

Overview

The Smart Array 5300 series of high-performance Ultra3 array controllers provides reliable data protection for ProLiant servers and offers new levels of flexibility thanks to an innovative modular design and new Advanced Data Guarding (RAID ADG) technology. The Smart Array 5300 controller raises the standard to higher performance levels with several enhancements including a new memory architecture and new RAID engine.

Designed and tested with industry-standard ProLiant Servers for greater reliability, this controller is ideal for the distributed workgroup server or centralized departmental server, and like other Smart Array controllers, the SA-5300 offers complete data compatibility with previous generations' Smart Array controllers for easy data migration and upgradability.

What's New

Updated option support list

Models

Smart Array 5304/256 Controller	283551-B21
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Related Options

NOTE: This is a list of related options, some may be discontinued.

Smart Array 5302/128 Controller	283552-B21
SAN Access Module for Smart Array 5302 Controller	216687-B21

Feature List

- Advanced RAID level: Advanced Data Guarding*
- High Performance Architecture
- Innovative modular design
 - Upgradable cache for higher performance
 - Upgradable from 2 to 4 SCSI channels
 - SAN Access Module
- High Capacity
 - 2 channel models support up to 28 drives
 - 4 channel models support up to 56 drives
- Multiple battery-backed cache options
 - 128 MB & 256 MB

Overview

Key Features

- **Advanced Data Guarding** (RAID ADG) offers breakthrough level of fault protection of RAID volumes up to 2TB and a total of 56 disk drive in a single RAID volume. RAID ADG provides fault protection greater than RAID 1 or RAID 5 and only consume the capacity of 2 disk drives for distributed parity data. RAID ADG protects against any 2 disk drive failures. This higher level of protection is ideal to protect large logical volumes and with high capacity disk drives where a failed drive rebuild time may be significant.
NOTE: RAID ADG is a standard feature of SA-5304 and available as an option to other models. RAID ADG requires a minimum of 64-MB battery-backed cache.
- **Modular**, easy-to-upgrade design lets you optimize performance and increase capacity, as needed, from two to four channels and with 32-MB, 64-MB, 128-MB, or 256-MB battery-backed cache.
128-MB or 256-MB battery-backed cache.
- **High-performance**, Fifth generation architecture offers the new hardware RAID engine, and a new performance memory architecture for increased performance over previous controllers.
- **Recovery ROM** protects against a ROM failure or corruption.
- **Ultra3 SCSI** technology delivers high performance and data bandwidth up to 160 MB/s bandwidth per channel.
- **Up to 4 channels** provides the highest storage capacity per PCI slot in the industry.
- **Mix-and-match** LVD SCSI compatibility protects your investments and lets you deploy drives as needed.
- **Battery-backed Cache** protects cached data in the event of a power outage, server failure or controller failure, and redundant, replaceable batteries take that protection even further. Maximum cache configuration is 256-MB of battery-backed cache.
- **64-bit, 66-MHz PCI** interface boosts bandwidth up to a 533 MB/s total transfer rate.
- **64-bit memory addressing** supports servers with greater than 4 GB of memory.
- **Online Management Features:** Online Capacity Expansion, Online RAID Level Migration, Online Stripe Size Migration, Multiple Online Spares (Global), User Selectable Read/Write cache, User Selectable Expand and Rebuild Priority
- **SAN Access**, the industry's first integrated SCSI controller and Fibre Channel SAN adapter offers centralized, consolidated backup solutions and incremental SAN based primary storage for groups of 5-10 servers driving Direct Attach Storage (SCSI) with Smart Array 5302 Controllers.

The Smart Array Advantage

HP's innovative design and integration work of the Smart Array family of products creates customer value that is unmatched in the industry. Use of Smart Array products across multiple applications results in a much lower Total Cost of Ownership (TCO) than any other server storage RAID products. The HP Smart Array family brings an unparalleled return on investment through:

- **Data Compatibility** - among all models of Smart Array controllers allows simple and easy upgrades any time needs for higher performance, capacity, and availability increase. Even successive generations of Smart Array controllers understand the data format of other Smart Array Controllers.
- **Consistent Configuration and Management Tools** - all Smart Array products utilize a standard set of management and utility software. These tools minimize Total Cost of Ownership (TCO) by reducing training requirements and technical expertise necessary to install and maintain the ProLiant server storage.
- **Universal Hard Drive** - form factor is for use across multiple ProLiant servers, disk enclosures and storage systems. With compatibility across many enterprise platforms, you are free to deploy and re-deploy these drives to quickly deliver increased storage capacity, migrate data between systems, and easily manage spare drives.
- **Pre-Failure Warranty** - means Insight Manager™ not only reports when a drive is going to fail but allows replacement of failing drives prior to actual failure. For complete details, consult the HP Support Center or refer to your ProLiant Server documentation.

Product Highlights

Data Compatibility Data compatibility among all models of Smart Array Controllers means customers can instantly upgrade their Smart Array products to get to higher performance, capacity and availability. Unlike competitive products, successive generations of Smart Array products understand the data format of other Smart Array controllers, providing investment protection for your HP storage solution.

Performance HP's High Performance Architecture sets new boundaries of industry performance expectations!

- Wide Ultra3 SCSI (160-MB/s bandwidth) per channel
- High-performance 64-bit architecture, featuring a super-scalar RISC processor
- New RAID XOR engine
- New performance memory architecture providing tri-directional data flow for improved performance
- 64-bit, 66-MHz PCI bus (533 MB/s bandwidth)

Capacity Given the need for scalable capacity growth of server storage, the SA-5300 offers up to four SCSI channels for over two terabytes of storage from a single PCI slot:

- Modular design offering 2 & 4 channel models plus, an Ultra3 channel expansion card offering 2 additional external SCSI channels for SA-5300 models with 2 channels
- 4 channel models support up to 56 hard drives (16.8 TB = 300 GB x 56 hard drives)
- 2 channel models support up to 28 hard drives (8.4 TB = 300 GB x 28 hard drives)

Availability Provides increased server uptime by providing advanced storage functionality:

- Online RAID Level Migration (between any RAID level)
- Online Capacity Expansion
- Logical Drive Capacity Extension
- Global Online Spare
- Pre-Failure Warranty

Fault Prevention The following features offer detection of possible failures before they occur, allowing preventive action to be taken:

- S.M.A.R.T.: Self Monitoring Analysis and Reporting Technology first developed at Compaq detects possible hard disk failure before it occurs, allowing replacement of the component before failure occurs.
- Drive Parameter Tracking monitors drive operational parameters, predicting failure and notifying the administrator.
- Dynamic Sector Repairing continually performs background surface scans on the hard disk drives during inactive periods and automatically remaps bad sectors, ensuring data integrity.
- Smart Array Cache Tracking monitors integrity of controller cache, allowing pre-failure preventative maintenance.
- Environment Tracking for External Storage System: Monitors fan speed and cabinet temperature of ProLiant Storage System and newer HP storage enclosures.

Fault Tolerance Keeps data available and server running while a failed drive is being replaced; several fault tolerance configurations are supported including:

- **Advanced Data Guarding** (RAID ADG): This is the highest level of fault tolerance. It allocates two sets of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand two simultaneous drive failures without downtime or data loss. It is available standard with SA-5304 and as an option to other models. Requires a minimum of 64-MB battery-backed cache.
- **Distributed Data Guarding** (RAID 5): This allocates parity data across multiple drives and allows simultaneous write operations. It is recommended for up to 14 hard drives.
- **Drive Mirroring** (RAID 1, 1+0): This allocates half of the drive array to data and the other half to mirrored data, providing two copies of every file. It is a high-performance RAID.

Product Highlights

Fault Recovery

Minimizes downtime, reconstructs data, and facilitates a quick recovery from drive failure

- **Recovery ROM:** provides a unique redundancy feature that protects from a ROM failure. A new version of firmware can be flashed to the ROM while the controller maintains the last known working version of firmware. If the firmware becomes corrupt, the controller will revert back to the previous version of firmware and continue operating. This reduces the risk of flashing firmware to the controller.
- **On-Line Spares:** Up to four spare drives can be installed prior to drive failure. If a failure occurs, recovery begins with an On-Line Spare and data is reconstructed automatically.
- **ECC-Protected Cache Memory:** Removable, battery-backed cache memory protects data, up to four days (three days with 256-MB Module), in the event of power failure, server hardware failure or controller failure. In addition, HP provides an exclusive design that includes redundant and replaceable batteries for greater cache protection.
 - 256-MB, 128-MB and 64-MB Cache modules also feature Chip Recovery, protecting the cache memory from a single chip failure and multi-bit errors from any single memory chip.

Ease of Use

Consistency and Upgradability make the Smart Array family unique in the industry:

- GUI based configuration, management and diagnostic software tools
- Common data format between generations of products
- Data migration between servers and external storage enclosures

SAN Access (Optional)

The SAN Access Module for the Smart Array 5302 Controller offers the industry's first true integrated bridge from Direct Attach Storage (SCSI) to the Fibre Channel Storage Area Network (SAN). Fibre Channel SAN offers robust data handling for superior reliability and manageability. Smart Array SAN Access Technology grants users of SCSI based storage the opportunity to implement a basic SAN for the consolidation of backup operations with HP Enterprise Backup Solutions (ARCPaq or BackPaq). SAN Access Technology also offers access to primary storage (RAID Array 4100) on the SAN.

Key Features:

- 1-Gbit bandwidth offering 100 MB/s of peak data transfer
- Reduction in PCI slot utilization: both Direct Attach Storage and SAN access on a single PCI slot
- Centralized backup of Direct Attach Storage through the Enterprise Backup Solution (EBS) using either ARCPaq or BackPaq software
- Access to incremental SAN based primary storage (RAID Array 4100) when using the FC-AL Switch 8
- Qualified on ProLiant servers running Microsoft Windows NT/2000 and Novell NetWare

Compatibility

Server Compatibility

For up to date compatibility, please see the following URL for complete Smart Array 5300 compatibility and support information:

<http://www.hp.com/products/smartarray>

Operating Systems

Microsoft Windows NT 4.0, 2000, 2003**

Novell NetWare 4.2, 5.x **

SCO UnixWare 7.1.x

SCO UnixWare 8

SCO OpenServer 5.0.4, 5.0.5, 5.0.6a

Linux

IBM OS/2 Warp Server 4

IBM OS/2 Warp Server for e-Business

Sun Solaris™ * Intel Platform Edition 7

Sun Solaris™ * Intel Platform Edition 8

**SAN Access module compatible with Operating System.

Software Suite

All Smart Array products share a common set of configuration, management and diagnostic tools, including Array Configuration Utility XE (ACU-XE), Array Configuration Utility (ACU), Array Diagnostic Utility (ADU), and Insight Manager. This software consistency of tools reduces the cost of training for each successive generation of product and takes much of the guesswork out of troubleshooting field problems. These tools lower the total cost of ownership by reducing training and technical expertise necessary to install and maintain the HP server storage.

HP Insight Manager

- Powerful server and server options/storage manager tool
- Monitors over 1200 server parameters

Configuration/Diagnostic Utilities

- Array Configuration Utility XE (ACU)
 - Easy to use Wizards for configuration Powerful Web based configuration utility for all Smart Array controllers
 - Provides a graphical view of HP drive array configurations
 - Allows for management of multiple arrays over a secure internet connection from anywhere in the world
 - Easy to use Wizards for configuration
 - Runs online on NT v4.0, Windows 2000/2003 and Linux
 - Array Diagnostic Utility (ADU)
 - Powerful diagnostic utility for all Smart Array controllers
- Options ROM Configuration Capability
 - Rapid configuration upon initial install of the OS

Service and Support, HP Care Pack, and Warranty Information

Software Product Services Standalone telephone support
Rights to new license version
Media and documentation updates

Hardware Product Services Installation services
On-site maintenance (includes warranty support)
Response time upgrades during the warranty period
Post-warranty coverage
RAID setup and performance consulting via statement of work
For additional hardware installation and maintenance information, please refer to the URL listed below:
<http://www.hp.com/hps/hardware/>

Warranty Upgrade Options Response - Upgrade on-site response from next business day to same day 4 hours
Coverage - Extend hours of coverage from 9 hours x 5 days to 24 hours x 7 days
Duration - Select duration of coverage for a period of 1, 3, or 5 years

HP Care Pack Information HP Care Pack is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage.
HP Care Pack is not available for less than the product's warranty duration.
HP Care Pack is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required.
HP Care Pack services are prepaid.
For additional HP Care Pack (hardware & software) information, as well as orderable part numbers, please refer to the URL <http://www.hp.com/hps/carepack/>

Options

Software	StorageWorks Virtual Replicator by HP	
	License & Media (CD-ROM)	388931-B21
	License Only	388932-B21
Disk Drive Enclosures	HP StorageWorks Modular Smart Array 30 SB	302969-B21
	NOTE: Rack-mountable 14 drive enclosure with single bus, redundant power supplies	
	HP StorageWorks Modular Smart Array 30 DB	302970-B21
	NOTE: Rack-mountable 14 drive enclosure with dual bus, redundant power supplies	
Hard Drives	Ultra320 Universal Drives – Hot Plug	
	36.4GB 10,000 rpm, U320 Universal Hard Drive, 1"	286713-B22
	72.8GB 10,000 rpm, U320 Universal Hard Drive, 1"	286714-B22
	146.8GB 10,000 rpm, U320 Universal Hard Drive, 1"	286716-B22
	300GB 10,000 rpm, U320 Universal Hard Drive, 1"	350964-B22
	18.2GB 15,000 rpm, U320 Universal Hard Drive, 1"	286775-B22
	36.4GB 15,000 rpm, U320 Universal Hard Drive, 1"	286776-B22
	72.8GB 15,000 rpm, U320 Universal Hard Drive, 1"	286778-B22
	NOTE: This is a list of supported hard disk drives (note that some drives may be discontinued).	
	NOTE: For complete compatibility information, refer to the SCSI Hard Drive Compatibility table located at: http://www.compaq.com/products/servers/proliantstorage/drives-enclosures/docs/index.html	
Universal Hot Plug Tape Drives	HP StorageWorks DAT 72 Tape Drive, Internal Hot-Plug (Carbon)	Q1529A
	HP StorageWorks DAT 40 Tape Drive, Internal Hot-Plug (Carbon)	Q1546A

Family Information

This is a brief overview and comparison of the Smart Array family of PCI RAID controllers.

	Smart Array 5302/5304	Smart Array 5312	Smart Array 4300	Smart Array 532
<i>Introduction Date</i>	July 2000	April 2002	July 1999	May 2001
SCSI Protocols Supported	Ultra3, Ultra2, Wide-Ultra	Ultra3, Ultra2	Ultra2, Wide-Ultra	Ultra3, Ultra2
Maximum Channel Transfer Rate (MB/s)	640 total 160 per channel	320 total 160 per channel	320 total 80 per channel	320 total 160 per channel
Channels	2, 4	2	4	2
SCSI Ports (external/internal)	2 channel model: 2/2 4 channel model: 4/2	2/2	4/2	1/1
Maximum Drives	56*	28*	56*	20*
Cache	256-, 128-, 64- or 32-MB read-write	128-MB read-write	64-MB read-write	32-MB read cache
Battery-backed, Removable Cache	Yes, Redundant , Replaceable Batteries	Yes, Redundant , Replaceable Batteries	Yes	No
Upgradeable Cache	Yes	Yes	No	No
Recovery ROM	Yes	Yes	No	Yes
RAID Support	0,1,1+0,5, Advanced Data Guarding**	0,1,1+0,5	0,1,1+0,5	0,1, 1+0,5
Configuration Tool(s)	ACU-XE ACU ORCA	ACU-XE ACU ORCA	ACU-XE ACU	ACU-XE ACU ORCA
Management and Diagnostic Tools	CIM ADU	CIM ADU	CIM ADU	CIM ADU
Maximum Volumes	32	32	32	32
Drive Roaming	Yes	Yes	Yes	Yes
Online Expansion	Yes	Yes	Yes	Yes
Online & Offline Configuration	Yes	Yes	Yes	Yes
Logical Drive Extension	Yes	Yes	Yes	Yes
Stripe Set Migration	Yes	Yes	Yes	Yes
RAID Level Migration	Yes	Yes	Yes	Yes
Redundant Controllers	No	No	No	No
Online Spare Support	Yes	Yes	Yes	Yes
Capacity Extension	Yes	Yes	Yes	Yes
SAN Access Module	Yes	No	No	No
PCI Bus	64-bit, 66-MHz	64-bit, 133-MHz PCI-X	32-bit, 33-MHz	64-bit, 66-MHz

*NOTE: Based on use of StorageWorks Enclosure 4200/4300 family (14 drives enclosure)

**NOTE: RAID ADG is a standard feature of SA-5304 and available as an option to other models. RAID ADG requires a minimum of 64-MB battery-backed cache.

Configuration Information

Building a Storage Sub-System with the Smart Array 5300 Controller

Step 1 – Smart Array 5300 – Choose a Model

Select one:

Model Number	Part Number	Model Description
SA-5304/256	283551-B21	Smart Array 5304/256 Controller Ultra3 2 channel PCI Array Controller board, Ultra3 2 channel Expansion Module, 256-MB Cache Module, Advanced Data Guarding, Setup and configuration software, Documentation

Step 2– Additional Options

Select each required option with quantities specified.

Part Number	Description with Parts Shipped:
286713-B22	36.4GB 10,000 rpm, U320 Universal Hard Drive, 1"
286714-B22	72.8GB 10,000 rpm, U320 Universal Hard Drive, 1"
286716-B22	146.8GB 10,000 rpm, U320 Universal Hard Drive, 1"
350964-B2	300GB 10,000 rpm, U320 Universal Hard Drive, 1"
286775-B22	18.2GB 15,000 rpm, U320 Universal Hard Drive, 1"
286776-B22	36.4GB 15,000 rpm, U320 Universal Hard Drive, 1"
286778-B22	72.8GB 15,000 rpm, U320 Universal Hard Drive, 1"
Q1529A	HP StorageWorks DAT 72 Tape Drive, Internal Hot-Plug (Carbon)
Q1546A	HP StorageWorks DAT 40 Tape Drive, Internal Hot-Plug (Carbon)

NOTE: This is a list of additional supported options – some may be discontinued.

Technical Specifications

Electrical Interface	LVD (Low Voltage Differential) and SE (Single Ended)
Protocol Support	Wide Ultra3 SCSI (160 MB/s per channel)
SCSI Ports	4 channel model: 4 external/2 Internal shared 2 channel model: 2 external/2 internal shared
Drives Supported	4 channel model: up to 56 drives 2 channel model: up to 28 drives
Maximum Capacity	4 channel model: 16.8 TB (56 drives x 300 GB) 2 channel model: 8.4 TB (28 drives x 300 GB)
PCI	PCI 2.2 Compliant
PCI Bus Speed	64-bit, 66-MHz PCI (533-MB/s maximum bandwidth)
Logical Drives	Up to 32 logical drives Up to 2TB per Logical Drive
RAID Support	RAID ADG (Advanced Data Guarding)* included with model SA-5304 RAID 5 (Distributed Data Guarding) RAID 1+0 (Striping & Mirroring) RAID 0 (Striping)
Cache Memory	Up to 256-MB Write Cache Memory (32-, 64-, 128-MB and 256-MB modules) ECC protection, battery-backed, and removable SA-5302/FC comes standard with 32-MB cache memory
Cache Batteries	Up to 4 days of redundant battery life, removable for easy replacement (3days with 256-MB Module)
Upgradable Firmware	2-MB flashable ROM
Disk Drive and Enclosure Protocol Support	Ultra3, Ultra2 and Wide-Ultra (SCSI-3)
Memory Addressing	64-bit, supporting servers memory greater than 4 GB
Dimensions (HxWxD)	18.375 x 8.25 x 4 in (46.67 x 20.95 x 10.16 cm)
Weight	Smart Array 5304/256 3.26 lbs (1.48 kg)

SAN Access Module Specifications

Fibre Channel Protocol Support **	1-Gbit Fibre Channel
Fibre Channel Ports **	1
EBS Qualification **	ARCPaq and BackPaq NOTE: Only with single (non-cascaded) 7 or 12 Port Fibre Channel Hub and FC-AL Switch 8.
SAN Primary Storage Qualification **	RAID Array 4100 NOTE: Access to volume (LUN) created by separate HP Fibre Channel Host Bus Adapter and assigned under Selective Storage Presentation and only with a single (non-cascaded) FC-AL Switch 8. * Fibre Channel support is a standard feature of the SA-5302/FC and available as an option to other models. Fibre Channel support requires the SAN Access Module.

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