

### Overview

The HP Smart Array P812 is HP's 24 port Serial Attached SCSI (SAS) RAID controller with PCI Express (PCIe). This high performance SAS RAID controller provides high levels of reliability for HP servers through its support of 6 Gb/s SAS, 1 GB FBWC, and advanced RAID capabilities. This controller ships standard with a Smart Array Advanced Pack license key and supports up to 100 hard drives.

### What's New

- Supported on Superdome 2
- Dual Domain support
- Support for Windows 7.0 R2 and SP2
- Supported on OpenVMS V8.4
- Support for HP StorageWorks MDS 600, HP StorageWorks 70 Modular Smart Array and HP StorageWorks 60 Modular Smart Array

### Models

**HP Integrity Smart Array P812 Controller** HP Integrity Smart Array P812/1GB 6Gb 4-p Ext PCIe SAS Controller

AM312A

### Standard Features

#### 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 product. 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 HP server storage.

**Universal Drive** form factors (2.5" and 3.5") are used across multiple HP 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 HP 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 HP Server documentation.

#### Key Features

- Seamless upgrades to and from other HP Smart Array controllers.
- Storage interface (SAS)
  - Four Mini SAS 4x connectors for attachment to JBODs and external tape drives
  - 6 Gb/s SAS technology delivers up to 600 MB/s per physical link.
- 24 SAS physical links distributed across six Mini SAS connectors
  - Two Mini SAS 4i connectors (8 physical links): for attachment to internal drive backplanes
  - Four Mini SAS 4x connectors (16 physical links): for attachment to JBODs and external tape drives
- Host interface (PCI Express)
  - PCI Express 2.0 8x host interface provides up to 4 GB/s in each direction
- RAID controller features
  - 1 GiB flash-backed write cache (not all of which is available for user data)
  - RAID 0, 1, 1+0, 5, 6, 50, and 60
  - Recovery ROM protects against ROM corruption.
- Smart Array Advanced Pack license key included (see below)
- Consistent management software among all Smart Array family products, including Array Configuration Utility (ACU), Systems Insight Manager (SIM), Array Diagnostic Utility (ADU), Online ROM Configuration Utility (ORCA), and SmartSet-up.
- SAS 2.0 (6 Gb/s, 3 Gb/s, and 1.5 Gb/s). 6 Gb/s bandwidth supports larger numbers of SAS drives in the SAS subsystem and provides better support for future high-bandwidth SSDs.
- Tape support (including boot from tape)

#### NOTE:

- [OLRAD is not supported with this card](#)
- [HP 60 MSA and HP 70 MSA are not supported with HP Superdome 2.](#)
- [Vpars is not supported with the card on rx7640, rx8640 and Superdome \(sx2000\). Vpars is supported with Superdome 2.](#)
- [Internal ports on P812 are not supported on HP Integrity Servers.](#)

### Standard Features

#### Host Interface (SAS)

- PCI Express 2.0 (5 MT/s and 2.5 MT/s)
- Eight PCI Express 2.0 lanes each supporting 5 Gb/s
- Electrically supports one, four, and eight lanes

#### Storage Interface (PCI Express)

P812 includes a PMC-Sierra SRC 8x6G SAS RAID-on-chip featuring:

- Eight SAS physical links, each supporting 6, 3, and 1.5 Gb/s for SAS protocol
- DDR2-800 memory controller
- High performance MIPS-based multi-processor subsystem
- Hardware XOR and Reed-Solomon Engines for RAID 5 and RAID 6 acceleration
- P812 also includes a PMC-Sierra SXP 36x3GSec 6 Gb/s SAS Expander to support six Mini SAS connectors in one controller card.

#### RAID Processor and Expander

The P812 1 GiB array accelerator features a flash-backed cache. If the cache DRAM contains write data when power is lost, the write data is copied into flash memory chips on the cache module, drawing power from attached capacitors. When power is restored, if the flash memory chips contain write data, the data is copied back into the DRAM so it can be flushed to the drives.

Advantages over battery-backed cache architectures include:

- No 72-hour deadline for retrieving the data before the batteries fully discharge
- Capacitors charge faster than batteries; controller disables the write cache for only a few minutes waiting for capacitors to charge rather than a few hours waiting for batteries to charge
- No need for periodic battery replacement
- No special disposal process

#### Interface Speeds

P812 supports the latest interface speeds.

Interface	Maximum bandwidth*	Notes
PCI Express	4 Gb/s (in each direction)	PCI Express 2.0 (8 lanes at 5 MT/s)
SAS	4.8 Gb/s (in each direction)	SAS-2 (8 physical links at 6 Gb/s) The RAID controller has eight 6 Gb/s SAS physical links. Bandwidth is dynamically shared by the 24 physical links used in the 6 Mini SAS connectors.
RAID cache	6.4 GiB/s	DDR2-800 SDRAM (64-bit data and 8-bit ECC).

\* Not counting protocol overhead.

#### Dual Domain Support

Dual domain SAS creates redundant pathways for external drives from servers to storage devices. The redundant paths created by these configurations reduce or eliminate single points of failure within the storage network. This provides increased levels of high availability with redundant paths from the controller to the drives. Dual domain SAS implementations make it possible to tolerate host bus adapter (HBA) or controller failure, external cable failure, expander failure, cable pulls, expander failure and failure in a spanned disk (JBOD) environments.

### Standard Features

#### Number of Drives

P812 supports up to 100 drives. Examples:

- Four HP StorageWorks D2700 Disk Enclosures with 25 drives each (100 drives)
- Eight HP StorageWorks D2600 Disk Enclosures with 12 drives each (96 drives)

#### RAID Levels

- **RAID 0 (striping)** provides no extra data protection. Data is striped across all drives in the array to increase performance. RAID 0 requires a minimum of one drive.
- **RAID 1 (mirroring)** protects against failure of one drive. Data is duplicated on a pair of drives. RAID 1 requires a minimum of two drives. Also see the Advanced Pack Mirror Splitting and Combining feature.
- **RAID 1+0 (mirroring and striping)** protects against failure of one drive (and failure of particular multiple drives). RAID 1+0 is a nested RAID method that uses RAID 0 striping across RAID 1 arrays to provide performance and protection. RAID 1+0 requires a minimum of four drives. Also see the Advanced Pack Mirror Splitting and Combining feature.
- **RAID 5 (distributed data guarding)** protects against failure of one drive. Data protection is provided by parity data distributed across all the drives. When a physical drive fails, data that was on the failed drive can be calculated from the remaining parity data and user data on the other drives in the array. This recovered data is usually written to an online spare drive through a process called a rebuild. RAID 5 requires a minimum of three drives.
- **RAID 6 with ADG (Advanced Data Guarding)**: 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.
- **RAID 50 (RAID 5+0)** protects against failure of one drive (and failure of particular multiple drives). RAID 50 is a nested RAID method that uses RAID 0 striping across RAID 5 arrays. RAID 50 tolerates one drive failure in each spanned array without loss of data. RAID 50 requires less rebuild time than single RAID 5 arrays. RAID 50 requires a minimum of six drives.
- **RAID 60 (RAID 6+0)** allows administrators to split the RAID 6 storage across multiple external boxes. RAID 60 requires a minimum of eight drives. RAID 60 is a nested RAID method that uses RAID 0 block-level striping across multiple RAID 6 arrays with dual distributed parity. With the inclusion of dual parity, RAID 60 will tolerate the failure of two disks in each spanned array without loss of data.

#### Online Management Features

- Online Capacity Expansion (increase array size feature)
- Advanced Capacity Expansion (shrink array and move array features)
- Online RAID Level Migration (change the fault tolerance level of a configured logical drive)
- Online Stripe Size Migration (change the stripe size of a configured logical drive)
- Online Spares (provide automatic drive replace for a failed drive in RAID levels other than RAID 0)
- User Selectable Expand and Rebuild Priority (select the priority of rebuilding data from a failed drive over current requests from the operating system)
- User Selectable Stripe Size
- User Selectable Read and Write Cache Sizes
- Logical Drive Extension (increase logical drive size without disturbing data)
- User Selectable Surface Scan idle interval (control the background process that scans drives for bad sectors, and verify the consistency of RAID 5 and RAID 6 parity data)
- Physical Drive Write Cache control (enable drive write cache for applications like video editing that can tolerate data loss, and/or systems that have redundant and uninterruptible power supplies)

### Standard Features

#### 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

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#### 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 HP 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 StorageWorks Modular Smart Array Enclosures.

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#### Fault Recovery

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

- Recovery ROM: This feature provides unique redundancy that protects from a ROM image corruption. 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: There is no limit to the number of spare drives that can be installed prior to drive failure. If a failure occurs, recovery begins with an On-Line Spare and data is reconstructed automatically.
- DRAM ECC corrects against single bit data and address corruption.

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#### Ease of Use

Consistency and Upgradeability 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 StorageWorks Modular Smart Array enclosures

### Compatibility

<b>Servers</b>	Integrity rx2660 Integrity rx2800i2 Integrity rx3600 Integrity rx6600 Integrity rx7640 Integrity rx8640 Integrity Superdome Integrity Superdome 2
<b>Operating Systems</b>	HP-UX 11i v3 (1009 release) OpenVMS V8.4 Microsoft Windows Server SP2 for Integrity (future) Microsoft Windows Server 2008 R2 for Integrity (future)
<b>Software Suite</b>	<p>All Smart Array products share a common set of configuration, management and diagnostic tools. 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 HP server storage.</p> <p><b>HP Systems Insight Manager (SIM)</b></p> <ul style="list-style-type: none"><li>• Provides the basic management features of system discovery and identification, single-event view, inventory data collection, and reporting</li><li>• Monitors over 1200 system wide parameters</li><li>• Smart Array performance monitoring</li><li>• Smart Array drive fault prediction</li></ul> <p><b>HP Array Configuration Utility (ACU)</b></p> <ul style="list-style-type: none"><li>• Powerful Web based configuration utility for all Smart Array controllers</li><li>• Provides a graphical view of HP drive array configurations</li><li>• Allows for management of multiple arrays over a secure Internet connection from anywhere in the world</li><li>• Easy to use Wizards for configuration</li><li>• Command line interface (ACU-CLI) also available</li><li>• Runs offline for all supported operating systems</li><li>• Runs online on Windows and linux</li><li>• For online configuration on NetWare, use CPQONLIN</li></ul> <p><b>CPQONLIN</b></p> <ul style="list-style-type: none"><li>• Menu-based configuration utility specifically for servers using Novell NetWare</li></ul> <p><b>HP Option ROM Configuration for Arrays (ORCA)</b></p> <ul style="list-style-type: none"><li>• ROM-based utility accessed by pressing F8 during system power up</li><li>• View, create, and delete arrays and logical volumes and assign an online spare drive</li><li>• Select the boot controller</li><li>• For more advanced array configurations, use ACU</li></ul> <p><b>HP Array Diagnostic Utility (ADU)</b></p> <ul style="list-style-type: none"><li>• In depth diagnostic and reporting utility for all Smart Array controllers</li><li>• Integrated with ACU</li><li>• Runs offline for all supported operating systems</li><li>• Runs online for Windows and Linux</li></ul> <p><b>HP Smart Array SAS/SATA Event Notification Service (CISSESRV)</b></p>

### Compatibility

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- Provides event notification to the Windows Server 2003 and Windows Server 2008 system event log
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#### **HP Smart Array Advanced Pack** (license key included with P812)

- RAID 6 (Advanced Data Guarding) protects against failure of any two drives. RAID 6 requires a minimum of four drives. ADG can tolerate multiple simultaneous drive failures without downtime or data loss and is ideal for applications requiring large logical volumes, because it can safely protect a single volume of up to 56 disk drives. RAID 6 also offers lower implementation costs and greater usable capacity per U than RAID 1.
- RAID 60 (RAID 6+0) allows administrators to split the RAID 6 storage across multiple external boxes. RAID 60 requires a minimum of eight drives. RAID 60 is a nested RAID method that uses RAID 0 block-level striping across multiple RAID 6 arrays with dual distributed parity. With the inclusion of dual parity, RAID 60 will tolerate the failure of two disks in each spanned array without loss of data.
- Advanced Capacity Expansion automates higher capacity migration using capacity transformation to remove logical drives by shrinking and then expanding them online. Standard drive migration and expansion remain unchanged.
- Mirror Splitting and Recombining. Mirror splitting is a task that splits an array with one or more RAID 1 or RAID 1+0 logical drives into two identical new arrays with RAID 0 logical drives. This is useful for administrators who want to replicate a configuration or need to build a backup before performing a risky operation. Using the ACU, administrators can also recombine a split mirrored array.
- Drive Erase completely erases physical disks or logical volumes. This capability is useful when decommissioning, redeploying, or returning hard drives. Provides three patterns:
  - One pass erase: Write zeros
  - Two pass erase: Write random data, then zeros
  - Three pass erase: Write random data, random data, then zeros
- Video On Demand Performance Optimization optimizes performance of video on demand and improves latency during video streaming. Provides controls for:
  - RAID 6/60 Alternate Inconsistency Repair Policy
  - RAID 5/6/50/60 Degraded Mode Performance Optimization
  - Physical Drive Request Elevator Sort
  - Monitor and Performance Analysis Delay
  - Maximum Drive Request Queue Depth

### Service and Support, HP Care Pack, and Warranty Information

#### Warranty

The warranty for this device is 3 years parts only.

**Pre-Failure Warranty:** Drives attached to the Smart Array Controller and monitored under Insight Manager are supported by a Pre-Failure (replacement) Warranty. For complete details, consult the HP Support Center or refer to your HP Server Documentation.

#### 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

**NOTE:** For additional hardware installation and maintenance information, please refer to the URL: <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

Warranty upgrade options can come in the form of Care Packs, which are sold at the HP System level this product attaches too.

#### 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. Care Packs for this option is sold at the system level this option attaches too.

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.

**NOTE:** 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/>



### Related Options

**NOTE:** This is a list of supported options. Some may be discontinued.

#### Hard Drives

**NOTE:** The components of a storage subsystem (e.g. the drive, the HBA/controller, firmware, and the server backplane) should operate at the same data transfer rate or the system bandwidth will be negotiated down to an acceptable level for all components.

**NOTE:** Hard drives have either a one year or three year warranty; refer to the specific hard drive QuickSpecs for details.

#### SAS Hot Plug SFF (2.5-inch) Enterprise (ENT) Drives

HP 900GB 6G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	619291-B21
HP 600GB 6G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	581286-B21
HP 450GB 6G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	581284-B21
HP 300GB 6G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	507127-B21
HP 300GB 3G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	492620-B21
HP 146GB 6G SAS 15K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	512547-B21
HP 146GB 3G SAS 15K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	504062-B21
HP 146GB 6G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	507125-B21
HP 146GB 3G SAS 10K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	418367-B21
HP 72GB 6G SAS 15K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	512545-B21
HP 72GB 3G SAS 15K rpm SFF (2.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	418371-B21

#### SAS Non-Hot Plug SFF (2.5-inch) Enterprise (ENT) Drives

HP 600GB 6G SAS 10K rpm SFF (2.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	590698-B21
HP 300GB 6G SAS 10K rpm SFF (2.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	537809-B21
HP 146GB 6G SAS 10K rpm SFF (2.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	537807-B21
HP 72GB 6G SAS 15K rpm SFF (2.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	537805-B21

#### SAS Hot Plug LFF (3.5-inch) Enterprise (ENT) Drives

HP 600GB 6G SAS 15K rpm LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	516828-B21
HP 450GB 6G SAS 15K rpm LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	516816-B21
HP 450GB 3G SAS 15K rpm LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	454232-B21
HP 300GB 6G SAS 15K rpm LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	516814-B21
HP 300GB 3G SAS 15K rpm LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	416127-B21
HP 146GB 3G SAS 15K rpm LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	384854-B21

#### SAS Non-Hot Plug LFF (3.5-inch) Enterprise (ENT) Drives

HP 600GB 6G SAS 15K rpm LFF (3.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	516830-B21
HP 450GB 6G SAS 15K rpm LFF (3.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	516826-B21
HP 450GB 3G SAS 15K rpm LFF (3.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	454234-B21
HP 300GB 6G SAS 15K rpm LFF (3.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	516824-B21
HP 300GB 3G SAS 15K rpm LFF (3.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	417950-B21

### Related Options

HP 146GB 3G SAS 15K rpm LFF (3.5-inch) Non-hot Plug Dual Port Enterprise 3yr Warranty Hard Drive	417855-B21
<b>NOTE:</b> Please see the QuickSpecs for Technical Specifications and additional information:	
<a href="http://h18000.www1.hp.com/products/quickspecs/12244_div/12244_div.html">http://h18000.www1.hp.com/products/quickspecs/12244_div/12244_div.html</a> (Worldwide)	
<b>6G SAS Hot Plug Enterprise Performance Solid State Drives</b>	
HP 200GB 6G SAS SLC SFF Enterprise Performance Solid State Drive	632492-B21
HP 400GB 6G SAS SLC SFF Enterprise Performance Solid State Drive	632494-B21
<b>6G SAS Hot Plug Enterprise Mainstream Solid State Drives</b>	
HP 200GB 6G SAS MLC SFF (2.5-inch) Enterprise Mainstream Solid State Drive	632502-B21
HP 400GB 6G SAS MLC SFF (2.5-inch) Enterprise Mainstream Solid State Drive	632504-B21
HP 800GB 6G SAS MLC SFF (2.5-inch) Enterprise Mainstream Solid State Drive	632506-B21
<b>NOTE:</b> Please see the QuickSpecs for Technical Specifications and additional information:	
<a href="http://h18000.www1.hp.com/products/quickspecs/13415_div/13415_div.html">http://h18000.www1.hp.com/products/quickspecs/13415_div/13415_div.html</a> (Worldwide)	
<b>Disk Enclosures</b>	
HP StorageWorks D2600 Disk Enclosure	AJ940A
<b>NOTE:</b> Supports 12 LFF drives, and SAS 6 Gb/s.	
HP StorageWorks D2700 Disk Enclosure	AJ941A
<b>NOTE:</b> Supports 25 SFF drives, and SAS 6 Gb/s.	
<b>NOTE:</b> Please see the QuickSpecs for additional information including configuration steps and additional options needed for a complete solution at:	
<a href="http://h18000.www1.hp.com/products/quickspecs/13404_div/13404_div.html">http://h18000.www1.hp.com/products/quickspecs/13404_div/13404_div.html</a> (Worldwide)	
<b>Modular Storage Arrays</b>	
HP StorageWorks 60 Modular Smart Array	418408-B21
<b>NOTE:</b> Supports 12 SFF drives, and SAS 3 Gb/s	
HP Storage Works 70 Modular Smart Array	418800-B21
<b>NOTE:</b> Supports 25 SFF drives, and SAS 3 Gb/s	
<b>NOTE:</b> Please see the QuickSpecs for additional information including configuration steps and additional options needed for a complete solution at:	
<a href="http://h18000.www1.hp.com/products/quickspecs/12627_div/12627_div.html">http://h18000.www1.hp.com/products/quickspecs/12627_div/12627_div.html</a> (MSA60)	
<a href="http://h18000.www1.hp.com/products/quickspecs/12652_div/12652_div.html">http://h18000.www1.hp.com/products/quickspecs/12652_div/12652_div.html</a> (MSA70)	
HP MDS600 with two Dual Port I/O Module System	AJ866A
<b>NOTE:</b> Please see the QuickSpecs for additional information including configuration steps and additional options needed for a complete solution at:	
<a href="http://h18000.www1.hp.com/products/quickspecs/13257_div/13257_div.html">http://h18000.www1.hp.com/products/quickspecs/13257_div/13257_div.html</a> (600 Modular Disk System)	

### Related Options

#### Tape Solutions

#### SAS Tape Enclosures

HP StorageWorks 1U SAS Rack-Mount Kit AE459A

**NOTE:** The 1U SAS Rack-Mount Kit can support up to (2) half-height tape drives.

HP StorageWorks 3U SAS Rack-mount Kit AG576A

**NOTE:** The 3U Rack-mount Kit can support up to (2) full-height or (4) half-height tape drives.

#### SAS Tape Drives

HP Storage Works DAT 320 SAS External Tape Drive AJ828A

HP StorageWorks DAT 160 SAS External Tape Drive Q1588A

HP StorageWorks LTO-5 Ultrium 3280 SAS Full-Height External Tape Drive EH900A

HP StorageWorks LTO-5 Ultrium 3000 SAS Half-Height External Tape Drive EH958A

HP StorageWorks LTO-4 Ultrium 1840 SAS Full-Height External Tape Drive EH861A

HP StorageWorks LTO-4 Ultrium 1760 SAS Half-Height External Tape Drive EH920A

HP StorageWorks LTO-3 Ultrium 920 SAS External Tape Drive EH848A

HP StorageWorks LTO-2 Ultrium 448 SAS External Tape Drive DW086A

#### Tape Autoloaders

HP StorageWorks 1/8 G2 LTO-5 Ultrium 3000 SAS Autoloader BL536A

HP StorageWorks 1/8 G2 LTO-4 Ultrium 1760 SAS Autoloader AK377A

HP StorageWorks 1/8 G2 LTO-3 Ultrium 920 SAS Autoloader AH558A

#### Tape Libraries

HP StorageWorks MSL2024 1 LTO-5 Ultrium 3000 SAS Drive Library BL537A

HP StorageWorks MSL2024 1 LTO-4 Ultrium 1760 SAS Drive Library AK378A

HP StorageWorks MSL2024 1 LTO-3 Ultrium 920 SAS Drive Library AH559A

HP StorageWorks MSL4048 2 LTO-5 Ultrium 3000 SAS Drive Library BL538A

HP StorageWorks MSL4048 2 LTO-4 Ultrium 1760 SAS Drive Library AK380A

HP StorageWorks MSL4048 1 LTO-3 Ultrium 920 SAS Drive Library AH560A

HP StorageWorks MSL8096 2 LTO-5 Ultrium 3000 SAS Drive Library BL539A

HP StorageWorks MSL8096 2 LTO-4 Ultrium 1760 SAS Drive Library AK382A

HP StorageWorks MSL8096 2 LTO-3 Ultrium 920 SAS Drive Library AH561A

#### SAS Cables for Tape Drives

2 meter external Mini-SAS (SFF8088) to Mini-SAS (SFF8088) 1x SAS cable AE470A

**NOTE:** Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.

4 meter external Mini-SAS (SFF8088) to Mini-SAS (SFF8088) 1x SAS cable AE465A

**NOTE:** Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.

2 meter external mini-SAS (SFF8088), split to 4x mini-SAS (SFF8088) cable AN975A

**NOTE:** One cable is required for every four drives. Use this cable to connect HP StorageWorks MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.

4 meter external mini-SAS (SFF8088), split to 4x mini-SAS (SFF8088) cable AN976A

**NOTE:** One cable is required for every four drives. Use this cable to connect HP StorageWorks MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.

### Related Options

#### Mini SAS to Mini SAS Cables

**NOTE:** Cables for use connecting the P812 with D2600, D2700, MSA60, and MSA70.

HP External Mini SAS 2m Cable

407339-B21

HP External Mini SAS 4m Cable

432238-B21

HP External Mini SAS 6m Cable

432239-B21

### Technical Specifications

<b>Dimensions</b> (excluding bracket)	12.3 in x 4.4 in x 0.5 in (31.1 cm x 11.1 cm x 1.2 cm)
<b>PCI Card Size</b>	Full-height, full-length PCI Express
<b>PCI Label</b>	PCIe2 x8 (i.e., x8 mechanical, up to x8 electrical)
<b>PCI Link Rate</b>	x8 5 GT/s PCI Express (4 GB/s maximum bandwidth in each direction)
<b>SAS Connectivity</b>	2 Mini SAS 4i connectors 4 Mini SAS 4x connectors
<b>SAS Link Rate</b>	SAS protocol: 6 Gb/s, 3 Gb/s, or 1.5 Gb/s
<b>SAS Performance</b>	Controller supports a maximum of 4.8 GB/s maximum bandwidth in each direction (allocated across all the connectors)
<b>RAID Cache</b>	1 GiB capacity (not all of which is available for user data) 64-bit data width with 8-bit error correcting code (ECC) Flash-backed on power loss Tether to capacitor pack Removable
<b>RAID Cache Bus Speed</b>	DDR2-800 (6.4 GiB/s maximum bandwidth)
<b>Software upgradeable Firmware</b>	Yes
<b>Maximum Drive Count</b>	100 drives
<b>System Memory Addressing</b>	64-bit, supporting servers memory space greater than 4 GiB
<b>RAID Support</b>	RAID 6 (Advanced Data Guarding) RAID 60 RAID 5 (Distributed Data Guarding) RAID 50 RAID 1+0 (Striping & Mirroring) RAID 1 (Mirroring) RAID 0 (Striping)
<b>Upgradeable Firmware</b>	Flashable ROM with redundant firmware images

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<b>Environment-friendly Products and Approach</b>	<b>End-of-life Management and Recycling</b>	Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: <a href="http://www.hp.com/go/green">http://www.hp.com/go/green</a> . To recycle your product, please go to: <a href="http://www.hp.com/go/green">http://www.hp.com/go/green</a> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.
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The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

### Technical Specifications

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For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less.