SPIRENT Communications Inspired Innovation

Spirent TestCenter™

SERIES 1000 AND SERIES 2000 GIGABIT ETHERNET TEST MODULES

Convergence is creating a new generation of integrated network devices and services that are much more complex than ever before. The resulting increased complexity, scarcity of testing skills and architectural shortcomings in current test systems are hurting the ability of manufacturers to ship products on time at escalating quality levels and slowing service providers' ability to deploy networks that get Quality of Experience (QoE) right the first time.

INCREASE PRODUCTIVITY: GET THERE FASTER WITH SPIRENT TESTCENTER

- Series 1000 for cost effective scalable Layer 2 and Layer 3 functional, routing protocol emulation performance and conformance test requirements
- Series 2000 for highly scalable functional and performance benchmark testing for data plane, routing protocol emulation, conformance testing and Layer 4-7 application testing
- Up to 144 ports of 10/100/1000 Mbps or 1GbE supported in a 9 rack mount unit chassis Up to 32,767 customizable transmit streams per port
- Hot swappable test modules Up to six users per test module and many users per chassis all sharing a single test software license
- Full IPv4/IPv6 dual stack support

Now you can create and execute more complex test cases in less time with the same resources – and scale tests higher while debugging problems faster. The results: lower CAPEX and OPEX, faster time to market, greater market share and higher profitability.

Spirent TestCenter offers a variety of test modules and a high-density chassis or a portable chassis for all Ethernet technology testing needs. Spirent TestCenter provides functional, performance, system and conformance test capability from Layer 2 through Layer 7 on a single test module. There are Series 1000 and Series 2000 modules with copper only, fiber only or dual media interfaces. Gigabit Ethernet port density ranges from 2 ports with dual media interfaces to 144 ports in a single chassis.

All Spirent TestCenter modules can test intelligent high-density enterprise switches and routers at an economical price. The Spirent TestCenter platform has broad technology coverage. Each port can generate realistic traffic at different layers and analyze specific metrics for each layer. Spirent TestCenter modules can simultaneously correlate data plane tests with control plane traffic such as routing to provide the most realistic performance measurements.

Spirent TestCenter with Inspire Architecture provides a quantum leap in productivity over traditional test tools. The Series 1000 Gigabit Ethernet test modules suit customers seeking cost effective, high density Layer 2/Layer 3 scalability with routing and conformance test capabilities.

EDM-2003B

Spirent TestCenter

CPR-2001B

The Series 1000 modules support up to 16,384 streams per port. These attributes make the Series 1000 test modules a cost effective solution for production test environments or in research and development environments where high scalability performance testing is not required.

The Series 2000 Gigabit Ethernet test modules suit customers with total flexibility including conformance test capabilities, Layer 2/Layer 3 scalability with basic routing, through advanced Layer 3 with high performance routing capabilities. Additionally, the Series 2000 GigE modules measure performance of IPTV, Layer 4 to 7 devices such as firewalls, load balancers, IDS/IPS systems, SSL accelerators, Web accelerators and SSL and IPSec VPNs.

Series 2000 modules can scale up to 32,767 streams per port. When combined with high-scale Spirent TestCenter software components, they offer the complete high performance testing solution.

In addition to the Gigabit Ethernet test modules, Spirent also offers Series 1000 and Series 2000 10-Gigabit Ethernet modules, creating a full spectrum of Ethernet test modules from 10Mbps to 10GbE.

APPLICATIONS

- Use Series 1000 modules combined with the SPT-5000A or SPT-9000A chassis to achieve high volume production testing where high-density, low cost Ethernet ports are required
- Benchmark network device scalability and limitations at a cost effective price
- Develop and test your device in the lab with the Series 1000 or Series 2000 test modules, then carry them to your customer site installed in an SPT-2000A portable chassis to prove your device's performance.
- Compare and validate network equipment to determine the suitability of a specific application prior to deployment
- Ensure the performance of advanced network devices. Such features encompass total host/client capacities and throughput, QoS class prioritization, SLA bandwidth verification, VLAN tagging and dozens of routing protocols, scalability protocols and performance metrics.

BENEFITS

- *Reduce lab space and test equipment costs:* High port density modules that support multi-user operation provide maximum efficiency on utilization of hardware resources
- *Protect your investment for future projects:* Dual media test modules provide flexibility with both copper and fiber Ethernet interfaces (10/100/1000 Mbps and Gigabit fiber)
- *Ease of service:* All Spirent TestCenter modules are hot-swappable for easy service or replacement while the chassis is fully operational. They can easily be managed remotely through an IP network.
- *Leverage test equipment purchases:* Use the same hardware platform to perform research and development to pinpoint potential issues, performing comprehensive functional testing and high-scale performance testing
- *Industry-leading scalability:* Emulate large networks with thousands of hosts. Generate up to 32,767 streams per port and track up to 65,535 incoming streams per port. Manage large scale test configurations involving hundreds of ports. Test creation tools are optimized to create large scale test scenarios in just a few clicks. New Inspire Architecture facilitates large port and stream count tests.
- *Single Automation API:* All Layer 2 and Layer 3 protocols for data plane and routing control plane testing can be accessed via a single, common automation framework user interface. The automation interface spans all network interfaces at all speeds, reducing your overall test automation while increasing test reuse.
- *Superior analysis capability:* Increase test case throughput, reduce test time and increase the productivity of engineers using flexible classification of results based on any characteristic of the received traffic. (For example, QoS levels of service, protocols, source and destination addresses, VLAN tagging including VLAN stacking.) Provides over 1.5 million user-selectable real time

statistics per receive port. Concurrently runs advanced measurements in real time such as jitter, packet loss, sequencing, latency and data integrity using PRBS techniques.

KEY FEATURES

- High port density modules with per-port group reservation, providing multi-user capability
- Dual media test modules provide 10/100/1000 Mbps and Gigabit Ethernet fiber
- Wire-rate and beyond wire-rate traffic generation and analysis at Layers 2 and 3
- Compatible with all Spirent TestCenter software applications for comprehensive functional, conformance and performance testing in one system
- Supports all core technologies required to test Enterprise L2/L3 switches, including QoS, IPv4/v6, multicast, routing, spanning tree, multiple spanning tree, VLAN and DHCP. Simultaneously runs multiple protocols per port to emulate large routed networks.
- Series 2000 GigE modules support testing of application level protocols such as HTTP, SSL, FTP, Telnet, DNS, IPv6, IPSec, Capture/Replay for L4-7, SIP, SMTP and POP3
- Custom packet and frame editing is facilitated by a graphically driven field editor that allows the user to edit templates for a wide variety of preconfigured control and data plane packets
- HyperFilters™ technology enables users to receive, track, inspect and accumulate statistics for up to five fields in each receive frame at wire rate for all speeds
- Real time per stream statistics such as minimum, maximum and average latency per traffic class
- Real time event log allows user to view actual protocol messaging on a per-port basis
- Hardware is field-programmable. The module can be upgraded on-site in its chassis as new features and technologies become available.

TECHNICAL SPECIFICATIONS

Analyzer – HyperFilters

- Five different traffic analysis filters may be placed anywhere in the packet for the user to select packet fields for measurement and statistical tracking analyses
- The analyzer supports a combination of 5 filters, 4 16-bit and 1 32-bit that operate on the incoming traffic stream
- Separates traffic into as many as 65,535 sub-streams for detailed analysis
- Automatically identifies Layer 2 (including MPLS and VLANs), Layer 3 and Layer 4 encapsulations per templates

Analyzer – Port Measurements

- Port and rate counters are 64 bits deep and can track 65,535 uniquely trackable stream and sub-stream values with real time statistics and graphs
- Additional Spirent TestCenter Base and Test Packages add technology or protocol specific port counters. Please refer to the specific software package data sheet for additional counter information.
- Traffic Generator and Total Port Count Counters: Transmit and Receive counters report all packet statistics for counts, bytes, signature field, CRC and FCS errors, and IPv4/IPv6 checksum errors for Layer 3 and Layer 4. Protocol counters such as UDP, TCP, MPLS, VLANs, ICMP are provided. Packet size statistics are counted for undersized, oversized and Jumbo frames.
- Transmit and Receive CPU Port Counts are provided for: Frames, Octets, IPv4/IPv6 Frames, ARP Requests and Replies, and ICMP Echo Requests and Replies
- QoS Counters: The Analyzer supports a counter set for each value of the ToS/ Diffserv byte in an IPv4 or IPv6 frame. The user can choose to count a single IP Destination or for traffic received on the port. For each value of the ToS/Diffserv byte the analyzer tracks: Value of the byte, IPv4 Frames, IPv6 Frames and associated rates.

Analyzer – Per Stream and Per Sub-stream Measurements

- The stream analyzer statistics are the same for sub-streams, with the exception of sequence-based statistics
- All stream counters have associated rate counters 64-bits deep, and they report real time statistics and charts
- Transmit and Receive Per-stream Counts for: Frames, Octets, IPv4, TCP and UDP Checksum Errors, PRBS Bit Errors, PRBS Filled Octets, FCS Errors, Average, Minimum and Maximum Latency, Dropped Frames, In-order and Re-ordered Frames, Duplicate Frames, Late Frames, In and Out-of¬sequence Frames, Total Average, Minimum and Maximum Jitter, Total, Average, Minimum and Maximum Inter-arrival Time
- Per-stream Histograms: Each stream has 16 histogram bins with user-defined boundaries. Histograms are available for Inter-arrival Time, Latency, Jitter, Frame Length, Sequence Difference and Sequence Run Length.

Analyzer – Traffic Group Measurements

- Stream blocks may be used in user-defined traffic groups for analysis of aggregated statistics. The traffic group analyzer measures Tx Frames, Rx Frames, Tx Octets and Rx octets.
- All traffic group counters have rate counters 64-bits deep, report real time group statistics and are charted

Analyzer – Capture

- Eight 4-byte pattern matching filters may be positioned anywhere in the frame and combined with AND, OR and NOT logic to form a combination trigger/counter to start capture, qualify frames in the capture buffer, or stop capture
- Combination trigger can be combined with OR and NOT logic with a set of 17 different event triggers to start capture, qualify frames in the capture buffer, or stop capture. Supported events are: FCS, PRBS, Layer 1 Error, IPv4 and TCP, UDP, IGMP Checksum Errors, and Signature Sequence Error. For Frames: Undersized, Oversized, Jumbo and Signature Frames. For Packets: IPv4/IPv6, TCP, UDP, IGMP, a particular Frame Length or a particular stream ID.
- Captured packets can be filtered, decoded, examined and saved to a file
- When combined with BPK-1029A, Spirent TestCenter Enhanced Capture and Decode Base Package BPK-1001A Base Package supports real time decodes of captured traffic, decode of the Spirent signature with full resolution of the timestamp, display of the captured preamble and ladder diagrams of routing protocols

Generator – General Stream and Stream Block Parameters

- The BPK-1001A base software package supports up to 32,767 streams per port for the Series 2000 test module. The Series 1000 test modules support 16,384 streams per port.
- Frame lengths may be fixed, incremented, decremented or randomly-generated. An automatic setting can be used in the frame editor to set minimum frame length per protocol type.
- Traffic load per stream block may be in percent of line rate, frames per second, inter-frame gap (in bytes, milliseconds or nanoseconds), bits per second, Kbps or Mbps
- For bursty traffic, the user can define the inter-burst and the inter-frame gap (in bytes)
- Staggered start for stream blocks on the same port is supported via a user-defined start offset
- Stream block parameters may be changed on the fly (e.g. rates, PDUs, frame size) without stopping the traffic generator. Stream blocks can be created and deleted, and disabled or enabled for transmission on the fly.
- Host, router, route, interface and traffic wizards allow users to create large test scenarios with the same effort as creating small ones. For example, using the host wizard, users can quickly create thousands of hosts across hundreds of ports in a few mouse clicks. Using the Traffic Wizard, thousands of streams can be created across a large-port test in the same amount of time required to create a single stream on one port.

Generator – Encapsulation Templates and Frame Editor

- The Frame Template selector contains hundreds of pre-defined frame templates for users to rapidly create realistic traffic
- Spirent TestCenter's integrated packet library streamlines deep functional testing targeted at specific device features
- With support from Spirent's Professional Services team, users can add customized templates to the Frame Template selector and use the defined PDUs in the PDU Editor
- Each field within the PDU (including the preamble of Ethernet frames) can be edited and field validation can be turned off to allow for negative testing
- Each field within the PDU can be the target of a stream modifier or a hardware Variable Field Definition (a software-based VFD increments the stream ID at the same time as it modifies the target field)
- Stream modifiers and hardware VFDs support incrementing, decrementing, random, list and shuffle mode
- Stream modifiers and hardware VFDs can be chained in any combination to support complex traffic patterns

Generator – Schedule Modes and Port-Based Parameters

- BPK-1001A base software package supports three scheduling modes:
  - Port-based: traffic rate and burst characteristics set per port
  - Rate-based: traffic rate and burst characteristics set per stream using a rate-based algorithm
  - Priority-based: traffic rate and burst characteristics set per stream using a user-defined priority level to govern stream scheduling
- Rate-based or Priority-based scheduling modes can mix bursty and constant rate traffic from the same port
- Traffic can be generated continuously for a burst count or for a user-defined time period
- Jumbo, undersized and oversized frame thresholds may be set per port

FBR-2001B

Generator – Command Sequencer

- All GUI commands in BPK-1001A base software package can be placed in the command sequencer and included as part of a test execution timeline
- Commands in the sequencer can be combined into a group. Each group can be the target of a continuous loop to be executed until the user manually terminates it, or for a fixed number of iterations.
- Each command sequencer step can be individually enabled or disabled
- Configurable time delays can be inserted between each command sequencer step
- Call an external script before, after, or at any point during the schedule to configure, monitor and/or manage the DUT/SUT during the sequence execution
- Using the custom test sequencer command, users can implement continuous tests, stepped tests, throughput tests with incrementing loads and frame sizes
- Create detailed and automated controls over Layer 2 and Layer 3 learning sequences using the command sequencer

Generator – MII Registers

- The BPK-1001A base software package provides an interface to MII registers for all 10/100/1000 Ethernet Ports
- Read and write the register content and set new values to each register within the MII register space as required
- Registers can be bit-masked for protection and negative tests
- Register templates may be saved to a file and retrieved as required

Generator/Analyzer – Error Insertion and Analysis

- Users can inject FCS, IPv4 and IPv6, TCP and UDP checksum errors. The analyzer provides counts and rates for all injected errors.
- For negative tests, errors may be placed in most fields within a PDU by turning off field validation

Series 1000 Specifications					
	CPR-1001B	*FBR-1001B*	*EDM-1000B*	*EDM-1002B*	*EDM-1003B*
Ports per module	8	8	4	2	12
Connector type	10/100/1000 RJ-45 Copper	1G SFP Fiber, LC connector	2 connectors per port. 10/100/1000 RJ-45 Copper and 1G SFP Fiber, LC connector		
SFP laser wavelengths*	N/A	850nm, 1310nm, 1550nm			
Cabling	4 pair CAT5 UTP	Multi-mode, single mode fiber	4 pair CAT5 UTP or Multi-mode, Single mode fiber		
Signal rate	10/100/1000 Mbps	1 Gbps	10/100/1000 Mbps and 1 Gbps		
CPU memory	512 MB per port pair				
Variable fields per stream (hardware VFDs)	4				
Minimum frame size, including CRC	44 bytes				
Maximum frame size	16 Kbytes				
Maximum transmit streams	16,384				
Maximum receive streams	65,535				

* SFP Transceivers ordered separately

Series 1000 Specifications						
Feature	*CPR-2001B*	*CPR-2002B*	*FBR-2001B*	*EDM-2001B*	*EDM-2002B*	*EDM-2003B*
Ports per module	8	8	8	4	2	12
Connector type	10/100/1000 RJ-45 Copper	10/100 RJ-45 Copper	1G SFP Fiber, LC connector	2 connectors per port. 10/100/1000 RJ-45 Copper and 1G SFP Fiber, LC connector		
SFP laser wavelengths*	N/A	N/A	850nm, 1310nm, 1550nm			
Cabling	4 pair CAT5 UTP		Multi-mode, single mode fiber	4 pair CAT5 UTP or Multi-mode, Single mode fiber		
Signal rate	10/100/1000 Mbps	10/100 Mbps	1 Gbps	10/100/1000 Mbps and 1 Gbps		
CPU memory	1GB per port pair					
Variable fields per stream (hardware VFDs)	6					
Minimum frame size, including CRC	44 bytes					
Maximum frame size	16 Kbytes					
Maximum transmit streams	32,767					
Maximum receive streams	65,535					

* SFP Transceivers ordered separately

Generator/Analyzer – Error Insertion and Analysis

- Users can inject FCS, IPv4 and IPv6, TCP and UDP checksum errors. The analyzer provides counts and rates for all injected errors.
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REQUIREMENTS

- Pentium® or greater PC running Windows® XP Professional SP2 with mouse/color monitor required for GUI operation. See Minimum PC Requirements section.
- One Ethernet cable and one 10/100/1000 Mbps Ethernet card installed in the PC
- A SPT-2000A Spirent 2U Chassis and Controller, SPT-5000A Spirent 5U Chassis and Controller or SPT-9000A Spirent 9U Chassis and Controller
- Operating system languages supported: English, French, German, Italian, Japanese, Korean, and Chinese (traditional and simplified)
- For test automation system requirements, refer to the Spirent TestCenter Automation data sheet (P/N 79-000037)
- Layer 4 to 7 testing requires 2000 series revision B modules
- Fiber ports require separately ordered SFP transceiver

MINIMUM PC REQUIREMENTS

- Small Port System: 1-25 ports
  - 2.4GHz Pentium 4 or equivalent with 512MB of free RAM and 10GB of free disk space
- Medium Port System: 26-75 ports
  - 3GHz Pentium 4 or equivalent with 2GB of RAM and 15GB of free disk space
- Large Port (75+ ports)
  - E6400 Intel® Core™ 2 Duo or equivalent with 3GB of RAM and 100GB of free disk space

ORDERING INFORMATION

Product	Part Number
Series 1000 modules	
10/100/1000 Copper RJ-45, 8 port	CPR-1001B
10/100/1000 Dual Media, 4 port	EDM-1001B
10/100/1000 Dual Media, 2 port	EDM-1002B
10/100/1000 Dual Media, 12 port	EDM-1003B
1G Fiber SFP, 8 port	FBR-1001B
Series 2000 modules	
10/100/1000 Copper RJ-45, 8 port	CPR-2001B
10/100/1000 Dual Media, 4 port	EDM-2001B
10/100/1000 Dual Media, 2 port	EDM-2002B
10/100/1000 Dual Media, 12 port	EDM-2003B
1G Fiber SFP, 8 port	FBR-2001B
10/100 Copper RJ-45, 8 port	CPR-2002B
SFF Card Carrier/Adapter for SPT-2000A/SPT-9000A Chassis	ACC-2090B
1000Base-SX Gigabit Ethernet SFP Transceiver, Multimode, 850nm, LC Connector	ACC-6025A
1000Base-LX Gigabit Ethernet SFP Transceiver, Single Mode, 1310nm, LC Connector	ACC-6026A
1000Base-ZX Gigabit Ethernet SFP Transceiver, Single Mode, 1550nm, LC Connector	ACC-7000A

Spirent TestCenter Chassis and Other Modules

Product	Part Number
Spirent 2U Chassis and Controller	SPT-2000A
Spirent 2U Chassis and Controller with High Speed Fans. (Suitable for lab use only)	SPT-2000A-HS
Spirent 5U Chassis and Controller	SPT-5000A
Spirent 9U Chassis and Controller	SPT-9000A
Series 1000 modules	
10G MSA Host Module, 2 port	MSA-1001B
10G XFP, 1 Port	XFP-1001B
Series 2000 modules	
10G MSA Host Module, 2 port	MSA-2001B
10G Host Module, 1 port	UPY-2001A
10G Host Module, 2 port	UPY-2002A
2.5G Host Module, 2 port	WAN-2002A
10G XFP, 1 port	XFP-2001B

SPIRENT GLOBAL SERVICES

Spirent Global Services optimizes your productivity with Spirent TestCenter over a broad range of technologies:

Professional Services

- Test lab optimization: Test automation engineering services
- Service deployment and service-level optimization: Vendor acceptance testing, SLA benchmarking, infrastructure and security validation
- Device scalability optimization: POC high-scalability validation testing

Education Services

- Web-based training: 24 x 7 hardware and software training
- Instructor-led training: Hands-on methodology and product training
- Certifications: SCPA and SCPE certifications

Implementation Services

- Optimized new customer productivity with up to three days of on-site assistance

Visit www.spirent.com/gs or contact your Spirent sales representative.

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