



THE POSSIBILITIES ARE INFINITE



Fujitsu and LSI Logic Drive Ready-to-Go SAS Storage Systems Through Proven Compatibility

<http://lsi.com/storage>
<http://www.fcpa.fujitsu.com/products/hard-drives/may-sas/>

SUMMARY ABSTRACT

LSI and Fujitsu Computer Products of America are driving the transition from SCSI to Serial Attached SCSI (SAS). Both companies have embarked on a full-scale effort to validate drive and Host Bus Adapter (HBA) compatibility with SAS server and storage enclosures. Compatibility has been proven through the efforts of the Fujitsu Firmware and Compatibility Testing (FACT) Lab™.

Understanding that SAS is both an evolutionary and revolutionary change in technology, proving compatibility is critical to supplying reliable storage systems. The Fujitsu FACT Lab provides a perfect environment for testing the LSI SAS controller products with different enclosures and Fujitsu hard disk drives (HDDs). Through extensive testing in the FACT Lab, Fujitsu and LSI have successfully proven compatible systems for integration.

Enabling the SAS market through interworking products comes at a critical time. Industry analysts anticipate that SAS market share will grow to 60% by 2007. Fujitsu provides both small form factor (2.5") HDDs and 3.5" HDDs to meet the market demand, and are currently shipping their second generation products.

First-to-market SAS controller and expander



Fujitsu SAS hard disk drive

TIME-TO-MARKET GOAL ACHIEVED

The SCSI interface has been the single, most successful storage industry interface for more than 20 years, powering generation after generation of workstation, server and enterprise storage systems. Now with Serial Attached SCSI technology replacing parallel SCSI implementations, LSI and Fujitsu are at the industry's forefront, supplying hard disk drive products and SAS components to server OEMs and system integrators.

Pre-Tested Solutions Take the Guesswork Out of SAS Interoperability

The Fujitsu FACT Lab has tested the following 2.5" SAS enclosures with the LSI SAS3442X-R Host Bus Adapter (HBA), and industry leading Fujitsu 2.5" SAS hard disk drives.

AIC
Enhance | Technology, Inc.



Rancho SysTech Inc

SUPERMICR

Additional information on page 4

Serial Attached SCSI Continues to Show Growth...



Underscoring commitment to the channel, SAS products are now also available to integrators, resellers and whitebox manufacturers. Channel customers have been among the first to implement SAS applications.

One key to success has been the collaboration between companies like LSI Logic and Fujitsu, as well as many others, in the development of open standards such as the SAS specification. With clearly defined standards, all companies can strive toward the same goals and thereby have products that meet the needs of the industry.

"SAS is seen by the industry as an extremely important interface ranging from large computer installations to small home office environments" states Mike Fitzpatrick, Sr. Research Executive, Fujitsu Computer Products of America and Chairman of the SCSI Trade Association's SAS Plugfest Technical Committee. "Since 2004, the SCSI Trade Association, in conjunction with the University of New Hampshire, has conducted six industry wide interoperability plugfests. These plugfests demonstrate the performance realized with

"We believe the transition to SAS hard disk drives will be an important trend to follow as adoption of this serial technology enables higher performance, improved reliability and increased scalability to both enterprise and SMB segments"

Sean Lavey, IDC Storage Analyst Program Manager

SAS technology and the interoperability of SAS-related devices working together successfully." The efforts of such plugfests have helped mature the technology, which has been available for more than a year.

The benefits of SAS are numerous, but can be grouped into four primary categories: performance, flexibility, scalability and reliability.

SAS performance includes the initial 3Gb/s transmission rate as well as advance command queuing, multiple point-to-point routing, and fault tolerance designs. The point-to-point architecture enables simultaneous read and write activity over the same port. The dual port capability allows connections among multiple initiators, thus doubling the usable bandwidth. SAS cabling is more compact, providing better airflow plus simplified hot plug connections.

IT managers gain greater flexibility with SAS architecture. The backplane design and interface protocol allows for both SAS and SATA HDDs to be used, benefiting both integrators and users (weighing cost, performance and mission critical applications). Virtually any hybrid storage system can be built with interoperability assured. SAS is also backward compatible with SCSI software and middleware, lessening the need for training on the upgraded system, or modifications to legacy software.

SCSI scalability is a critical need given today's constant changes in system requirements. SAS uses expander hardware as a switch, which simplifies configurations for larger external storage applications. As a result, these can be scaled with very little effect on latency, and allows bandwidth to be preserved for increased workloads. In addition, the expander allows for a large number of topologies to well over 16K mixed SAS/SATA hard disk drives.

With dual-ported SAS hard disk drives, high availability systems can be built. With no single points of failure, this makes the hard disk drives reachable, thus increasing fault



tolerances. Use of SAS expanders, along with dual-port SAS HDDs, allows for redundant systems with the highest possible fault tolerance. SAS builds on the SCSI feature set. Today's demanding enterprise storage customer will accept no less.

AN END-TO-END INTEROPERABILITY ADVANTAGE

LSI Logic is the only manufacturer able to provide all SAS component solutions, from ASICs and controller ICs, to SAS expanders, HBAs and RAID storage adapter cards. As such, interoperability, reliability and performance are more easily engineered and tested. Collaboration, testing and control over all aspects of the engineering design and manufacturing of SAS components results in end-to-end interoperability second to none.

The LSISAS1064 and LSISAS1068 controller ICs use Fusion-MPT™ (Message Passing Technology) architecture to speed OEM system development as it allows compatibility with LSI Logic's complete line of common architecture drivers. Fusion-MPT architecture provides the benefit of complete binary compatibility of host software across different physical interfaces (such as SCSI, Fibre Channel and Serial Attached SCSI). The result is reduced software development, as well as considerably less integration and certification time, for system designers with a critical need to shorten time-to-market.

The LSI Logic's PCI-X 4-port SAS host bus adapter is the first SAS device in the industry to achieve Windows Logo certification. This important milestone for product development and support allows OEM vendors to pursue the



LSISAS1068 Chip and LSI Logic SAS3442X-R Adapter Board

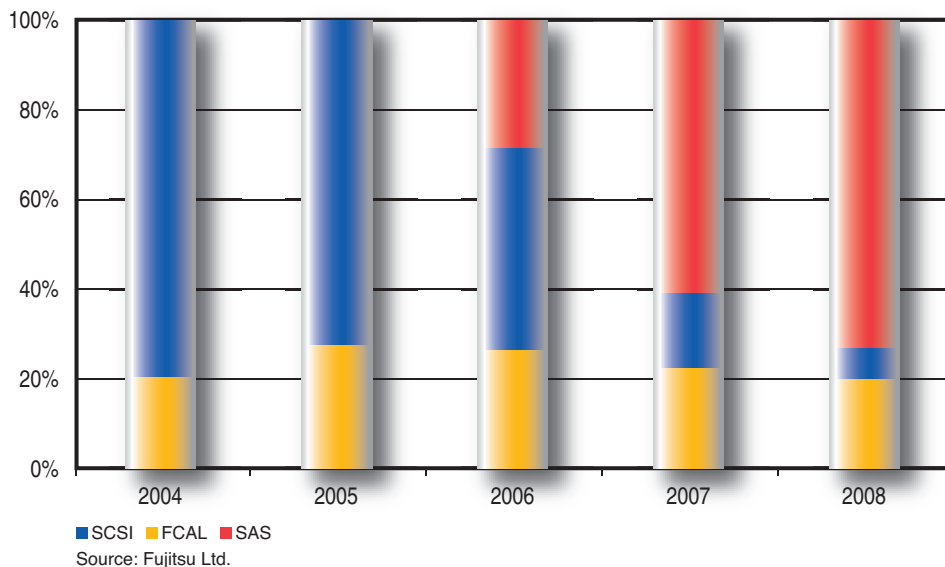
Windows Logo certification for complete computer systems shipped with LSI Logic components.

FUJITSU SAS HARD DISK DRIVES

With more than thirty-five years of experience in hard disk drive technology, Fujitsu offers state-of-the-art storage products for your most demanding enterprise applications. Fujitsu was the first to bring SAS hard disk drives to the enterprise market and are currently shipping their second generation products. This reflects determination and confidence in the SAS technology Fujitsu has championed.

Fujitsu SAS hard disk drives help enterprises keep costs lower and maintain flexibility. The 2.5" hard disk drives offer up to 73.5GB of storage and 10K RPM – a perfect combination for high-end, mission-critical applications residing on database servers, storage arrays, and NAS and SAN systems. They are also hot pluggable, so you can insert or remove drives without harming the data or the system while the entire system is still powered on.

ENTERPRISE INTERFACE TRANSITION



“SAS is seen by the industry as an extremely important interface ranging from large computer installations to small home office environments”

*Mike Fitzpatrick, Sr. Research Executive
Fujitsu Computer Products of America
SAS Plugfest Technical Committee*

The Fujitsu SAS hard disk drives' 3Gb/s SAS interface allows customers to take advantage of the increased performance associated with Serial Attached SCSI, while at the same time providing lower heat dissipation and lower acoustics.

LSI Logic storage component products and Fujitsu hard disk drives are sold world-wide through distributors and channel reseller partners. Visit on line for a complete listing of partners, technical specifications and product applications.

THE FUJITSU FACT LAB HELPS YOU FIND PRE-TESTED SOLUTIONS FAST!

Take the guesswork out of interoperability questions. FACT Lab performs the important task of interoperability testing to determine compatibility between Fujitsu Enterprise and Mobile hard disk drives, customers' systems and third party partners' products, such as host bus adapters, controller cards, enclosures and switch boxes.

The Fujitsu FACT Lab has tested the following 2.5" SAS enclosures with the LSI SAS3442X-R host bus adapter (HBA), and our industry leading 2.5" SAS hard disk drives.

ADVANCED INDUSTRIAL COMPUTER (AIC) BR-SAS28

BR-SAS28 is an Enterprise-class Hard Disk Drive Canister designed for mission-critical storage applications. It converts two 5.25" bays to eight 2.5" small form factor (SFF) SAS/SATA hard disk drive bays, holding up to 1TB of storage capacity under high spindle data read/write. Its 12-PHY SAS expander with four lanes of bandwidth supports up to 1.2GB/s throughput (dual expander option is also available). With its self-contained SAS expander(s), SAS backplane and cooling fans, users can take advantage of the robust performance SFF SAS hard disk drive without buying a brand new server.



ENHANCE TECHNOLOGY, INC. Q14SS

QuadraPack Q14 is the industry's first and only removable multi-disk one bay internal storage backplane designed for use with four 2.5" SCSI/SATA/SAS Enterprise hard disk drives. A completely modular and hot-swap architecture makes Q14 the perfect building block for dense computing and embedded applications. Enhance Technology is a pioneer in design and manufacturing storage components for the IT industry, and has envisioned the QuadraPack Q14 being the next versatile tools for the system integrators to configure their next generation box. The QuadraPack Q14 is available in SATA (II), Ultra320 SCSI, and the latest Serial SCSI (SAS) interfaces.



**JMR ELECTRONIC, INC.
SAS-STOR 8-BAY**

SAS-Stor supports eight 2.5" SAS/SATA hard disk drives in a single 5.25" full height enclosure, thus multiplying the number of spindles typically used in the space by a factor of eight. Each hard disk drive has its own dedicated channel to the SAS/SATA host. This effectively eliminates the bottlenecks found in a typical shared bus enclosure.



**RANCHO SYSTECH, INC.
MINISTOR 4-1 4-BAY**

The 1U MiniStor4-1-1U SAS JBOD enclosure is an extremely cost-effective and highly scalable storage system for 2.5" SAS hard disk drive technology. This enclosure accepts up to eight 2.5" SAS hard disk drives.



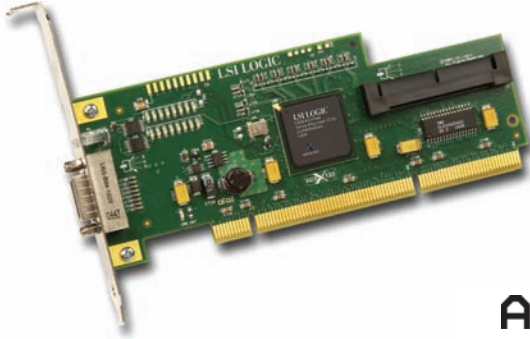
The 1U JBOD can be aggregated into a larger chassis with multiple enclosures to provide high performance, highly scalability, fault tolerance, and enterprise class storage. The 1U JBOD provides an affordable, scalable storage solution in the smallest form factor ever available for these types of applications.

The JBOD also supports SAS narrow and wide port configuration for optimum bandwidth. Options include auto fail over redundant power supply and four SAS Edge Expanders for total redundancy/fault tolerance. In addition, a performance-cooling fan is included for greater reliability.

**SUPERMICRO COMPUTER, INC.
M28/E1**

Supermicro's engineering expertise focuses on providing a wide range of high-quality server building block solutions. Proudly designing first-to-market SAS storage solutions that offer fully optimized functionality and compatibility in a cost-effective package, the new M28E1 SAS Mobile Rack supports eight 2.5" SAS hard disk drives in each rack, cascading functionality, and 3Gb/s high-speed data transfer rates.





FOR ADDITIONAL INFORMATION, VISIT THESE SITES:

LSI Logic SAS products: <http://lsi.com/sas>

LSI Logic Storage products: <http://lsi.com/storage>

LSI Logic Fusion-MPT products: <http://lsi.com/fusion>

Fujitsu Computer Products of America:

<http://www.fcpa.fujitsu.com/products/hard-drives/may-sas/>

AIC http://www.aicipc.com/products_AccDetail.asp?catID=23&id=193

Enhance | Technology, Inc. <http://www.enhance-tech.com/products/multidrive/q14.html>

JMR <http://www.jmr.com/solutions/index.html>

Rancho SysTech Inc <http://www.rancho.com/Products.aspx?ID=56>

SUPERMICR <http://www.supermicro.com/products/accessories/mobilerack/CSE-M28E1.cfm>



PCI-X <http://www.pcisig.com>

STA SCSI Trade Association SCSI Trade Association & Free SAS Newsletter: <http://www.scsita.org>



For more information please visit the LSI Logic web site at:

<http://www.lsi.com/storage>

<http://www.lsi.com/sas>



Technical Support
Tel: 800 633 4545

LSI Logic Corporation
North American Headquarters - Milpitas, CA
Tel: 866 574 5741 (within U.S.)
408 954 3108 (outside U.S.)

LSI Logic Europe Ltd.
European Headquarters - United Kingdom
Tel: 44 1344 413200
Fax: 44 1344 413254

LSI Logic KK Headquarters
Tokyo, Japan
Tel: 81 3 5463 7165
Fax: 81 3 5463 7820

Fujitsu Computer Products of America, Inc.
Sunnyvale, CA
Tel: 800 626 4686
<http://www.fcpa.fujitsu.com>

LSI Logic and the LSI Logic logo design are trademarks or registered trademarks of LSI Logic Corporation. Fujitsu and the Fujitsu logo are registered trademarks and The Possibilities are Infinite is a trademark of Fujitsu Ltd. FACT Lab is a trademark of Fujitsu Computer Products of America, Inc. All other brand and product names may be trademarks of their respective companies.

LSI Logic Corporation reserves the right to make changes to any products and services herein at any time without notice. LSI Logic does not assume any responsibility or liability arising out of the application or use of any product or service described herein, except as expressly agreed to in writing by LSI Logic; nor does the purchase, lease, or use of a product or service from LSI Logic convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual property rights of LSI Logic or of third parties.

Fujitsu Computer Products of America, Inc. reserves the right to modify at any time without prior notice these statements, our products, their performance specifications, availability, price, and warranty and post-warranty programs. All statements herein are valid only in the U.S. for U.S. residents, are based on normal operating conditions, are provided for informational purposes only, and are not intended to create any implied warranty of merchantability or fitness for a particular purpose.

Copyright ©2006 by LSI Logic Corporation.
All rights reserved.

Order No. 10032
3/06 – Printed in USA