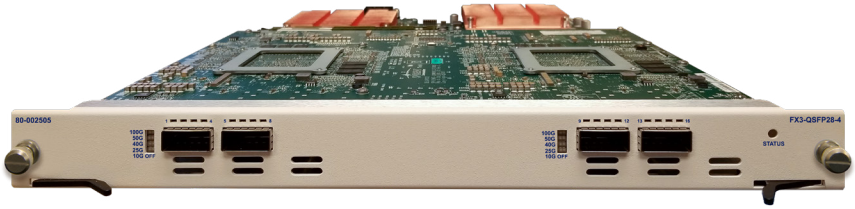
Support for the latest Data Center speeds of 25G and 50G are combined with "legacy" speeds of 100G, 40G and 10G to ensure dataplane QoS performance over realistic routing and cloud infrastructure topologies of the latest high-density multi-terabit routers and cloud-scale Data Center switches.

The Spirent fX3 Ethernet multi-speed test modules combine Spirent's industry-leading Layer 2–3 traffic generation and analysis with powerful network emulation and application layer protocols for emulating a wide range of device types, users and protocols. These modules deliver the highest performance per dollar for Layer 2–7 testing. Reduced power consumption and quint-speed support results in lower CAPEX and OPEX. These modules are ideal for functional and performance testing of data center and service provider network infrastructure where extreme protocol performance is not required.

These modules are designed with four QSFP28 ports that utilize four 25G electrical lanes each to support the latest transceivers and interconnects. The multi-speed QSFP28 interfaces are combined with Spirent's flexible FPGA logic to allow mode-switching of the fX3 packet generation and analysis engine to operate at 100, 50, 40, 25 and 10G speeds. The fX3 module family is also available in other speed combinations to match your test needs and budget.

Applications

- **Service Provider Core and Edge Routers–**Verify scale, reliability, and performance of Layer 2 & 3 services including IP data and video delivered via unicast routing, multicast routing, switching, Multicast VPN, EVPN and MPLS VPN technologies.
- **Data Center Top of Rack, Spine and Core Switches–**Benchmark capacity of high-density and capacity fabrics using IETF RFC 2544, RFC 2889 and RFC 3918 methodologies with easy test setup using dynamically bound traffic and automated wizards.
- **Carrier Ethernet–**Verify scale, reliability, performance of Ethernet services delivered via Ethernet OAM (CFM IEEE 802.1ag and Y.1731), MPLS-TP, VPLS, PWE3 Pseudowires, bridged Ethernet, packet transport protocols or combinations of these technologies.



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Features & Benefits

- Hardware options available to allow customers to customize module testing needs for speeds and features
- Enable and disable Clause 74 BASE-R FEC, Clause 91 RS-FEC, and Clause 108 RS-FEC, and Auto Negotiation and Link Training
- Low total cost of ownership compared to other test modules in its class:
  - Excellent price-performance ratio that delivers faster time-to-market by combining leading-edge technical innovation with Spirent's extensive testing experience
  - Intelligent power control to shut down unused test modules and allows faster boot time to bring capacity back on-line quickly
  - More total throughput than the competition for a given power footprint
  - Enhanced chassis software license value—Two to four times the device or end-user emulation per chassis with no increase in software costs
  - Topology emulation lowers Capex by eliminating the need for multiple DUTs in multiprotocol tests
  - Intelligent results gets answers in a fraction of the test time required by competitive products
  - Faster boot and firmware upgrade times mean less downtime in continuous running 24x7 regression test beds
- Spirent TestCenter's industry-leading Layer 2–3 feature set:
  - "Hardened" system proven for testing from a single port up to 2,100 ports
  - Stress ASIC and backplane designs with live traffic changes. The number of emulated devices, the traffic they emanate and the rate at which they send it can all be changed "on the fly" making for more realistic tests and faster troubleshooting
  - Best-in-industry for measuring ultra-low sub-microsecond latencies with 2.5ns precision and resolution. Latency accuracy up to 10 times better than the competition
  - 19 different scheduling algorithms available for finding the right traffic to emulate the real world or tax the device's ability to handle any traffic pattern—from micro-bursts to carefully timed sequences of "killer" frames
- fX3 modules support Spirent TestCenter's deep analysis system:
  - Port counts, rates, errors and protocol summaries provide a high-level view for quick drilldown to specific issues
  - Broadest set of per stream metrics with simultaneous control and data plane results allows most tests to be run in a single pass
  - Real-time traffic filters allow analysis down to specific fields. Multiple metrics can be simultaneously collected and instantly analyzed
  - Dynamic views feature multi-metric extraction, sorting and operation in real-time or post-test
  - Full packet capture enables timing, sequencing and content analysis for individual packets
  - Powerful filters ensure the capture buffer is filled with relevant data

Technical Specifications

Spirent fX3 module				
Maximum Support	Speed	Maximum ports per slot	Maximum ports per STP-N11U chassis	Maximum ports per SPT-N4U chassis
FX3-QSFP28-4-100A	100G Only	4	48	8
FX3-QSFP28-4-125A	100/25G	4/16	48/192	8/32
FX3-QSFP28-4-175A	100/50/25G	4/8/16	48/96/192	8/16/32
FX3-QSFP28-4-150A	100/40/10G	4/4/16	48/48/192	8/8/32
FX3-QSFP28-4-225A	100/50/40/25/10G	4/8/4/16/16	48/96/48/192/192	8/16/8/32/32

Technical Specifications (cont'd)	
Port density	4-port QSFP28 module options
Media support and FEC options See accessory table below for part numbers	Support varies by module speed mode • 100G: 100GBASE-SR4, 100GBASE-CR4, 100GBASE-LR4, plus additional MSA PMDs • 50G: 25/50G Consortium 50GBASE-CR2, • 40G: 40GBASE-SR4, 40GBASE-CR4, 40GBASE-LR4 • 25G: 802.3by 25GBASE-CR, 25GBASE-CRS, 25GBASE-SR • 10G: 10GBASE-SR, 10G Copper DAC • QSFP28 to SFP28 breakout cable options • Auto-Negotiation and Link Training for 100G, 50G, 40G and 25G • Clause 74 BASE-R FEC, Clause 91 RS-FEC, and Clause 108 RS-FEC • 25/50G Consortium 50GBase-R FEC CL74, 25/50G Consortium 50GBase RS-FEC CL91 • IEEE 25GBASE CR CL74, CL108, CR-S CL74, SR FEC CL108 • 25/50G Consortium 25GBase-R FEC CL74, 25/50G Consortium 25GBase RS-FEC CL91
Line clocking and packet time stamping (modules get their transmit line clocking and time-stamping from the control modules on the SPT-N11U and SPT-N4U)	• Stratum-3 rated oscillator is the default time source. • Frame time stamp resolution of 2.5ns. • GPS and CDMA-based external time sources are supported • IEEE 1588v2 and NTP packet-based external time sources are supported • TIA/EIA-95B-based external time sources are supported
Inter-module and Inter-chassis Time Synchronization	Ports in the same chassis are locked to the internal timing source. For separate systems: • Timing chain synchronization with +/- 20ns • Synchronized via GPS or CDMA network • Using NTP or PTP packet-based approaches (requires supporting controller version)
User reservation	Per-port reservation
Transmit / receive streams per port	64k TX and 128k RX for all speeds
VFDs and Variable Fields	• 6 VFDs available for each 1k (100G) and 512 (50/40/25/10G) stream templates • 4m route insertion table entries for all speeds
Scheduler Mode Support	• Port Based – traffic scheduling handled at the port level • Rate Based – key parameters determined at the port level with division among the individual stream blocks • Priority Based – scheduling determined at the stream block level using user-assigned priorities. Precise scheduling of CBR and bursty traffic for QoS testing. • Manual Mode – manual control of stream sequence.
Frame length range and controls	100% line rate for frames of 64-16383 bytes controlled by fixed, increment, decrement, random and IMIX modes.
Statistics	• Nearly 50 transmit stats per port reported in real time. Includes L1-4 counters and rates and checksum and CRC errors • Over 40 real-time measurements per stream including advanced sequencing, latency, jitter and data integrity
Transmit clock adjustment	• +/- 100 PPM in 1 PPM increments per 2 100G ports
Capture	• 1MB per 100G or 40G port • 512kB per 50G port • 256kB per 25G port • Capture software includes sophisticated trigger and filtering controls
Histograms	Port-level histogram modes for latency, jitter, interarrival time, frame length, sequence run length and sequence difference check
Operating temperature	15 C - 35 C, 20% - 80% RH (non-condensing)

Spirent TestCenter Protocol Emulation (cont'd)	
Spirent TestCenter protocols available as separately licensed packages. Below is a sample list of sup-ported protocols. Contact Spirent for a full list of capabilities and packages.	
Enterprise and data center switch protocol support	• OpenFlow 1.3 / 1.0: OpenFlow switch and controller emulation testing • 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: VXLAN, EVPN, DCBX, FCoE, FIP, 802.1Qbb • Stateful L4-7: HTTP, SIP, FTP, and LACP and LAG emulation
Service Provider protocol support	• WAN SDN: PCE-P, BGP-LS (Link State), BGP Flow Spec and Segment Routing for ISIS, OSPF and BGP • NFV: Validate performance and scale for NFVI and VNFs including vSwitch, BGP v RouteReflector, vBNG, vCPE and vRouter • Routing and MPLS: All major IPv4 and IPv6 unicast and multicast routing protocols, RSVP-TE, LDP, VPLS-LDP, VPLS-BGP, BGP/MPLS-VPN, EVPN (RFC 7432), PBB EVPN, mVPN, NG MVPN, GTM, BFD, MPLS BFD, LSP Ping, TWAMP and PWE3 (RFC4447) • Access: ANCP, PPPoE, DHCP, L2TP, L2TPv3, IGMPv1/v2/v3, MLDv1/v2, DHCP-PD and PPPoEv6 • Carrier Ethernet and bridging: LACP, STP, RSTP, MSTP, 802.1ag CFM, Y.1731, PBB, PBB-TE, Link OAM • Stateful L4-7: HTTP, SIP, FTP, Unicast/Multicast RTSP, RAW TCP, and LACP and LAG emulation • Mobile Backhaul: MPLS-TP, 1588v2 and Synchronous Ethernet

Ordering Information

Test Modules	
Base Package Description*	**Part Number**
SPIRENT FX3 100GBE ONLY QSFP28 4-PORTS	FX3-QSFP28-4-100A
SPIRENT FX3 100 25GBE QSFP28 4-PORT	FX3-QSFP28-4-125A
SPIRENT FX3 100 40 10GBE QSFP28 4-PORT	FX3-QSFP28-4-150A
SPIRENT FX3 100 50 25GBE QSFP28 4-PORT	FX3-QSFP28-4-175A
SPIRENT FX3 100 50 40 25 10GBE QSFP28 4-PORT **Additional Base Packages can be created on request, based on any desired speed combinations.*	FX3-QSFP28-4-225A
Accessories for QSFP28 interfaces	
Optical transceiver QSFP28 100GBASE-SR4 MMF 850NM	ACC-6095A
Optical Transceiver QSFP28 100GBASE-LR4 SMF 1310NM	ACC-6096A
Copper DAC QSFP28 100GBASE-CR4 1M	ACC-1034A
Copper DAC QSFP28 100GBASE-CR4 3M	ACC-1035A
Copper DAC QSFP28 100GBASE-CR4 5M	ACC-1038A
Speed Upgrades**	
100G HARDWARE SPEED OPTION FOR FX3-QSFP28-4	HWO-FX3-QSFP28-4-100G
50G HARDWARE SPEED OPTION FOR FX3-QSFP28-4	HWO-FX3-QSFP28-4-50G
40G HARDWARE SPEED OPTION FOR FX3-QSFP28-4	HWO-FX3-QSFP28-4-40G
25G HARDWARE SPEED OPTION FOR FX3-QSFP28-4	HWO-FX3-QSFP28-4-25G
10G HARDWARE SPEED OPTION FOR FX3-QSFP28-4	HWO-FX3-QSFP28-4-10G

***For when you buy a Base Package and later decide to add a new speed to it.*

Contact Us

For more information, call your Spirent sales representative or visit us on the web at www.spirent.com/ContactSpirent.

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