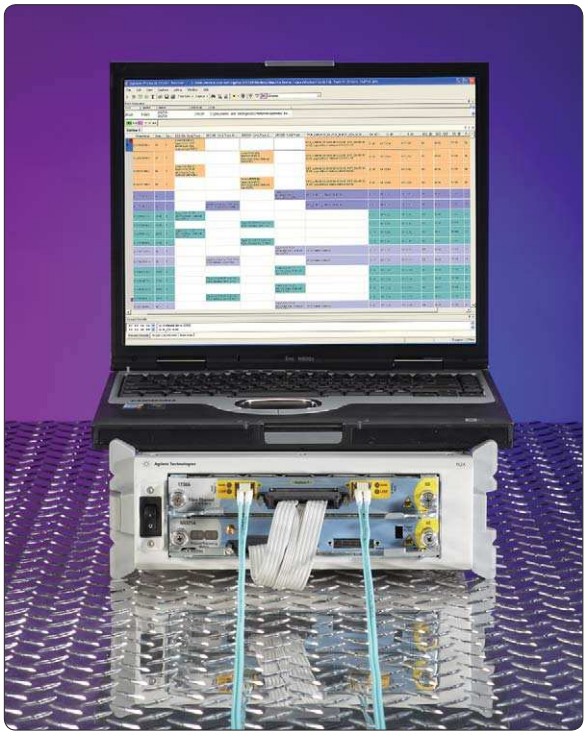
1736A 1, 2, 4 and 8G Fibre Channel Dual Purpose Module

SAN Tester and Protocol Analyzer

Data Sheet



- **Simplify Test Environment:** Traffic Generation, Performance Test and Protocol Analysis all in one hardware.
- **Time to Market:** Accelerate your development and QA cycle.
- **Total Cost of Ownership:** Reduce your test equipment expenditure.

Agilent Technologies

1736A 1, 2, 4 and 8G Fibre Channel Dual Purpose Module - SAN Tester and Protocol Analyzer

Applications

- Fibre Channel hardware and ASIC turn-on and debug
- Performance and scalability test of Fibre Channel equipment and components
- Error injection and negative test of Fibre Channel equipment and components
- Storage area network (SAN) deployment testing and troubleshooting
- SAN fabric
  - services test
  - scalability test
  - stress test
- Recreate realistic network scenarios to aid debug and troubleshooting

Key features

- Dual purpose module for SAN testing (traffic generation) and protocol analysis Fibre Channel 1, 2, 4 and 8G.
- Dual channel trigger sequencer in the Protocol Analyzer to trigger on complex events conditions
- Easy to use drag and drop trigger, search and filter setup with predefined pattern library
- Easy Flow and Context Sensitive display provides a fast way of understanding protocol interactions in the trace
- Flexible multi-port traffic generation and real time statistics for comprehensive system testing
- Configurable test port behavior to emulate various HBAs, and various topologies (N_Port, or L_Port)
- Flexible Link layer (FC-1) error injection and negative test on demand
- Extensive and well documented Application Programming Interface (API) for automation and regression testing
- Compatible with all existing 173x Series test modules and chassis, to protect your investment.
- Multiuser, modular and scalable system

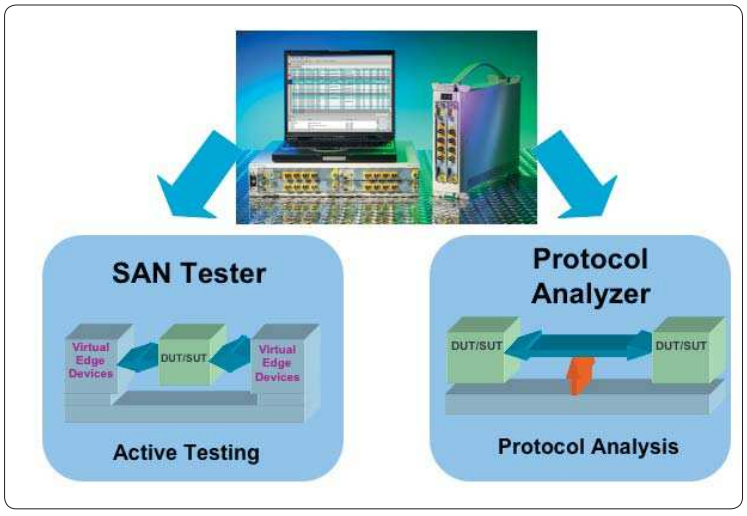


Figure 1. Toggle back and forth between the two configurations by simply clicking an icon.

1736A 1, 2, 4 and 8G Fibre Channel Dual Purpose Module - SAN Tester and Protocol Analyzer

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

The next generation of Fibre Channel runs at 8.5 Gb/s, a doubling of the speed that has an exponential effect on the complexity that designers and system-level validation teams face. To test effectively, you need traffic generation tools to create realistic traffic conditions to exercise and stress their designs before real servers or storage equipment at 8.5 Gb/s are available. Traffic generators (SAN Tester) are the tools of choice here, because they can emulate many different topologies (N_Port or L_Port), simulate different HBA behavior, and can be configured to create stressful scenarios to improve the test coverage in general.

If problems are uncovered during the testing, then Protocol Analyzers are used to further debug and troubleshoot the issue at hand. At the very high data rates of 8.5 Gb/s, it is imperative the protocol analyzer used has a sophisticated triggering system to ensure that the event of interested is captured in the trace. Further more, protocol analyzers need to provide intuitive visualization capabilities to highlight the protocol interactions to the user.

Agilent's 1736A solution is unique because it provides both the SAN Tester and Protocol Analyzer capabilities in a single test tool. The 1736A can be configured as either a Protocol Analyzer or a SAN Tester (traffic generator) by simply clicking an icon.

The 1736A 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.

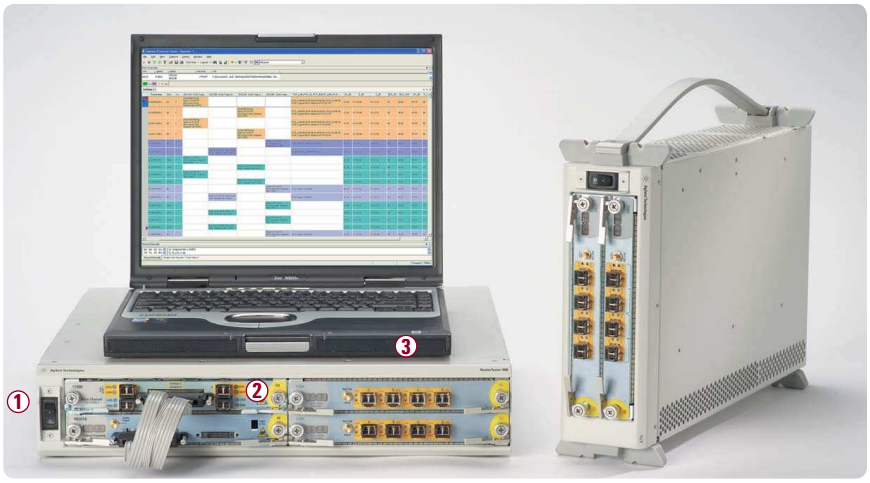
Active test configuration (SAN tester)

- In active test mode (SAN tester mode), both the 1736A module and the 1736AB includes two test ports that can simulate multiple independent devices generating wire-speed traffic to the DUT.
- The 1736A can 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 an 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.

Passive test configuration (Protocol Analyzer)

- In passive test mode (protocol analyzer mode), the 1736A transparently captures traffic between two real devices.
- All analyzers can be synchronized and cross triggered for multi-port system analysis.
- Each analyzer includes a multilevel, state machine based sequencer to trigger the analyzer on complex event conditions.

Versatile system architecture



① Chassis (2 slot or 4 slot)
② 173x Series test module
③ PC Controller to manage and interact with 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

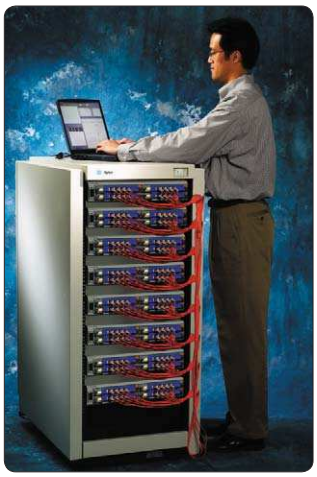
From a lightweight portable system to large-scale test environment

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 be used for troubleshooting in the field. It includes a built-in handle and soft carry bag and is recommended for test scenarios where portability and small size are important.

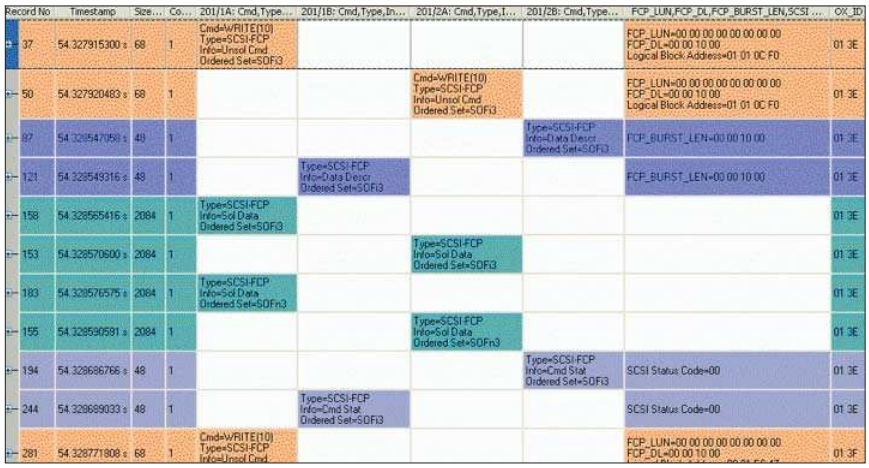
System features and benefits

Feature	Benefits
Expandable, modular system architecture	• Supports both small and large-scale SAN environments • Protects your financial investment for future needs
Multi-application modules	• Minimizes the number of test devices needed to create a SAN test environment • Common architecture for debug, peformance and system validation tests
Multi-protocol platform	• Correlated analysis of multiple technologies, providing the clarity of a full system view of DUT. For example, correlated PCI Express and Fibre Channel analysis provides full system view of a HBA or storage IC.
Test customization and automation with TCL	• Automates tedious testing • Repeats tests for subsequent product builds • Creates and automates your specific test procedure • Performs regression tests



Protocol analysis application gives you fast insight into your system

Agilent's protocol analyzer helps you troubleshoot by funneling large amounts of information from multiple locations into smaller and more manageable data set for easy analysis. This funneling is achieved by using an array of powerful features including Triggering, Visualization, Search and Filter and Post Analysis.



Powerful Triggering

Troubleshooting at data rates of 1, 2, 4 or 8G, it is hard to ensure that the error event you are looking for is captured in the analyzer trace. Agilent's trigger system can help you capture elusive issues with the least number of mis-triggers.

- Resolve complex issues speedily with Agilent's dual channel trigger sequencer
- Quickly understand the trigger configuration with the state diagram
- Drag and drop from an extensive predefined patterns library to easily setup triggers

Flexible Visualization

Flexible and customizable visualization is key to understanding large amounts of data. Agilent's flexible GUI provides a clear visualization of device interaction.

- Easy Flow layout clearly highlights the protocol interactions
- Context sensitive columns minimize the amount of scrolling and maximize information density
- Predefined views including Virtual Fabric (VFT), Arbitrated Loop, etc allows you to quickly switch to the appropriate view for your debugging task

Fast Search & Filter

Search and filter functions are critical in helping find relevant events in a large trace. If these tools are slow, they can become a frustrating impediment to gaining a full understanding of your system's operation.

- Hardware based searching and filtering can turn minutes of searching into seconds
- Independent filtering with multiple listings helps you isolate the conversation (between single initiator and target) you are debugging without the distraction of irrelevant frames from other conversations.

Post Analysis

Agilent's 173x Series Fibre Channel Protocol Analyzer, in tandem with SanAlytics post processing software provides additional insight into your trace, letting you focus on more challenging tasks.

- Quickly find protocol errors in the trace by using SanAlytics Fault View
- Graph views show performance at the SCSI or Fibre Channel level to help reveal performance issues quickly; a dramatic improvement over the conventional method of using spreadsheets.

Technical specifications for protocol analysis

1736A Physical interface

Number of ports	One bi-directional Fibre Channel analyzer per test card - 2 channels. Can be configured as 1 bi-directional analyzer or used in the SAN tester application as two SAN tester ports
Line rate	1.0625, 2.125, 4.25 or 8.50 Gigabits/second (Gb/s). Industry Standard SFP Interface. Shipped with 850 nm SFP.

Protocol analysis (analyzer mode)

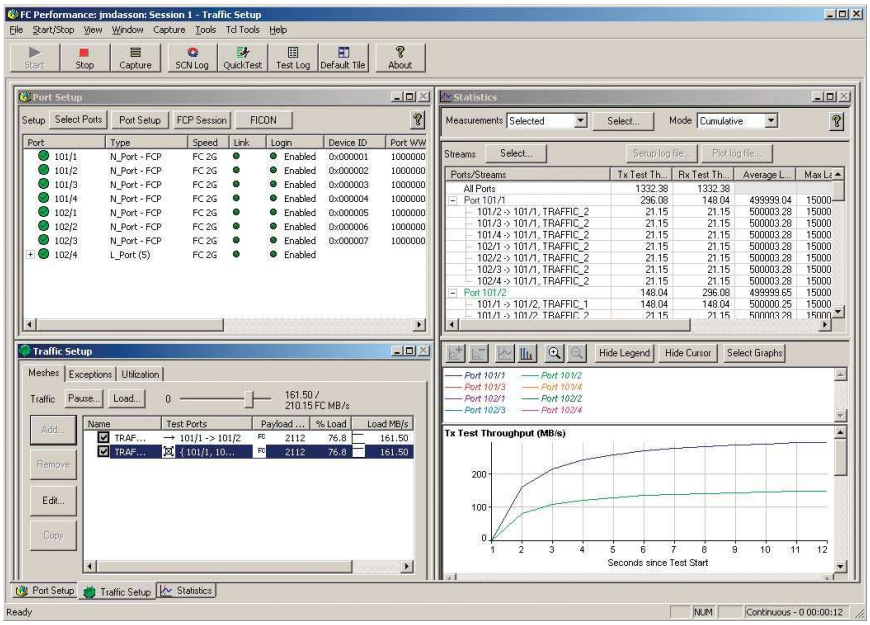
Analyzers	Each analyzer has its own triggering and filtering resources.
Traffic capture	Each analyzer captures bidirectional traffic between two fibre channel devices
Memory size	1 GB per analyzer (2 GB per module)
Trigger	Multi-state, multi-level trigger sequencer per analyze
Dual channel	Trigger on 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	10 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 40 modules (80 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

SAN tester application helps you characterize your system's performance under realistic network 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

SAN tester provides realistic device emulation to help you quickly reproduce your customer's environment, allowing you to minimize the number of real devices required for large scale test.

- Each port can emulate either a Fibre Channel Node device (N_Port) or a large number of Arbitrated Loop (AL_Port) devices.
- Each device can behave as standard Fibre Channel devices, or to take on non-standard behavior for boundary condition testing.
- Dynamic, and configurable HBA behavior including automatic login, register for state change notification registration, and fabric services testing.

Increase test coverage with configurable traffic generation

Testing using stressful network conditions ensures on time product delivery that meets your customer's expectations. Agilent's SAN Tester, can create a wide range of specific real-world traffic conditions.

- Hardware based traffic generation technology generates traffic at 1, 2, 4 or 8 Gb/s.
- User configurable frame header fields, frame size, inter-frame gap size, buffer-to-buffer credit behavior, error type, and more.
- Easily configure traffic sources and destinations in a point-to-point or a meshed configuration.
- Flexible data link level errors (FC-1) can be generated on demand to validate performance under negative conditions.

Immediately see your system's performance with Real-time statistics

You can monitor "live" measurement results while a test is running for better insight into how your DUT is performing.

- Real-time statistics include throughput, latency (min/avg/max), lost frames, and error counters.
- Real-time measurements are presented in both tabular and graphical format, allowing you to identify performance issues quickly.
- Real-time measurements are guaranteed regardless of the scale of your test system.

Test customization and automation

Automate tests that would be too tedious or imprecise to do manually or repeatedly through the GUI with the built in TCL/TK Application Programming Interface (API).

- Predefined test suite for common test cases to save your time and accelerate your testing.
- All SAN Tester features and capability are accessible through the API.
- Integrate the SAN Tester into your regression environment to ensure high quality releases.

Technical specifications for SAN Tester application

1736A Physical interface	
Number of ports	Two Fibre Channel test ports for the SAN tester application. Can be configured as 1 bi-directional analyzer (2 channels) or used in the SAN tester application as two ports.
Line rate	1.0625, 2.125, 4.25 or 8.50 Gigabits/second (Gb/s). Industry Standard SFP Interface. Shipped with 850 nm SFPs.

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, idropped SOF, dropped EOF, LOS, invalid ordered sets

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 tester application.

Capture memory (SAN tester mode)	
Capture memory	64 MB 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	• Zone test • Name server performance • Name server command coverage • State change notification latency

Programming languages	
Programming languages	Tcl/Tk with graphical interface

How to configure a system

The Agilent 173x Series SAN test system consists of a Windows®-based system controller and one or more chassis containing Agilent 173x 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 test cards in the future, thereby securing your 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. There are many types of cards to choose from depending on your test needs.

- 1733A – 2G and 4G, 4-port active test card
- 1735A – 1G, 2G, and 4G 2 port multi-application (active and passive) test card.
- 1736A - 1G, 2G, 4G and 8G dual-purpose (SAN Tester and protocol analyzer) Fibre Channel Interface Module (2 port). Requires a N5321A module.
- N5321A - Protocol Processing Module. Only required with the 1736A module.

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.

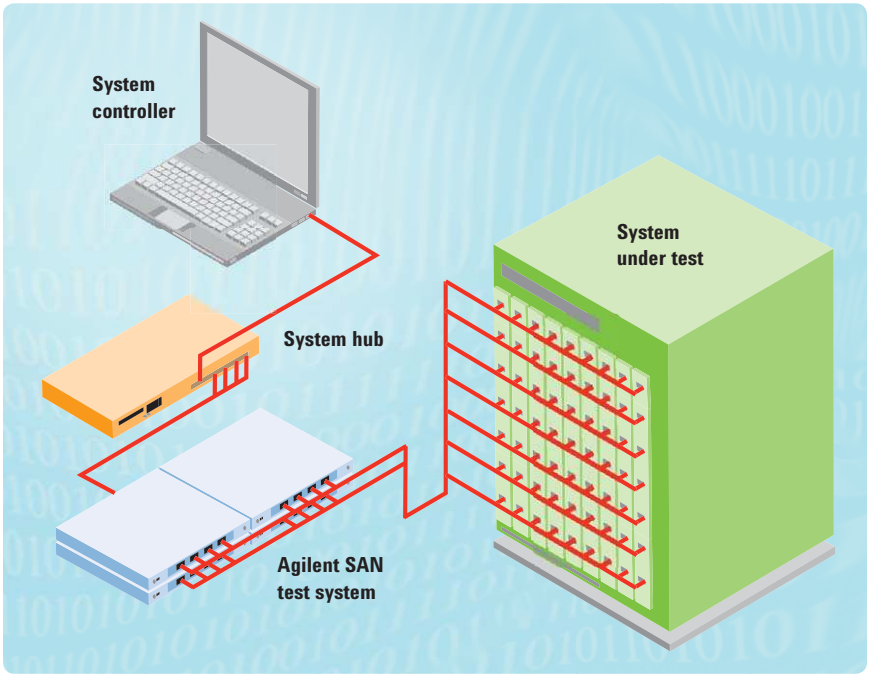


Figure 8. system controller and SAN test chassis filled with four Fibre Channel test

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 Cards	
1736A	1, 2, 4 and 8 Gb/s Fibre Channel Interface Module (2 ports)
Option ST0	SAN tester application License
Option A00	Fibre Channel Protocol Analysis License
Option P00	Fibre Channel Protocol Analysis License with Premium SanAlytics Software
N5321A	Protocol Processing Module
Chassis	
N5540A 2-slot	2U-high chassis
N5541A 4-slot	2U-high chassis
N5542A 4-slot	2U-high chassis with BITS clock
System controller	
N5543B Option 120	Portable laptop system controller
N5544B Option 120	Standard 1U rack-mount server controller. Pentium® 2.4 GHz, 1-GB RAM, 2 LAN cards; includes switch. Software instant ignition for 1730 Series products.
N5545B Option 120	High-performance 1U rack-mount server controller. Pentium 2.8 GHz twin processor, 4-GB RAM, 2 LAN cards; includes switch. Software instant ignition for 1730 Series products.
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	
N5541A	4- slot chassis
N5543B Option 120	Laptop with preloaded software
1736A	1, 2, 4 and 8 Gb/s Fibre Channel Interface Module
N5321A	Protocol Processing Module
1736A-ST0	Fibre Channel SAN tester License
1736A-A00	Fibre Channel Protocol Analyzer License

Related Literature

Publication Title	Publication Type	Publication Number
Agilent Technologies 173x Series Storage Area Network (SAN) Test Solutions	Color Brochure	5988-6806EN
N2X 4-Slot Chassis (N5541A)	Technical Data Sheet	5989-1531EN
1733A 2 and 4 Gb/s Fibre Channel SAN Tester	Data Sheet	5988-7227EN
1735A 1, 2 and 4 Gb/s Fibre Channel Multi-application Protocol Analyzer and Traffic generator	Datasheet	5989-1661EN

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