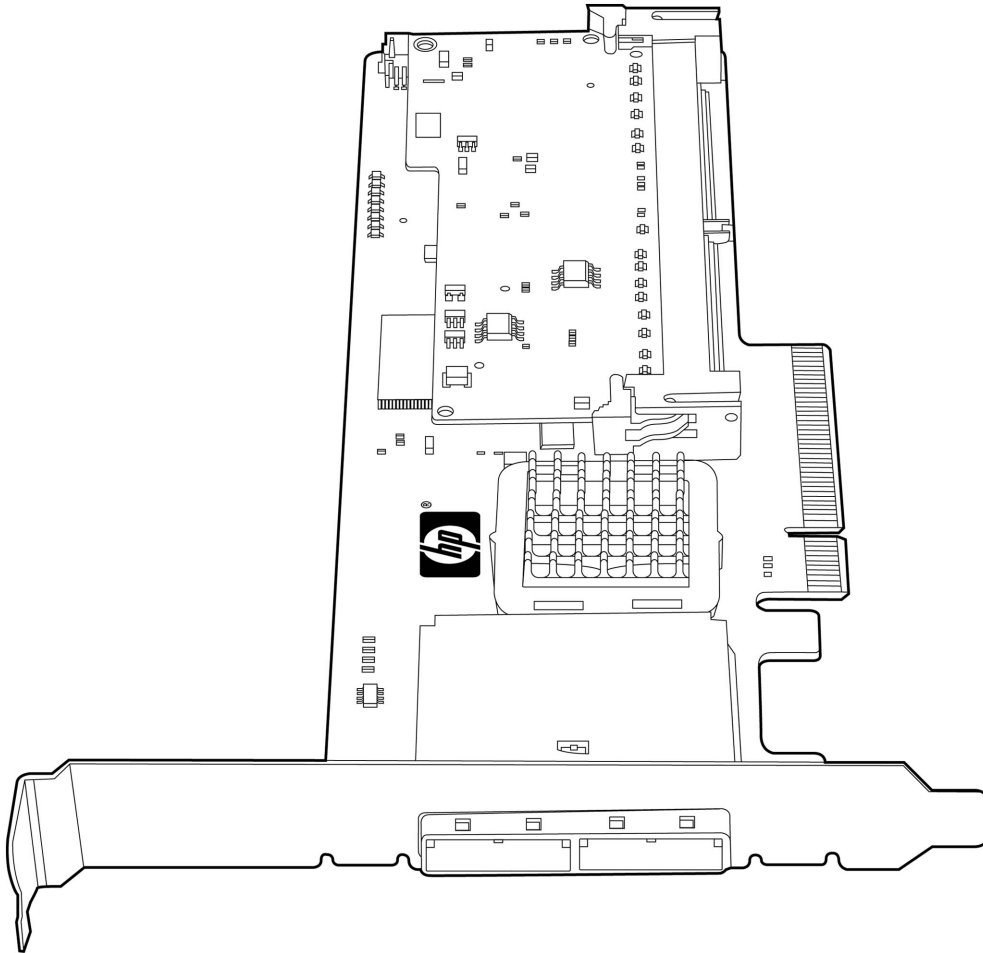


### Overview

The HP Smart Array P411 is HP's external connect only, PCI Express (PCIe) 2.0 Serial Attached SCSI (SAS) RAID controller. The low profile, half height card has 8 ports and utilizes DDR2-800 memory. The P411 is ideal for RAID 0, 1, 1+0, 5, 5+0 and can be upgraded with a minimum of 256MB cache module, battery kit (for BBWC), Flash Backed Write Cache (FBWC), and Smart Array Advanced Pack license key for RAID 6 (ADG) & 6+0.



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### What's New

- 512MB Flash Backed Write Cache (FBWC)
- 1G Flash Backed Write Cache (FBWC)
- HP StorageWorks D2600 Disk Enclosure Support
- HP StorageWorks D2700 Disk Enclosure Support
- HP StorageWorks 600 Modular Disk System

### Overview

### Models

HP Smart Array P411 Controller	HP Smart Array P411/256MB Controller	462830-B21
	HP Smart Array P411/512MB Battery Backed Write Cache	462832-B21
	HP Smart Array P411/512MB Flash Backed Write Cache	578299-B21
	HP Smart Array P411/1G Flash Backed Write Cache	572531-B21

### Upgrade Options

HP Optional Upgrades	512MB BBWC	462967-B21
	Battery Kit upgrade	462969-B21
	<b>NOTE:</b> To enable BBWC on the 256MB cache.	
	512MB Flash Backed Write Cache	534916-B21
	1G Flash Backed Write Cache	534562-B21
	HP Smart Array Advanced Pack No Media 1-Server license including 1yr 24x7 Technical Support	516471-B21
	<b>NOTE:</b> This part number can be used to purchase a single license or to order multiple licenses with a single activation key. Customers will receive a license entitlement certificate via e-mail. The license entitlement certificate must be redeemed online or via fax in order to obtain the license activation key(s). Include one year of 24x7 HP Software Technical Support Services.	
	<b>NOTE:</b> A license key and a minimum of 256MB cache with battery kit or a license key and FBWC are required to enable features. For more information go to: <a href="http://www.hp.com/go/saap">http://www.hp.com/go/saap</a>	

### 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 Hard Drive** form factor is for use 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

- The SA-P411 Controller supports up to 100 drives. Additional drives can be supported with cache and connection to an expander
- The SA-P411 Controller supports the HP StorageWorks 60 Modular Smart Array, HP StorageWorks 70 Modular Smart Array, HP StorageWorks D2600 Disk Enclosure, HP StorageWorks D2700 Disk Enclosure, and HP StorageWorks 600 Modular Disk System.
- Seamless upgrades to current or next generation HP high performance and high capacity Serial Attached SCSI Smart Array controllers
- 6Gb/s SAS technology delivers high performance and data bandwidth and contains full compatibility with 3Gb/s SATA technology.
- x8 PCI Express host interface technology delivers high performance and data bandwidth up to 2 GB/s maximum bandwidth.
- Addition of the battery or flash backed cache upgrade enables array expansion, logical drive extension, RAID migration, and stripe size migration.
- Additionally, Smart Array Advanced Pack License key enables RAID 6 (ADG), 6+0, Advanced Capacity Expansion, Mirror Splitting and Recombining in Offline Mode, Drive Erase, Performance Optimization-Degraded Reads and Read Coalescing (VOD)
- Mix-and-match SAS and SATA hard drives, lets you deploy drive technology as needed to fit your computing environment.
- Support for SAS tape products.
- Software consistency among all Smart Array family products: Array Configuration Utility, Systems Insight Manager, Array Diagnostic Utility (ADU) and SmartStart.
- 256 MB 40-bit wide DDR2-800 MHz cache module standard (with optional battery upgrade)
- Low-profile PCI Express form factor - ships with a full size bracket for deployment in either a low-profile or full sized slot

### Standard Features

#### Online Management Features

- Online array expansion (with BBWC or FBWC)
- Online Advanced Capacity Expansion (with BBWC or FBWC and Smart Array Advanced Pack upgrade)
- Online logical drive extension (with BBWC or FBWC)
- Online RAID Level Migration (with BBWC or FBWC)
- Online Stripe Size Migration (with BBWC or FBWC)
- Offline Mirror splitting and recombining (with BBWC or FBWC and Smart Array Advanced Pack upgrade)
- Unlimited global online spare assignment
- User selectable expand and rebuild priority
- User selectable RAID level and stripe size
- User selectable read and write cache size ratio

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- #### Ports
- Eight (8) SAS physical links distributed across 2 external x4 miniSAS connectors.

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#### Performance

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

- 6Gb/s SAS (600MB/s bandwidth per physical link)
- 8x 6Gb/s SAS physical links (compatible with 3Gb/s SATA)
- 256 MB 40-bit wide DDR2-800MHz cache upgradeable to 512 MB 72-bit wide DDR2-800MHz battery-backed write cache or 512 MB / 1 G 72-bitwide DDR2 flash backed write cache provides up to 4.2 GB/s maximum bandwidth
- Write-back caching (with BBWC or FBWC)

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#### Native Command Queuing

Native Command Queuing (NCQ) is a technology designed to increase performance of SATA hard disk drives by allowing the individual hard disk to internally optimize the order in which received read and write commands are executed. This can reduce the amount of unnecessary going back-and-forth on the drive's heads, resulting in increased performance for workloads where multiple simultaneous read/write requests are outstanding, most often occurring in server or storage-type applications. Without NCQ the drive has to process and complete one command at a time. For NCQ to be enabled, it must be supported and turned on in the controller and in the hard drive itself.

**NOTE:** Please see the [SATA Hard Drive QuickSpecs](http://h18000.www1.hp.com/products/quickspecs/11940_div/11940_div.html) for specific SATA hard drive capacities that support NCQ: [http://h18000.www1.hp.com/products/quickspecs/11940\\_div/11940\\_div.html](http://h18000.www1.hp.com/products/quickspecs/11940_div/11940_div.html)

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#### Capacity

Given the increasing need for high performance and rapid capacity expansion, the SA-P411 offers:

- Up to 57.6TB of external storage per PCI slot with 8x HP StorageWorks 60 Modular Smart Array enclosures or HP StorageWorks D2600 Disk Enclosures and 96 x 600GB 3.5" SAS hard drives
- Up to 96TB of external storage per PCI slot with 8x HP StorageWorks 60 Modular Smart Array enclosures or HP StorageWorks D2600 Disk Enclosures and 96 x 1TB 3.5" SATA MDL hard drives
- Up to 30TB of external storage per PCI slot with 8x HP StorageWorks 70 Modular Smart Array enclosures or HP StorageWorks D2700 Disk Enclosures and 100 x 300GB SFF SAS hard drives
- Up to 50 TB of external storage per PCI slot with 8x HP StorageWorks 70 Modular Smart Array enclosures or HP StorageWorks D2700 Disk Enclosures and 100 x 500GB SFF SATA hard drives

**NOTE:** Support for greater than 2TB in a single logical drive.

### Standard Features

#### Availability

Provides increased server uptime by providing advanced storage functionality:

- Online RAID Level Migration (between any RAID level/with BBWC or FBWC)
- Online Capacity Expansion (with BBWC or FBWC)
- Online Advanced Capacity Expansion (with Smart Array Advanced Pack)
- Logical Drive Capacity Extension (with BBWC or FBWC)
- 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) was first developed by HP which 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 and HP StorageWorks Disk Enclosures.

#### Fault Tolerance

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

- **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 6+0**: Supported with min of 8 drives, but would have 4 available. Target benefit is to split RAID across the external boxes  
**NOTE: RAID 6, 6+0 can be enabled with either**
  - Minimum of 256 MB cache with Battery kit and Smart Array Advanced Pack License key option upgrades
  - Minimum of 512 MB BBWC or FBWC and Smart Array Advanced Pack License key option upgrades
- **RAID 5** (Distributed Data Guarding): This allocates one set of parity data across drives and allows simultaneous write operations. This level of fault tolerance can withstand a single drive failure without downtime or data loss.
  - RAID5 is available on the SA P411 with a minimum of 256MB cache
- **RAID 5+0**: This is a RAID 0 array striped across 5 elements. Combines the straight block-level striping of RAID 0 with the distributed parity of RAID 5.
- **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.

### Standard Features

#### Fault Recovery

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

- Recovery ROM: This new feature provides a unique redundancy feature 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.
  - Battery-backed write cache upgrade provides for up to two days of battery power for data cache retention. The data backup duration could be extended anytime the server's auxiliary power is available during system power down.
  - Flash Backed Write Cache upgrade provides indefinite data retention.
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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 HP StorageWorks Modular Smart Array enclosures and HP StorageWorks Disk Enclosures

### Compatibility

#### Server Support

For up to date compatibility, please see the following URL for complete Smart Array P411 Controller compatibility and support information:

<http://h18006.www1.hp.com/products/servers/proliantstorage/arraycontrollers/index.html>

#### Operating Systems

Microsoft Windows 2003 x64

Microsoft Windows 2003

Microsoft Windows 2003 x84

Microsoft Windows 2008 Server x64

Microsoft Windows 2008 Server x84

Novell Open Enterprise Server, NetWare 6.5  
SP5

Red Hat Enterprise Linux 4, 5, & 6 (x64 & x84)

SUSE Linux Enterprise Server 9 (x64 & x84)

SUSE Linux Enterprise Server 10 (x64 & x84)

SUSE Linux Enterprise Server 11 (x64 & x84)

VMWare

**NOTE:** For more Linux OS support & certification information, please visit:

- ProLiant & BladeSystem Server Linux matrix  
<http://h18004.www1.hp.com/products/servers/linux/hplinuxcert.html>
- Integrity & BladeSystem Server Linux matrix  
<http://h71028.www7.hp.com/enterprise/cache/321101-0-0-0-121.html>

#### Software Suite

All Smart Array products share a common set of configuration, management and diagnostic tools, including Array Configuration Utility (ACU), Array Diagnostic Utility (ADU), and Systems Insight Manager. These software tools reduce the cost of training for each successive generation of product and take 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.

##### Systems Insight Manager

- Powerful server and server options/storage manager tool
- Monitors over 1200 system wide parameters
- Configuration/Diagnostic Utilities

##### HP Array Configuration Utility (ACU)

- 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 Windows and NetWare (CPQONLIN)

##### HP Option ROM Configuration for Arrays (ORCA)

### Compatibility

- An alternative method for easily viewing, creating, and deleting multiple arrays and logical volumes during system power up.
- For advanced array configurations use ACU

**NOTE:** For advanced array configurations use ACU.

#### HP Array Diagnostic Utility (ADU)

- In depth diagnostic and reporting utility for all Smart Array controllers



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

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**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.

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

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**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/>

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**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.

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**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.

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

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

HP 600GB 6G SAS 15K LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	516828-B21
HP 450GB 6G SAS 15K LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	516816-B21
HP 450GB 3G SAS 15K LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	454232-B21
HP 300GB 6G SAS 15K LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	516814-B21
HP 300GB 3G SAS 15K LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	416127-B21
HP 146GB 3G SAS 15K LFF (3.5-inch) Dual Port Enterprise 3yr Warranty Hard Drive	384854-B21
HP 72GB 3G SAS 15K 3.5" DP ENT HDD	384852-B21

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

HP 600GB 6G SAS 15K LFF (3.5-inch) Non-hot Plug Dual Port ENT 3y Wty Hard Drive	516830-B21
HP 450GB 6G SAS 15K LFF (3.5-inch) Non-hot Plug Dual Port ENT 3y Wty Hard Drive	516826-B21
HP 450GB 3G SAS 15K LFF (3.5-inch) Non-hot Plug Dual Port ENT 3y Wty Hard Drive	454234-B21
HP 300GB 6G SAS 15K LFF (3.5-inch) Non-hot Plug Dual Port ENT 3y Wty Hard Drive	516824-B21
HP 300GB 3G SAS 15K LFF (3.5-inch) Non-hot Plug Dual Port ENT 3y Wty Hard Drive	417950-B21
HP 146GB 3G SAS 15K LFF (3.5-inch) Non-hot Plug Dual Port ENT 3y Wty Hard Drive	417855-B21

#### SAS Hot Plug SFF (2.5-inch) Midline (MDL) Drives

HP 500GB 6G SAS 7.2K rpm SFF (2.5inch) Midline 1yr Warranty Hard Drive	507610-B21
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#### SAS Hot Plug LFF (3.5-inch) Midline (MDL) Drives

HP 2TB 6G SAS 7.2K rpm LFF (3.5-inch) Dual Port Midline 1yr Warranty Hard Drive	507616-B21
HP 1TB 6G SAS 7.2K rpm LFF (3.5-inch) Dual Port Midline 1yr Warranty Hard Drive	507614-B21
HP 1TB 3G SAS 7.2K rpm LFF(3.5-inch) Dual Port Midline 1yr Warranty Hard Drive	461137-B21

### Related Options

HP 750GB 3G SAS 7.2K rpm LFF(3.5-inch) Dual Port Midline 1yr Warranty Hard Drive 461135-B21

**NOTE:** Please see the QuickSpecs for Technical Specifications and additional information:

[http://h18000.www1.hp.com/products/quickspecs/12244\\_div/12244\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12244_div/12244_div.html)  
(Worldwide)

#### SATA Hot Plug SFF (2.5-inch) Midline (MDL) Drives

HP 500GB 3G SATA 7.2K rpm SFF (2.5-inch) Midline 1yr Warranty Hard Drive 507750-B21

HP 160GB 3G SATA 7.2K rpm SFF (2.5-inch) Midline 1yr Warranty Hard Drive 530888-B21

#### SATA Non-Hot Plug SFF (2.5-inch) Midline (MDL) Drives

HP 500GB 3G SATA 7.2K rpm SFF (2.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 507753-B21

HP 160GB 3G SATA 7.2K rpm SFF (2.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 530891-B21

#### SATA Hot Plug LFF (3.5-inch) Midline (MDL) Drives

HP 2TB 3G SATA 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive 507632-B21

HP 1TB 3G SATA 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive 454146-B21

HP 750GB 3G SATA 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive 458930-B21

HP 500GB 3G SATA 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive 458928-B21

HP 250GB 3G SATA 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive 458926-B21

#### SATA Non-Hot Plug LFF (3.5-inch) Midline (MDL) Drives

HP 2TB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 507774-B21

HP 1TB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 507772-B21

HP 750GB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 462595-B21

HP 500GB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 458941-B21

HP 250GB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Midline 1y Wty Hard Drive 458939-B21

#### SATA Hot Plug SFF (2.5-inch) Entry (ETY) Drives

HP 250GB 3G SATA 5.4K rpm SFF (2.5-inch) Entry 1yr Warranty Hard Drive 460355-B21

HP 120GB 1.5G SATA 5.4K rpm SFF (2.5-inch) Entry 1yr Warranty Hard Drive 458924-B21

#### SATA Non-Hot Plug SFF (2.5-inch) Entry (ETY) Drives

HP 250GB 3G SATA 5.4K rpm SFF (2.5-inch) Non-hot Plug Entry 1y Wty Hard Drive 460357-B21

HP 120GB 1.5G SATA 5.4K rpm SFF (2.5-inch) Non-hot Plug Entry 1y Wty Hard Drive 459357-B21

#### SATA Hot Plug LFF (3.5-inch) Entry (ETY) Drives

HP 250GB 3G SATA 7.2K rpm LFF (3.5-inch) Entry 1yr Warranty Hard Drive 571230-B21

HP 160GB 3G SATA 7.2K rpm LFF (3.5-inch) Entry 1yr Warranty Hard Drive 458945-B21

#### SATA Non-Hot Plug LFF (3.5-inch) Entry (ETY) Drives

HP 250GB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Entry 1y Wty Hard Drive 571232-B21

HP 160GB 3G SATA 7.2K rpm LFF (3.5-inch) Non-hot Plug Entry 1y Wty Hard Drive 458947-B21

### Related Options

**NOTE:** Please see the QuickSpecs for Technical Specifications and additional information:

[http://h18000.www1.hp.com/products/quickspecs/13021\\_div/13021\\_div.html](http://h18000.www1.hp.com/products/quickspecs/13021_div/13021_div.html)  
(Worldwide)

#### SATA Hot Plug Midline (MDL) Solid State Drives

HP 60GB 3G SATA 2.5in MDL 1y Wty SSD 572071-B21

HP 120GB 3G SATA 2.5in MDL 1y Wty SSD 572073-B21

#### SATA Hot Plug 3.5" Midline (MDL) Solid State Drives

HP 60GB 3G SATA 3.5in MDL 1y Wty SSD 570761-B21

HP 120GB 3G SATA 3.5in MDL 1y Wty SSD 570763-B21

**NOTE:** Please see the QuickSpecs for Technical Specifications and additional information:

[http://h18000.www1.hp.com/products/quickspecs/13415\\_div/13415\\_div.html](http://h18000.www1.hp.com/products/quickspecs/13415_div/13415_div.html)  
(Worldwide)

**NOTE:** Go to the HP Hard Drive Compatibility table for complete drive compatibility information (<http://www.hp.com/products/harddiskdrives>). Using hard drives in unsupported configurations will result in voiding the warranty and could result in damage to the drive and/or loss of data.

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### HP Disk Storage Systems

#### MSA SAN Storage Arrays

HP StorageWorks 60 Modular Smart Array 418408-B21

**NOTE:** Supports 12 SFF drives, and SAS 3 Gb/s and SATA 1.5 Gb/s.

HP StorageWorks 70 Modular Smart Array 418800-B21

**NOTE:** Supports 25 SFF drives, and SAS 3 Gb/s and SATA 1.5 Gb/s.

**NOTE:** Please see the QuickSpecs for additional information including configuration steps and additional options needed for a complete solution at:

[http://h18000.www1.hp.com/products/quickspecs/12627\\_div/12627\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12627_div/12627_div.html)  
(MSA60)

[http://h18000.www1.hp.com/products/quickspecs/12652\\_div/12652\\_div.html](http://h18000.www1.hp.com/products/quickspecs/12652_div/12652_div.html)  
(MSA70)

#### Disk Enclosures

HP StorageWorks D2600 Disk Enclosure AJ940A

**NOTE:** Supports 12 LFF drives, and SAS 6 Gb/s and SATA 3 Gb/s.

HP StorageWorks D2700 Disk Enclosure AJ941A

**NOTE:** Supports 25 SFF drives, and SAS 6 Gb/s and SATA 3 Gb/s.

**NOTE:** Please see the QuickSpecs for additional information including configuration steps and additional options needed for a complete solution at:

[http://h18000.www1.hp.com/products/quickspecs/13404\\_div/13404\\_div.html](http://h18000.www1.hp.com/products/quickspecs/13404_div/13404_div.html)  
(D2000 Disk Enclosures)

HP MDS600 with two Dual Port I/O Module System AJ866A

**NOTE:** Please see the QuickSpecs for additional information including configuration steps and additional options needed for a complete solution at:

[http://h18000.www1.hp.com/products/quickspecs/13257\\_div/13257\\_div.html](http://h18000.www1.hp.com/products/quickspecs/13257_div/13257_div.html)  
(600 Modular Disk System)

### Related Options

#### HP Tape Backup

**NOTE:** For the complete range of StorageWorks tape drives, autoloaders, libraries and media see: <http://www.hp.com/go/tape>.

**NOTE:** The HP Smart Array P411 Controller is for connection to external (desktop) tape drives, tape drives in Rack-Mount Kits, tape autoloaders and tape libraries.

#### SAS Tape Drives

HP StorageWorks DAT 160 SAS Internal Tape Drive	Q1587A
HP StorageWorks DAT 160 SAS External Tape Drive	Q1588A
HP StorageWorks DAT 320 SAS Internal Tape Drive	AJ830A
HP StorageWorks DAT 320 SAS External Tape Drive	AJ828A
HP StorageWorks LTO-2 Ultrium 448 SAS External Tape Drive	DW086A
HP StorageWorks LTO-3 Ultrium 920 SAS External Tape Drive	EH848A
HP StorageWorks LTO-4 Ultrium 1760 SAS External Tape Drive	EH920A
HP StorageWorks 1U SAS Rack-Mount Kit with one LTO-4 Ultrium 1760	EH946A
HP StorageWorks LTO-4 Ultrium 1840 SAS External Tape Drive	EH861A

#### Rack-mount Tape Drive Enclosures

HP StorageWorks 1U SAS Rack-Mount Kit	AE459A
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**NOTE:** The 1U SAS Rack-Mount Kit can support up to (2) half-height tape drives and is compatible with the DAT 160 SAS (Q1587A), LTO-2 Ultrium 448 SAS (DW085A), LTO-3 Ultrium 920 SAS (EH847A) and LTO-4 Ultrium 1760 (EH919A) tape drives.

HP StorageWorks 3U SAS Rack-mount Kit	AG576A
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**NOTE:** The 3U Rack-mount Kit can support up to (2) full-height or (4) half-height tape drives and compatible with multiple SAS tape drives including DAT 160 SAS (Q1587A), LTO-2 Ultrium 448 SAS (DW085A), LTO-3 Ultrium 920 SAS (EH847A), LTO-4 Ultrium 1760 SAS (EH919A) and LTO-4 Ultrium 1840 SAS (EH860A) tape drives.

#### SAS Tape Autoloaders

HP StorageWorks 1/8 G2 LTO-4 Ultrium 1760 SAS Autoloader	AK377A
HP StorageWorks 1/8 G2 LTO-3 Ultrium 920 SAS Autoloader	AH558A

#### SAS Tape Libraries

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 1 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-4 Ultrium 1760 SAS Drive Library	AK382A
HP StorageWorks MSL8096 2 LTO-3 Ultrium 920 SAS Drive Library	AH561A

#### SAS Cables for Tape Drives and Automation

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

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.

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### HP Optional Cables

#### SAS to Mini SAS Cables

Mini-SAS to Mini-SAS, 28.00"	496013-B21
Mini-SAS to Mini-SAS, 33.00"	496014-B21
Mini-SAS to SFF8484, 18.00"	496015-B21
Mini-SAS to SFF8484, 24.00"	496015-B21
Mini-SAS to SFF8484, 32.00"	496016-B21
Mini-SAS to SFF8484, 35.00"	496016-B21
Mini-SAS to SFF8484, 33.00"	591734-B21

#### Additional Cables

HP 15 POS 24in SFP Battery Cable Assy	496029-B21
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### Technical Specifications

Dimensions (excluding bracket)	Low Profile PCIe Form Factor 19.05 cm x 24.13 cm x 5.72 cm (7.5 in x 9.5 in x 2.25 in)
Disk Drive and Enclosure Protocol Support - Transfer rate	6Gb/s SAS (Serial Attached SCSI) 3Gb/s SATA (Serial AT Attachment)
SAS Connectors	2 external (Mini SAS) x8 wide port connectors
Data Transfer Method	x8 5G PCIe 2.0 Express (4 GB/s maximum bandwidth)
Memory Bus Speed	DDR2-800 MHz with 40 bit or 72-bit wide bus provides up to 4.2 GB/s maximum bandwidth
PCI	PCIe Express Gen 2.0
Simultaneous Drive Transfer Ports	2 x4 Wide SAS Ports
SAS Port Link Rate	24 Gb/s per x4 wide port connector (4 x 6 Gb/s)
Software upgradeable Firmware	Yes
Cache Memory	40-bit 256MB ECC protected cache (72-bit 512MB BBWC or 72-bit 512MB and 1G FBWC module upgrades available); transportable with battery-backed or flash upgrade
Logical Drives Supported	Up to 64 logical drives
Maximum Capacity	100TB (100 x 1TB)
Memory Addressing	64-bit, supporting servers memory space greater than 4 GB
RAID Support	RAID 6, 6+0 (Advanced Data Guarding) <b>NOTE:</b> RAID 6, 6+0 can be enabled with either <ul style="list-style-type: none"><li>• Minimum of 256 MB cache with Battery kit or FBWC and Smart Array Advanced Pack License key option upgrades</li><li>• Minimum of 512 MB BBWC or FBWC and Smart Array Advanced Pack License key option upgrades</li></ul> RAID 5, 5+0 (Distributed Data Guarding) <b>NOTE:</b> A minimum of 256 MB cache is required to enable RAID 5, 5+0 support of the Smart Array P411 RAID 1+0 (Striping & Mirroring) RAID 0 (Striping)
Upgradeable Firmware	Upgradeable Firmware with Recovery ROM feature

### Technical Specifications

#### Environment-friendly Products and Approach

#### End-of-life Management and Recycling

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: <http://www.hp.com/go/green>. To recycle your product, please go to: <http://www.hp.com/go/green> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

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.

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