

1735A 1, 2 and 4 Gb/s Fibre Channel Multi-Application Protocol Analyzer Module and Traffic Generator

Data Sheet



- Simplify your test environment by combining traffic generation, protocol analysis and performance test
- Accelerate your test development
- Reduce your expenditures for test equipment



Agilent Technologies

The 1735A 1, 2 and 4 Gb/s Fibre Channel multi-application protocol analyzer module and traffic generator

Applications

- Fibre Channel hardware prototype turn-on and debug
- Software debug and performance test of Fibre Channel equipment and components
- Storage area network (SAN) troubleshooting
- SAN fabric
 - services test
 - scalability test
 - stress test
- Robustness test with error injection and exception generations

Key features

- Multi-application module for both 1 Gb/s, 2 Gb/s and 4 Gb/s Fibre Channel protocol analysis and traffic generation (SAN tester mode)
- Modular, scalable, multiport, multiuser system
- Compatible with existing SAN tester modules when used in SAN tester mode
- Multilevel sequencer with multiway branching to trigger the analyzer on complex events conditions
- Easy trigger setup with predefined pattern library
- Hierarchical trace displaying capabilities
- Generates any combination of traffic for multiple ports and correlates in real time the test results for comprehensive system testing
- Configurable test port behavior to emulate various HBAs

The 1735A multi-application Fibre Channel test module

Combine traffic generation, protocol analysis and performance test to diagnose and characterize your system faster

As Fibre Channel fabrics grow in size and complexity, it becomes more difficult to identify the root cause of elusive, system-level problems. Designers and system-level validation teams need access to Fibre Channel traffic history on multiple nodes. To test effectively, they also need simultaneous analysis, cross triggering and time correlation on traffic flows on multiple nodes on the fabric.

To reproduce system problems or run non-regression tests, you often need to create traffic conditions that may be difficult to reproduce with real server and storage equipment. Fibre Channel traffic generators can accelerate the design/debug/test cycle by reproducing these conditions.

Now you can get the capabilities you need in a single test tool. The versatile 1735A multi-application protocol analyzer is a new-generation Fibre Channel test module that you can easily configure as either a dual Fibre Channel protocol analyzer or a 2-port traffic generation and performance measurement system. You can toggle back and forth between the two configurations by simply clicking an icon.

The module fits in a universal chassis that you can easily expand or upgrade. You can use either a 2-slot or 4-slot chassis for mobile or bench testing. You configure and monitor tests over the LAN through a convenient graphical user interface or TCL-based script for automated testing.

The modular system architecture supports from two to hundreds of time-synchronized test ports in a single test session; it can be reconfigured as your test needs change.

With this versatile architecture, you can use the same platform from the design phase to system deployment, installation and maintenance, so you reduce your expenditure on test equipment.

This common, scalable system for protocol analysis and traffic generation protects your financial investment for years to come.

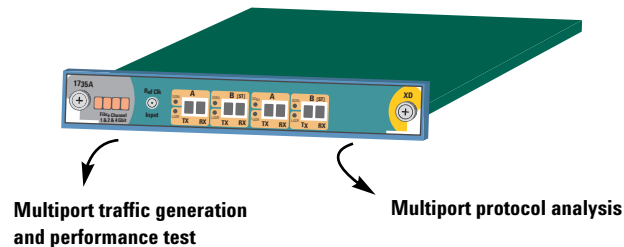


Figure 1. Toggle back and forth between the two configurations by simply clicking an icon.

Versatile system architecture



- ① Chassis (2 slot or 4 slot)
- ② 1735A test module
- ③ PC for local control of the system
 - 100 M LAN card for connection with chassis
 - 10/100 M LAN Card for connection to enterprise LAN (optional)
 - Click an icon to choose the test software you need:
 - Protocol analysis software
 - SAN tester software for traffic generation and performance test

From a lightweight portable system to large-scale test environment

The Agilent Fibre Channel test platform is a truly scalable environment. It can be used to capture traffic on-site and can scale up to hundreds of time-synchronized test ports generating wire-speed Fibre Channel traffic in a system integration lab.



The light weight 2-slot chassis can accommodate up to two test modules (four full-duplex Fibre Channel analyzers). It includes a built-in handle and soft carry bag and is recommended for test scenarios where portability and small size are important.

System features and benefits

Feature	Benefits
Expandable, modular system architecture	<ul style="list-style-type: none"> • Supports both small and large-scale SAN environments • Protects your financial investment for future needs
Multi-application modules	<ul style="list-style-type: none"> • Minimizes the number of test devices needed to create a SAN test environment • Common architecture for debug, performance and system validation tests
Test customization and automation with TCL	<ul style="list-style-type: none"> • Automates tedious testing • Repeats tests for subsequent product builds • Creates and automates your specific test procedure • Performs regression tests

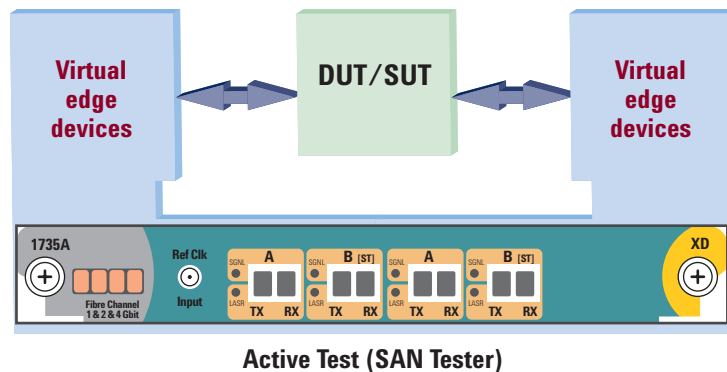


Typical configurations

Active tester configuration (SAN tester)

- In active tester mode (SAN tester mode), each 1735A module includes two test ports that can simulate multiple independent devices generating wire-speed traffic to the DUT.
- The 1735A can then be used to test performance of network semiconductors, networking equipment (switches and directors), or large fabrics.
- Each test port can be configured in N_port or L_port mode.

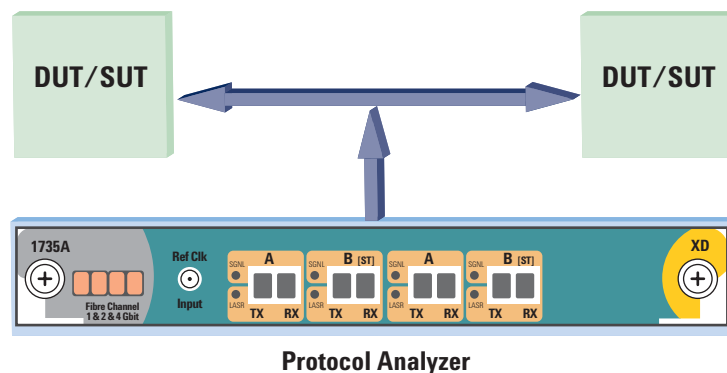
- Each device can be configured to mimic HBA's initialization process.
- Traffic load can be modified in real time to identify the knee of the system's performance curve.
- Each test port acquires continuous real-time traffic statistics for a detailed view of system performance.
- Performance measurements include throughput, latency, lost frames, and sequence errors.



Protocol analysis configuration

- In passive test mode (protocol analyzer), the 1735A transparently captures traffic between two real devices.
- Each 1735A includes two independent full duplex analyzers.

- All analyzers can be synchronized and cross triggered for multi-port system analysis.
- Each analyzer includes a multilevel sequencer to trigger the analyzer on complex event conditions.



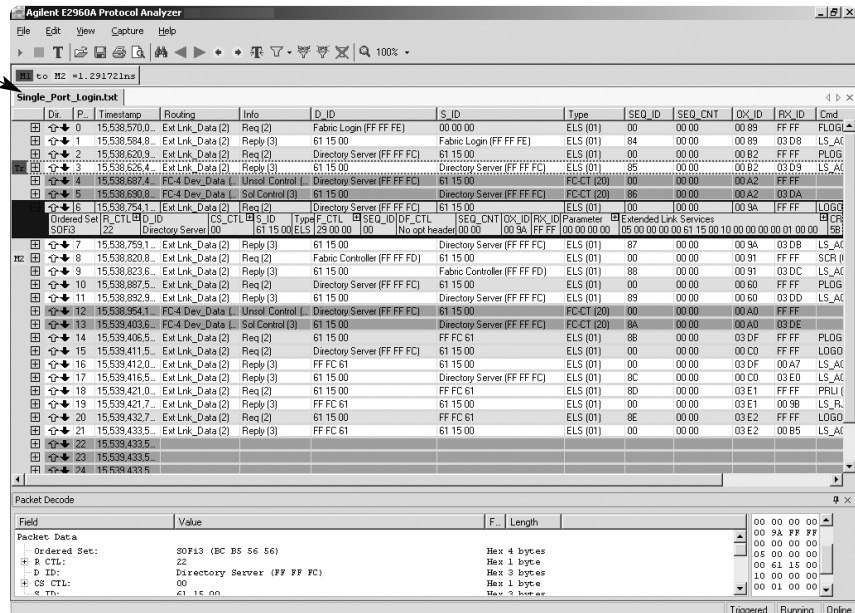
Protocol analysis application gives you fast insight into your system

All-in-one window gives you easy visibility into Fibre Channel traffic

- Traffic activity, port link status, trigger status, and trace content are simultaneously displayed

Hierarchical trace display speeds your debug process

- Avoid constant scrollings with the hierarchical display that maximizes information density on the screen
- Compare frames details by zooming on multiple lines
- Easily retrieve information with embedded markers
- Quickly find problems with automatic error detection
- Simultaneous display of 8b/10b/decoding and tree detection
- FC-2 decoding capabilities (basic and extended link services)



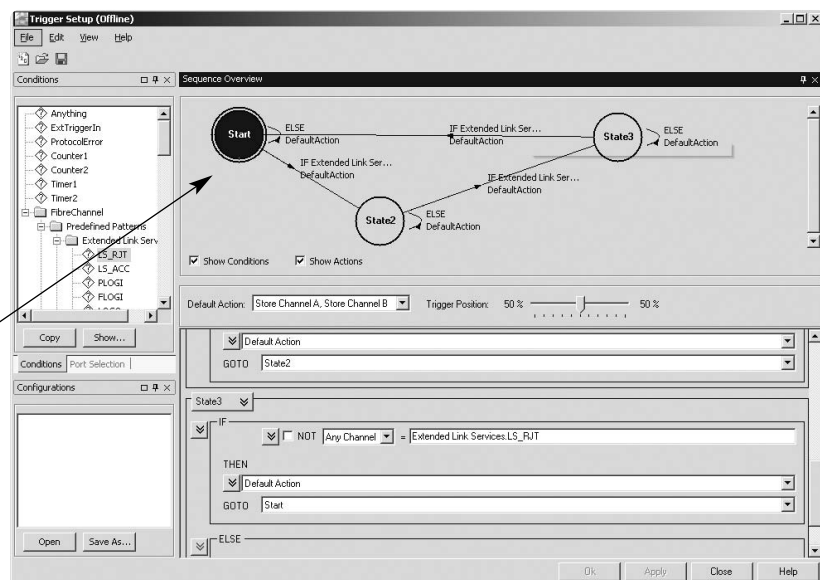
Dir	P	Time/Stamp	Routing	Info	D_ID	S_ID	Type	SEQ_ID	SEQ_CNT	DX_ID	RK_ID	Cmd
0	15:53:570.0	Ext Link_Data (2)	Req (2)	Fabric Login (FF FF FE)	00 00 00	00 00 00	ELS (01)	00	00 00	00 89	FF FF	FLOGI
1	15:53:594.8	Ext Link_Data (2)	Reply (3)	Fabric Login (FF FF FE)	61 15 00	61 15 00	ELS (01)	84	00 00	00 89	03 08	LS_At
2	15:53:620.9	Ext Link_Data (2)	Req (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	00	00 00	00 B2	FF FF	PLOGI
3	15:53:626.4	Ext Link_Data (2)	Reply (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	85	00 00	00 B2	03 09	LS_At
4	15:53:687.4	FC-4 Dev_Data (1)	Unsol Control (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	FC-CT (20)	86	00 00	00 A2	FF FF	LOGO
5	15:53:690.8	FC-4 Dev_Data (1)	Sol Control (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	FC-CT (20)	86	00 00	00 A2	03 DA	LOGO
6	15:53:754.1	Ext Link_Data (2)	Req (2)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	00	00 00	00 9A	FF FF	LOGO
7	15:53:793.1	Ext Link_Data (2)	Reply (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	87	00 00	00 9A	03 DB	LS_At
8	15:53:820.8	Ext Link_Data (2)	Req (2)	Fabric Controller (FF FF FD)	61 15 00	61 15 00	ELS (01)	00	00 00	00 91	FF FF	SCH I
9	15:53:823.6	Ext Link_Data (2)	Reply (3)	Fabric Controller (FF FF FD)	61 15 00	61 15 00	ELS (01)	88	00 00	00 91	03 DC	LS_At
10	15:53:887.5	Ext Link_Data (2)	Req (2)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	00	00 00	00 60	FF FF	PLOGI
11	15:53:892.9	Ext Link_Data (2)	Reply (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	89	00 00	00 60	03 DD	LS_At
12	15:53:954.1	FC-4 Dev_Data (1)	Unsol Control (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	FC-CT (20)	8A	00 00	00 A0	FF FF	LOGO
13	15:53:403.6	FC-4 Dev_Data (1)	Sol Control (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	FC-CT (20)	8A	00 00	00 A0	03 DE	LOGO
14	15:53:406.5	Ext Link_Data (2)	Req (2)	FF FC 61	61 15 00	61 15 00	ELS (01)	88	00 00	03 DF	FF FF	PLOGI
15	15:53:411.5	Ext Link_Data (2)	Req (2)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	00	00 00	00 C0	FF FF	LOGO
16	15:53:412.0	Ext Link_Data (2)	Reply (3)	FF FC 61	61 15 00	61 15 00	ELS (01)	00	00 00	03 DF	00 A7	LS_At
17	15:53:416.5	Ext Link_Data (2)	Reply (3)	Directory Server (FF FF FC)	61 15 00	61 15 00	ELS (01)	8C	00 00	00 C0	03 E0	LS_At
18	15:53:421.0	Ext Link_Data (2)	Req (2)	FF FC 61	61 15 00	61 15 00	ELS (01)	8D	00 00	03 E1	FF FF	PRLI
19	15:53:421.7	Ext Link_Data (2)	Reply (3)	FF FC 61	61 15 00	61 15 00	ELS (01)	00	00 00	03 E1	00 98	LS_R
20	15:53:432.7	Ext Link_Data (2)	Req (2)	FF FC 61	61 15 00	61 15 00	ELS (01)	8E	00 00	03 E2	FF FF	LOGO
21	15:53:432.6	Ext Link_Data (2)	Reply (3)	FF FC 61	61 15 00	61 15 00	ELS (01)	00	00 00	03 E2	00 B5	LS_At
22	15:53:433.5											
23	15:53:433.5											
24	15:53:433.5											

Packet Decode

Field	Value	Length
Packet Data		
Ordered Set:	80F13 (BC B5 56 56)	Hex 4 bytes
P_CTL:	22	Hex 1 byte
D_ID:	Directory Server (FF FF FC)	Hex 3 bytes
S_CTL:	00	Hex 1 byte
S_ID:	61 15 00	Hex 3 bytes

Multipoint display for better insight into your system

- Traces captured from multiple ports are displayed with common time-stamp and common markers.
- Multiple analyzers can share events for sophisticated cross triggering.



Powerful triggering, easy setup

- Easy trigger setup by dragging predefined patterns from the pattern library
- Quickly understand the trigger configuration with the bubble chart
- Trigger on handshaking problems with the dual direction sequencer. The sequencer can be easily configured to detect events such as FLOGI, ACC, PLOGI then time-out.

Customize your measurements with test automation and scripting capabilities

- TCL script capabilities for test automation and customized test development

Technical specifications for protocol analysis

Physical interface

Number of ports	Two pairs of Fibre Channel ports per test card - up to four test cards per chassis. Can be configured in four ports as an analyzer or two ports as a SAN tester.
Line rate	1.0625, 2.125 or 4.25 Gigabits/second (Gb/s). Industry Standard SFP Interface. Shipped with 850 nm SFP.

Protocol analysis (analyzer mode)

Analyzers	Two independent, dual port, full-duplex analyzers per module. Each analyzer has its own triggering and filtering resources.
Traffic capture	Each analyzer captures bidirectional traffic between two fibre channel devices
Memory size	1 GB per analyzer (2 GB per module)
Trigger	Two independent multilevel trigger sequencers per module with multiway branching
Dual channel	Trigger on sequence of events in both directions (Tx and Rx)
Sequencer	Eight states per sequencer
Resources	Two counter/timers (for trigger on time-outs) per sequencer
Pattern matchers	Eight 128-byte pattern matchers (primitives or frames) with associated local occurrence counters
Global timers	Two 48-bit (7-day) global timers with associated reset
Counters	Two 24-bit global counters that count up/down and have an associated reset
Combinations	'AND' or 'OR' conditions between pattern matchers
Cross triggering (internal)	Cross-module arm in/out for inclusion in sequencer events coming from another analyzer
Cross triggering (external)	One external trigger in/out per chassis
Filters	Hardware filter conditions can be defined individually for each sequence level
Error detection	Disparity, code violation, CRC error, undersize frames, oversized frames, loss of synch
Frame truncation	Beginning at the SOF, specified number of FC words are captured to memory - effectively deepening the trace
Resolution	8.3 ns TimeStamp resolution
Time correlation	All analyzers in the same session share the same clock to allow for time-correlated measurements. Time correlation on up to 128 modules (256 analyzers).
Search	High-speed hardware assisted search
Trigger in/out	One external trigger in/out per chassis

Programming languages

Programming languages	Tcl/Tk with graphical interface
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SAN tester application helps you characterize your system's performance under multiple traffic conditions

All-in-one window gives you easy visibility into your system's performance

- Traffic activity, port link status, Traffic Configuration and real time statistics simultaneously displayed

Perform realistic tests with device emulation

- Simulate various test scenarios by setting each device the way you want
- Minimize the number of real devices needed to create a large-scale test environment

Increase test coverage with configurable traffic generation

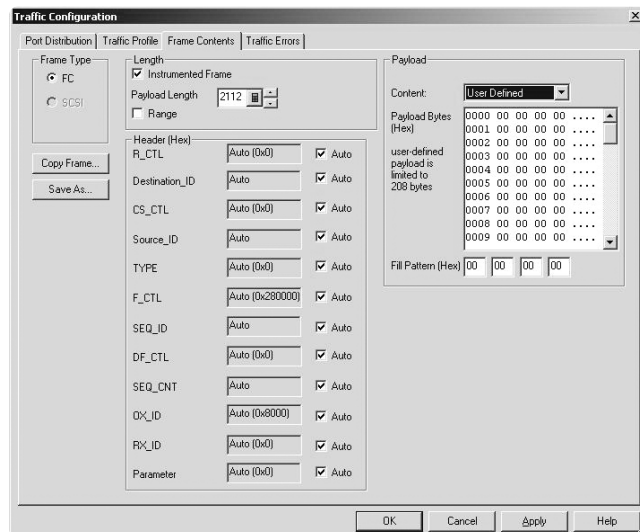
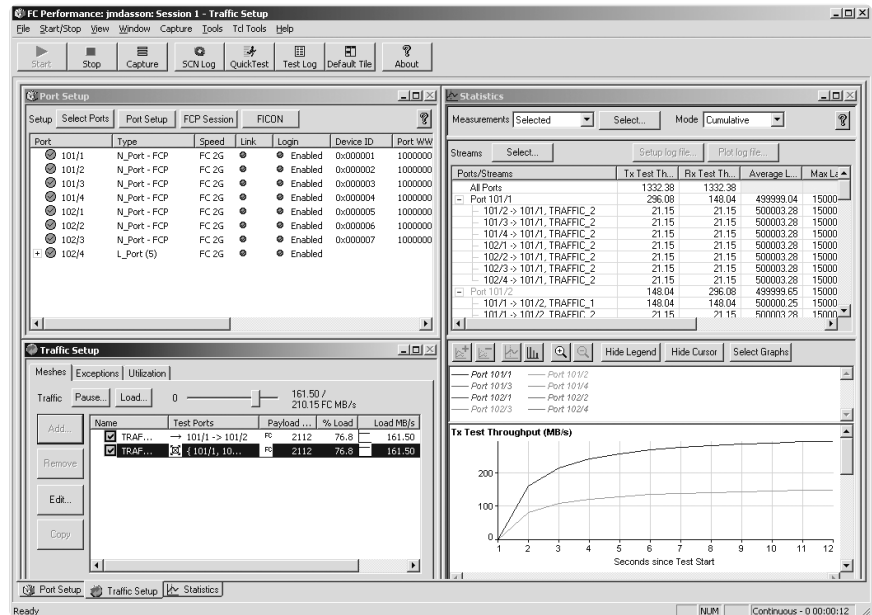
- Use a wide range of specific real-world traffic conditions
- Validate the boundary conditions of SAN fabrics and components
- Generate any combination of traffic for multiple ports and correlates the test results across time for comprehensive system testing

Real-time statistics help you see immediate changes in your system's performance

- Acquires continuous real-time statistics for a detailed view of system performance
- Guarantees real-time measurements regardless of test system size

Customize your measurements with test automation and scripting capabilities

- Automates tedious testing.
- Repeats tests for subsequent product builds
- Creates and automates your specific test procedure
- Performs regression tests



Technical specifications for SAN Tester application

Physical interface

Number of ports	Two Fibre Channel test ports per test card - up to four test cards per chassis. Can be configured in four ports as an analyzer or two ports as a SAN tester
Line rate	1.0625, 2.125 or 4.25 Gigabits/second (Gb/s). Industry Standard SFP Interface. Shipped with 850 nm SFP.

Traffic generation (SAN tester mode)

Number of ports	Two ports for traffic generation
Rate	Full line speed rate
Port type	N_port, Arbitrated loop port (including up to 126 loop devices)
Port behavior	Control of port initialization either as FCP or FICON port. FCP includes control of Flogi, NS registration, RSCN, Discovery, NS Query. FICON includes control of Flogi, QSA, RNID, RSCN, LIRR
Classes of service	Class 2 (FICON initialization) and Class 3 traffic
Traffic profiles	15
Traffic streams	256 streams per port
Oversized frame	Oversized frames traffic generation and capture. Frames will be captured in the trace buffer, but they will cut off at 2136 bytes and will be flagged as oversized and invalid.
Interframe gap	Adjustable from 3 to 1000
Minimum frame length	Transmitted: 24 bytes, Received: 24 bytes
Buffer-to-buffer credit	Adjustable from 1 to 256
Error generation	Aborted frame, CRC error, oversized frame, invalid SOF, invalid EOF

Measurements (SAN tester mode)

Measurements	24 real-time measurements including throughput, latency, dropped frames, disparity errors, BB credit, failover recovery time
Result types	Cumulative: measurements are reported from the start of the measurement interval. Sampled: measurements are reported from the most recently completed sampling interval.
Measurement clock resolution	10 ns resolution; ± 0.5 ppm/year clock drift; 3 ppm maximum difference between cards
Measurement interval	Range: 1 second to 7 days
Display sampling interval	Range: 1 second to 1 hour
Test card synchronization	All measurements are synchronized across all test cards within the SAN Test System.

Capture memory (SAN tester mode)

Capture memory	32MB real time memory per port.
Capture triggers	Eight patterns per port, as well as triggering capabilities on statistics (throughput, latency, sequence error)

Fabric service test

Fabric service test	<ul style="list-style-type: none">• Zone test• Name server performance• Name server command coverage• State change notification latency
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Programming languages

Programming languages	Tcl/Tk with graphical interface
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How to configure a system

The Agilent SAN test system consists of a Windows®-based system controller and one or more chassis containing SAN test cards. The system controller provides a graphical interface to drive protocols and applications running on the test cards.

This flexible test system will be compatible with new Agilent SAN test cards in the future, thereby securing your initial investment.

System controller

Several system controllers are available to meet your performance requirements. The controller provides an easy-to-use Windows environment for running the test system software.

Fibre Channel test card

High-density, scalable Fibre Channel SAN test cards are equipped with powerful traffic-generation and measurement capabilities. Each test card houses four ports of Fibre Channel at 1 Gb/s and 2 Gb/s (model 1730B) or 2 Gb/s and 4 Gb/s (model 1733A).

These and future SAN test cards will fit within the chassis. Each test card features its own CPU and distributed processing power that allows synchronized performance measurements across multiple chassis.

Chassis

The compact, 4-slot, 2U-high chassis houses up to 16 ports of Fibre Channel SAN. An ultra-compact 2-slot chassis houses up to eight ports of Fibre Channel SAN.

You can easily daisy-chain multiple chassis to support hundreds of test ports in a single test system. You can move hot-swappable test cards between chassis without affecting other test sessions.

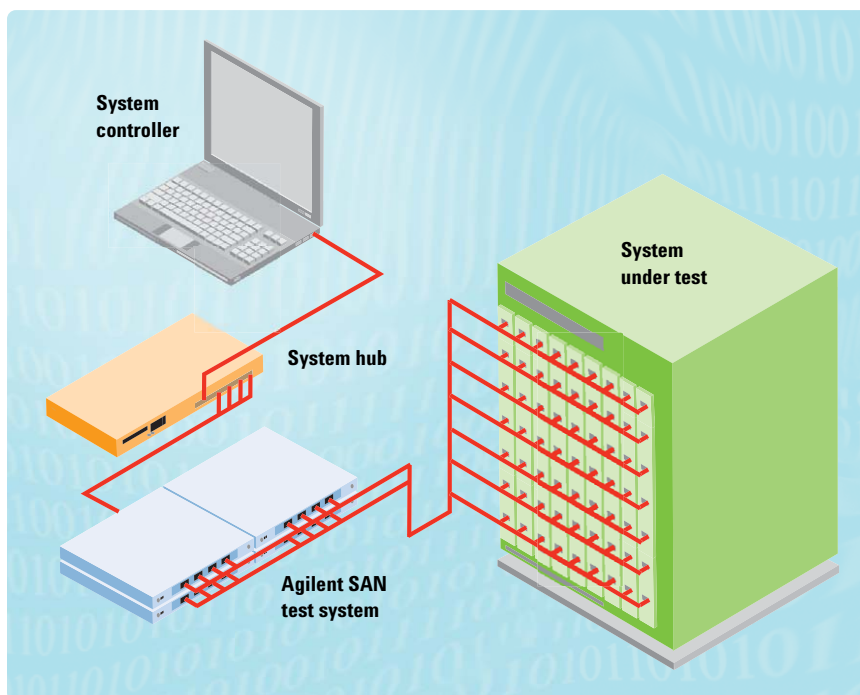


Figure 8. system controller and SAN test chassis filled with four Fibre Channel test cards.

Mechanical specifications

Physical (per card)	Width: 206 mm (8.11 in)
	Depth: 313 mm (12.32 in)
	Height: 30 mm (1.18 in)
	Weight: 875 g
Electrical (per card)	Power consumption: 32 W typical; 110 W maximum. (8 W per port)
Environmental	Operating temperature: 0 °C to 50 °C
	Storage temperature: -40 °C to 70 °C
	Humidity: 50% to 95% relative humidity at 5 °C to 40 °C

Ordering information

Agilent product number	Description
Test card	
1735A Option A00	2-port 1/2/4Gbps Fibre Channel test card includes 850 nM SFP Fibre Channel protocol analysis license and software
1735U Option A00	Module Upgrade Kit Fibre Channel protocol analysis license and software
Chassis	
N5540A	2-slot, 2U-high chassis
N5541A	4-slot, 2U-high chassis
N5542A	4-slot, 2U-high chassis with BITS clock
SAN tester software	
1731A	SAN tester PC controller software and license
1734A	Capture software license for SAN tester. This license enables the real-time protocol capture capabilities embedded in each SAN tester port.
1732A	Software enhancement service (one year of software upgrades - included in 1731A and 1734A)
System controller	
N5543A Option 120	Portable laptop system controller
N5544A Option 120	Standard 1U rack-mount server controller. Pentium® 1.13 GHz, 512-MB RAM, 2 LAN cards; includes switch. Software instant ignition for 1730x.
N5545A Option 120	High-performance 1U rack-mount server controller. Pentium 1.13 GHz twin processor, 2-GB RAM, 2 LAN cards; includes switch. Software instant ignition for 1730x.
Option AQ2	15-inch flat panel display: 1024 x 768
Accessories	
E7900-64207	Chassis-to-chassis cable. (Required for multi-chassis configuration)
E7900-64208	Rack-to-rack-cable. (Required for multi-rack configuration)
E7900-80002	Transit case

Typical configuration

N4541A	4- slot chassis
1733A	2 and 4 Gb/s SAN test card
N5543A Option 120	Laptop with preloaded software
1731A	SAN tester software license
1734A	Capture software license

Related Literature

Publication Title	Publication Type	Publication Number
<i>Agilent Technologies 1730 Series Storage Area Network (SAN) Test Solutions</i>	Color Brochure	5988-6806EN
<i>RouterTester 900 4-Slot Chassis</i>	Data Sheet	5988-5000EN, Rev B
<i>Fibre Channel SFP Optical Transceiver</i>	Data Sheet	5988-6974EN

Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at:
www.agilent.com/find/fctester

To order and configure the test system, consult your local Agilent sales engineer.

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