Spirent **Automotive C50**

Layer 2-7 System for Deterministic Testing of Automotive Ethernet Applications

Solution Overview

Test Automotive InCar or Car2X devices and systems with a solution that reproduces a realistic and deterministic environment accelerating product development and improving quality.

Spirent's C50 minimizes your risk with its highly accurate emulated traffic and measurements so networks and individual network elements can be quickly validated. The C50 lowers the barrier to entry and enables companies of all sizes to test smarter and optimize their test investment by leveraging the industry-leading test capabilities Spirent offers.

The Spirent Automotive C50 supports the Spirent TestCenter™, and TTworkbench™ Software Test Suites. Whether you are an InCar network engineer, product researcher/developer, or systems engineer – Spirent will empower you to better manage your solutions and deliver on the promise of next-generation Automotive services.

The Spirent Automotive C50 offers the power of Spirent's award-winning Layer 2–7 router, switch, application and security test solutions in a 3U form factor delivering the best total cost of ownership in its class.

With support for line-rate 10/100 BroadR-Reach® (100BASE-T1), 1000BASE-T1, NBASE-T (100M/1/2.5/5/10G), 1G and 10G Ethernet test ports, the C50 offers the power of a professional test tool for deterministic testing of Automotive Ethernet products and solutions.

A complete Layer 2 to Layer 7 test tool, delivering the perfect blend of realism, scalability and performance, is now available to replace open source utilities and ad-hoc testing methods. Test smarter by moving up to Spirent C50.

Features & Benefits

- Native BroadR-Reach PHY eliminates latency measurement inaccuracies and provides true interoperability testing
- Transceiver based PHY options provide flexibility
  - 100BASE-T1, 1000BASE-T1, 10/100/1000BASE-TX, NBASE-T (100M/1/2.5/5/10G) and 10GBASE-T
- Hardware-based timestamp measurements for highly accurate latency measurements
- Best-in-industry for measuring ultra-low sub-microsecond latencies with 10ns precision and 2.5ns resolution (10ns resolution for native copper interfaces)
- Wizard-driven RFC benchmark suites for push-button, repeatable tests
- Realistic stateful protocol emulation to exercise protocol state machines
- Configurable interface mix and density
  - 4, 8, 12 and 16 port configurations
  - BroadR-Reach; RJ-45, SFP and SFP+ interfaces
- Full chassis chaining and external timing synch available via direct connect, NTP, PTP, GPS, and CDMA
- Small footprint appliance and quiet operation for benchtop or desktop operation

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Testing the In-Car Network

Solutions for Automotive Ethernet

- Protocol conformance and functional testing
- Interoperability testing
- Device/network security and robustness
- Pre-defined, automated test suites (such as IEEE1588v2 or TSN/AVB)
- Performance/stress testing
- Real-life network traffic emulation

Testing BroadR-Reach (Ethernet/IP Performance Testing)

- Throughput, Delay, Jitter, Packet-Loss, Packet Out of Order
- Switch Benchmarking (RFC 2544 & RFC2889)
- Quality of Service (Diffserv &IEEE 802.1Q)
- Timing and Synchronization (IEEE 1588v2 & 802.1AS)
- Full TSN (Time Sensitive Network) test support
- Application playback (Unicast & Multicast)

Realism

- Realistic Layer 2–3 traffic to test Quality of Service (QoS) mechanisms
- Realistic Layer 4–7 user and endpoint emulation to test applications and application infrastructure - Industry's most comprehensive TSN standard and protocol emulation support
- Security and vulnerability testing (emulate attacks & malware, fuzzing)

Productivity

- Intelligent Results™ allow users to quickly confirm positive results and identify problematic areas
- Real-time traffic and protocol controls enable the tester to validate and troubleshoot problems by altering the test configuration while the test is running
- Real-time results views allow the user to see how the network responds to changes in specific test conditions without having to stop the test and save the results
- Built-in wizards and automated test scenarios reduce test setup and execution times
- Easy NoCode™ automation for novice programmers

Applications

C50 is ideal for Automotive OEMs, suppliers, component manufacturers and service providers performing:

- R&D testing involving technology feasibility studies and performance modeling
- Device and protocol functional testing
- Conformance and certification testing
- Device, sub-system, or services performance characterization, scalability and availability
- Stress testing requiring higher device and traffic emulation scaling capability & higher physical interface connection
- Device benchmarking (test using IETF RFC 2544, RFC 2889 and RFC 3918 methodologies with easy test setup using dynamically bound traffic and automated wizards)
- Security and vulnerability testing (emulate attacks & malware, fuzzing)

What to test

Automotive Ethernet-
BroadR-Reach®

Test interoperability,
functionality, & performance.

Simplify compliance with
network protocols.

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Technical Specifications	
C50	
Chassis	• Four to sixteen ports • 3U H x 16.53" W x 19.75" D, weight: 32 lbs. (14 kg) • 115 V–230 V, 50/60 Hz–750 W max • Supports Spirent TestCenter, and TTworkbench
Max ports	Sixteen ports per chassis
Interface media support (based on configuration)	• 10/100 BroadR-Reach: 2 x 2-wire DE9M connectors (2 ports per connector) • 1G: 10/100/1000BASE-T (RJ-45), 1GE (SFP): 10/100/1000BASE-T, 100BASE-T1 or Fiber • NBASE-T (100M/1/2.5/5/10G) (RJ-45) • 10 GE: 10GBASE-T or Fiber (SFP+ Transceiver)
Traffic encapsulations	• Layer 2: 802.3, Ethernet II, 802.1Q, 802.1ad, 802.1ah, 1722 • Layer 3 and 4: IPv4, IPv6, UDP, TCP • Custom PDU builder
Timing	**Internal Tx clock**; optionally synchronized to NTP server or IEEE1588v2 Grandmaster inter-chassis synchronization
Tx/Rx streams	Up to 64k/128k per port depending on configuration
Multi-user	Per port user reservation
Layer 2/3 Generator and Analyzer	
Frame transmit modes	• Port based (rate per port) • Stream based (rate per stream) • Burst • Timed • Manual Rate Scheduling (supported by kits with NIC-65)
Min/max frame size (w/CRC)	60 to 10,240
Min/max Tx rates	1 packet per 3.43 seconds to 101% of line rate
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 35 measurements tracked in real-time for each received stream including: • **Real-time loss** and advanced sequencing • Out of sequence • **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 & TCP/UDP checksum, frame CRC, embedded CRC and PRBS bit errors
Packet capture	• 4 MB (first 128 bytes of each frame via CPU RAM) • Stateful capture/replay for extended protocol support
Reporting	• Integrated Test Results Reporter (TM) • Full raw test results in CSV and customizable report generation in PDF and HTML
Automotive advanced software kit	• IGMPv1/v2/v3 and MLDv1/ v2 protocol emulation • IEEE 1588v2 protocol emulation • IEEE 802.1x protocol emulation • Spirent dynamic protocol generator • RFC 2544 network device benchmarking suite & wizard • RFC 2889 switching benchmarking suite and wizard • HTTP, SIP, and FTP emulation

TSN/AVB software kits	• Full TSN/AVB emulation of multiple talker or listeners on each port
	• Mixed TSN/AVB and non-TSN/AVB traffic generation capability on each port
	• Full set of standards supported:
	  – IEEE 802.1: AS (-Rev), BA, CB, Qat, Qav, Qbu, Qbv, Qci
	  – IEEE 802.3br
	  – IEEE 1722
	  – IEEE 1733

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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	
Part Number	**Product Description**
AUTO-C50-KIT-01	AUTOMOTIVE C50 KIT 16-PORT 1G COPPER & L2-3 SW
AUTO-C50-KIT-02	AUTOMOTIVE C50 KIT 16-PORT 10/100M BROADR-REACH & L2-3 SW
AUTO-C50-KIT-03	AUTOMOTIVE C50 KIT 8-PORT 10/100M BRDR-RCH, 8-PORT 1G & L2-3 SW
AUTO-C50-KIT-04	AUTOMOTIVE C50 KIT 8-PORT 10/100M BRDR-RCH, 4-PORT 1G & L2-3 SW
AUTO-C50-KIT-05	AUTOMOTIVE C50 KIT 12-PORT 10/100M BRDR-RCH, 4-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-06	AUTOMOTIVE C50 KIT 16-PORT 1G (SFP)/L2-3 SW
AUTO-C50-KIT-07	AUTOMOTIVE C50 KIT 4-PORT 10/1G (SFP+), 4-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-08	AUTOMOTIVE C50 KIT 4-PORT 10/100M BRDR-RCH, 4-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-09	AUTOMOTIVE C50 KIT 8-PORT 10/100M BRDR-RCH, 4-PORT 1G, 4-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-10	AUTOMOTIVE C50 KIT 4-PORT 10/1G (SFP+), 8-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-11	AUTOMOTIVE C50 KIT 8-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-12	AUTOMOTIVE C50 KIT 12-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-13	AUTOMOTIVE C50 KIT 4-PORT 10/1G (SFP+), 8-PORT 1G (SFP), 4-PORT WI-FI & L2-3 SW
AUTO-C50-KIT-14	AUTOMOTIVE C50 KIT 8-PORT 10/100M BRDR-RCH, 8-PORT 1G (SFP) & L2-3 SW
AUTO-C50-KIT-15	AUTOMOTIVE C50 KIT 4-PORT 10/1G (SFP+) & L2-3 SW
AUTO-C50-KIT-16	AUTOMOTIVE C50 KIT 4-PORT 1G (SFP), 8-Port N-BASE-T & L2-3 SW
AUTO-C50-KIT-17	AUTOMOTIVE C50 KIT 8-PORT 1G (SFP), 4-Port N-BASE-T & L2-3 SW
Base SW included with every HW Kit	
BPK-1001A	PACKET GENERATOR AND ANALYZER BASE PACKAGE A
Accessories	**Product Description**
AUTO-ACC-0012	COPPER SFP TRANSCEIVER 100BASE-T1
AUTO-ACC-0013	COPPER SFP TRANSCEIVER 1000BASE-T1
AUTO-ACC-6092A	COPPER SFP RJ-45 10/100/1000BASE-T
AUTO-ACC-6025A	1000BASE-SX GIG ETHER SFP TRANSCEIVER, MM 850NM, LC CONN
AUTO-ACC-6026A	1000BASE-LX GIG ETHER SFP TRANSCEIVER, SM 1310NM, LC CONN
AUTO-ACC-6092A	COPPER SFP RJ-45 10/100/1000BASE-T
AUTO-ACC-7001A	COPPER TRANSCEIVER 10GBASE-T SFP+, RJ45 CONNECTOR, 30M

Ospirent™
Promise. Assured.