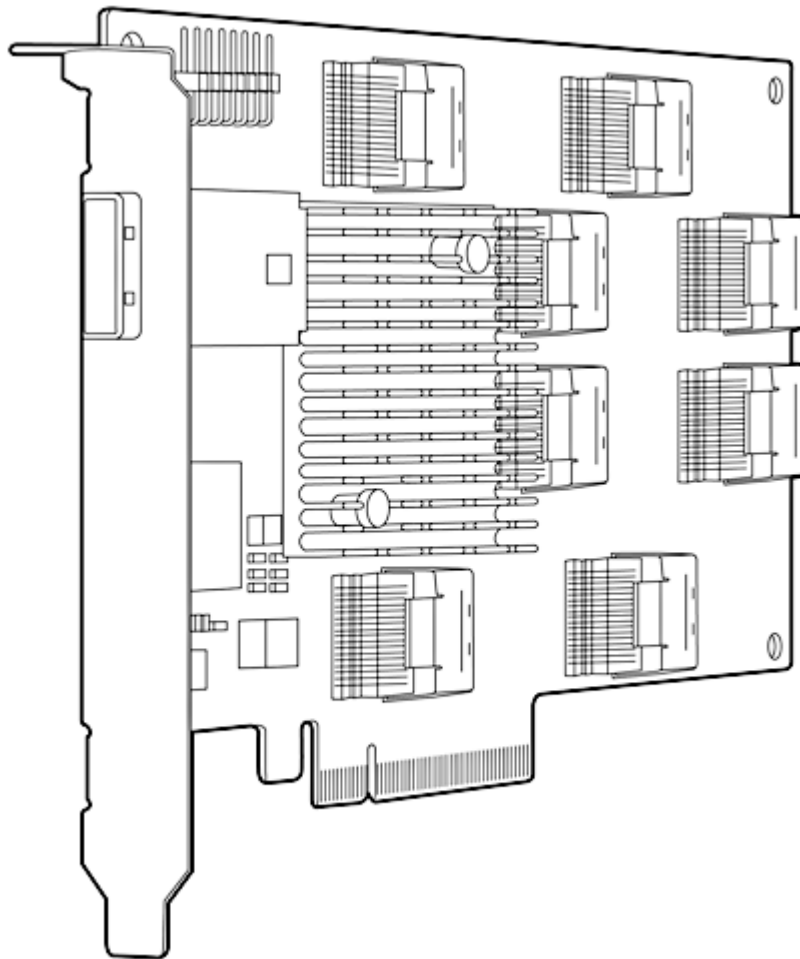


### Overview

The HP Smart SAS Expander Card enhances the Smart Array controller family by allowing support for more than 8 internal hard disk drives on select ProLiant servers when connected to a Smart Array P410 Controller (SA-P410) or Smart Array P410i Controller (SA-P410i). The full height, Serial Attached SCSI (SAS) expander card supports up to 24 internal drive bays plus an external connection for tape. The HP SAS Expander Card is ideal for ProLiant server customers that want to RAID more than 8 internal hard disk drives or for ProLiant server customers who purchase an additional internal drive cage and want to be able to RAID across all internal drives.

**NOTE:** The use of the HP SAS Expander Card requires a minimum of 256MB cache on the SA-P410 or SA-P410i Controller.



### Models

HP SAS Expander Card    HP SAS Expander Card

468406-B21

### Standard Features

#### The Smart Array Advantage

HP's innovative design and integration work of the Smart Array family of products, including the HP SAS Expander Card connected to a SA-P410 or SA-P410i Controller 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.

Smart Array Advanced Pack (SAAP) delivers value added software features with the Smart Array Controller, which will further enhance performance, reliability, and availability of customer data.

**NOTE:** For more information on features and benefits of Smart Array Controllers please visit: [www.hp.com/products/smartarray](http://www.hp.com/products/smartarray)

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#### Key Features

- 6 Gb/s SAS technology delivers high performance and data bandwidth up to 600 MB/s per physical link and contains full compatibility with 3.0Gb/s SAS technology and 1.5 and 3.0Gb/s SATA technology. Mix-and-match SAS and SATA hard drives, lets you deploy drive technology as needed to fit your computing environment.
- Supports up to 24 internal drive bays plus an external connection for tape (supports 3 drive backplanes with each holding 8 drive bays)

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#### Management Features

- Upgradeable firmware via HP firmware CD or <http://www.hp.com/cgi-bin/hpsupport/index.pl>

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#### Ports

- 24 internal drive bays plus external port for tape
- 8 Mini SAS 4i ports
- 2 Mini SAS 4i ports intended for attachment to the Smart Array controller (e.g. P410 or P410i)
  - 6 Gb/s Gbps SAS bandwidth = 4800 MB/s
- 6 Mini SAS 4i ports intended for attachment to server drive backplanes
  - Supports up to 24 drive bays (3 drive backplanes with each holding 8 drive bays)
- 1 Mini SAS 4x port
  - Intended for attachment to a SAS tape drive, autoloader, or library
  - 6Gb/s SAS bandwidth = 2400 MB/s

### Standard Features

#### Performance

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

- 6Gb/s SAS (600MB/s bandwidth per physical link) 3.0Gb/s SATA (300MB/s bandwidth per physical link)
- 

#### Capacity

Given the increasing need for high performance and rapid capacity expansion, the SAS Expander Card and the SA-P410 or SAP410i Controller offers:

- Up to 14TB of total storage with 14 x 1TB 3.5" SATA MDL HDD
  - Up to of 7.2 TB total storage with 24 x 300GB 6Gb/s SAS 10K SFF DP ENT HDD
- 

#### Fault Recovery

The HP SAS Expander Card helps to minimize downtime.

- Recovery ROM: This feature protects the user from a firmware image corruption by storing a redundant copy of the firmware image. If the active firmware image becomes corrupt, the controller will use the redundant firmware image and continue operating.

### Compatibility

#### Server Compatibility

##### ProLiant DL (rack-optimized):

- HP ProLiant DL380 G6
- HP ProLiant DL385 G5p
- HP ProLiant DL580 G5
- HP ProLiant DL785 G5

##### ProLiant ML (expansion-optimized):

- HP ProLiant ML350 G6
- HP ProLiant ML370 G6

**NOTE:** Customer needs to order 8" Mini SAS to Mini SAS cables (496012-B21) when connecting the Smart Array P410 Controller to a SAS Expander Card in a G6 server or ProLiant DL385 G5p. The 8" Mini Sas To Mini SAS cables are not needed when connected the Smart Array P410i Controller to a SAS Expander Card in a G6 server or ProLiant DL385 G5p.

#### Operating Systems

Microsoft Windows 2003 x64 Edition  
Microsoft Windows 2003 x86 Edition  
Microsoft Windows 2008 Server x64  
Microsoft Windows 2008 Server x86  
Microsoft Window Vista Enterprise  
Novell Open Enterprise Server, NetWare 6.5  
Oracle Enterprise Linux (OEL)  
Red Hat Enterprise Linux 4, 5 (x64 & x86)  
SUSE Linux Enterprise Server 9 (x64 & x86)  
SUSE Linux Enterprise Server 10 (x64 & x86)  
SUSE Linux Enterprise Server 11 (x64 & x86)  
VMWare  
UnixWare

**NOTE:** For more Linux OS support & certification information, please visit our the ProLiant & BladeSystem Server Linux matrix: <http://h71028.www7.hp.com/enterprise/cache/321146-0-0-0-121.html>

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

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**Warranty** The warranty for this device is 3-years parts only.

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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  
**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.

#### 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 Enterprise (ENT) Drives

HP 300GB 6G SAS 10K SFF DP ENT HDD	507127-B21
HP 300GB 3G SAS 10K SFF DP ENT HDD	492620-B21
HP 146GB 6G SAS 15K SFF DP ENT HDD	512547-B21
HP 146GB 3G SAS 15K SFF DP ENT HDD	504062-B21
HP 146GB 6G SAS 10K SFF DP ENT HDD	507125-B21
HP 146GB 3G SAS 10K SFF DP ENT HDD	418367-B21
HP 146GB 3G SAS 10K SFF SP HDD	431958-B21
HP 72GB 6G SAS 15K SFF DP ENT HDD	512545-B21
HP 72GB 3G SAS 15K SFF DP ENT HDD	418371-B21
HP 72GB 3G SAS 15K SFF SP HDD	431935-B21
HP 72GB 3G SAS 10K SFF DP ENT HDD	384842-B21
HP 72GB 3G SAS 10K SFF SP HDD	375861-B21
HP 36GB 3G SAS 15K SFF DP ENT HDD	418369-B21
HP 36GB 3G SAS 15K SFF SP HDD	431933-B21

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

HP 300GB 6G SAS 10K SFF DP NHP ENT HDD	537809-B21
HP 146GB 6G SAS 10K SFF DP NHP ENT HDD	537807-B21
HP 72GB 6G SAS 15K SFF DP NHP ENT HDD	537805-B21

#### SAS Hot Plug 3.5" Enterprise (ENT) Drives

HP 600GB 6G SAS 15K 3.5" DP ENT HDD	516828-B21
HP 450GB 6G SAS 15K 3.5" DP ENT HDD	516816-B21
HP 450GB 3G SAS 15K 3.5" DP ENT HDD	454232-B21
HP 400GB 3G SAS 10K 3.5" DP ENT HDD	459508-B21
HP 300GB 3G SAS 15K 3.5" SP HDD	431944-B21
HP 300GB 6G SAS 15K 3.5" DP ENT HDD	516814-B21
HP 300GB 3G SAS 15K 3.5" DP ENT HDD	416127-B21
HP 146GB 3G SAS 15K 3.5" SP HDD	375872-B21
HP 146GB 3G SAS 15K 3.5" DP ENT HDD	384854-B21
HP 72GB 3G SAS 15K 3.5" SP HDD	375870-B21
HP 72GB 3G SAS 15K 3.5" DP ENT HDD	384852-B21

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

HP 600GB 3G SAS 15K NHP 3.5" DP ENT HDD	516830-B21
HP 450GB 6G SAS 15K NHP 3.5" DP ENT HDD	516826-B21

### Related Options

HP 450GB 3G SAS NHP 15K 3.5" DP ENT HDD	454234-B21
HP 400GB 3G SAS NHP 10K 3.5" DP ENT HDD	508232-B21
HP 300GB 6G SAS 15K NHP 3.5" DP ENT HDD	516824-B21
HP 300GB 3G SAS NHP 15K 3.5" DP ENT HDD	417950-B21
HP 300GB 3G SAS 15K NHP 3.5" SP HDD	431950-B21
HP 146GB 3G SAS NHP 15K 3.5" DP ENT HDD	417855-B21
HP 146GB 3G SAS 15K NHP 3.5" SP HDD	432093-B21
HP 72GB 3G SAS 15K NHP 3.5" SP HDD	432095-B21
<b>SAS Hot Plug SFF Midline (MDL) Drives</b>	
HP 500GB 6G SAS 7.2K SFF DP MDL HDD	507610-B21
<b>SAS Hot Plug 3.5" Midline (MDL) Drives</b>	
HP 1TB 3G SAS 7.2K 3.5" DP MDL HDD	461137-B21
HP 750GB 3G SAS 7.2K 3.5" DP MDL HDD	461135-B21
<b>SATA Hot Plug SFF Midline (MDL) Drives</b>	
HP 500GB 3G SATA 7.2K 2.5in MDL HDD	507750-B21
HP 160GB 3G SATA 7.2K 2.5in MDL HDD	530888-B21
<b>SATA Non-Hot Plug SFF Midline (MDL) Drives</b>	
HP 500GB 3G SATA 7.2K 2.5in NHP MDL HDD	507753-B21
HP 160GB 3G SATA 7.2K 2.5in NHP MDL HDD	530891-B21
<b>SATA Hot Plug 3.5" Midline (MDL) Drives</b>	
HP 1TB 3G SATA 7.2K 3.5" MDL HDD	454146-B21
HP 750GB 3G SATA 7.2K 3.5" MDL HDD	458930-B21
HP 500GB 3G SATA 7.2K 3.5" MDL HDD	458928-B21
HP 250GB 3G SATA 7.2K 3.5" MDL HDD	458926-B21
<b>SATA Non-Hot Plug 3.5" Midline (MDL) Drives</b>	
HP 750GB 3G SATA 7.2K NHP 3.5" MDL HDD	462595-B21
HP 500GB 3G SATA 7.2K NHP 3.5" MDL HDD	458941-B21
HP 250GB 3G SATA 7.2K NHP 3.5" MDL HDD	458939-B21
<b>SATA Hot Plug SFF Entry (ETY) Drives</b>	
HP 250GB 3G SATA 5.4K SFF ETY HDD	460355-B21
HP 120GB 1.5G SATA 5.4K SFF ETY HDD	458924-B21
<b>SATA Non-Hot Plug SFF Entry (ETY) Drives</b>	
HP 250GB 3G SATA 5.4K NHP SFF ETY HDD	460357-B21
HP 120GB 1.5G SATA 5.4K NHP SFF ETY HDD	459357-B21
<b>SATA Hot Plug 3.5" Entry (ETY) Drives</b>	
HP 160GB 3G SATA 7.2K 3.5" ETY HDD	458945-B21
<b>SATA Non-Hot Plug 3.5" Entry (ETY) Drives</b>	
HP 160GB 3G SATA 7.2K NHP 3.5" ETY HDD	458947-B21

**NOTE:** Go to the [HP Hard Drive Compatibility table](http://www.hp.com/products/harddiskdrives) 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.

### Related Options

**NOTE:** There is a known compatibility issue with some early 3.5" SATA HDD that will make them unable to be used with the SA-P400 controller. Customers should verify that they are not using hard drive part number 332649-002/003 (spare 353042-001), 332650-002/003 (spare 353043-001), or 356536-002/003 (spare 353044-001).

**NOTE:** SATA Drive Write Cache is disabled by default to minimize the risk of data loss in case of power loss and cannot be enabled for SATA drives attached to all HP Smart Array controllers and HP 8 Port internal SAS/SATA HBA with RAID.

### Tape Storage

#### SAS Tape Drives

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

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

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

**NOTE:** The 1U SAS Rack-Mount Kit can support up to (2) half-height tape drives and is compatible with the DAT 160 SAS, LTO-2 Ultrium 448 SAS, LTO-3 Ultrium 920 SAS and LTO-4 Ultrium 1760 SAS 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 and compatible with multiple SAS tape drives including DAT 160 SAS, LTO-2 Ultrium 448 SAS, LTO-3 Ultrium 920 SAS, LTO-4 Ultrium 1760 SAS and LTO-4 Ultrium 1840 SAS tape drives.

#### 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

#### 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

2M 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.

4M 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.

2M External Mini SAS (SFF8088) 1x to Mini SAS (SFF8088) 4x fanout SAS Cable AN975A

**NOTE:** Use this cable to connect HP StorageWorks MSL SAS Tape Libraries to Mini SAS (SFF8088) ports.

### Related Options

4M External Mini SAS (SFF8088) 1x to Mini SAS (SFF8088) 4x fanout SAS Cable	AN976A
<b>NOTE:</b> Use this cable to connect HP StorageWorks MSL SAS Tape Libraries to Mini SAS (SFF8088) ports.	
HP StorageWorks Mini SAS Cable for LTO Internal Tape Drive	AP746A
HP StorageWorks Mini SAS Cable for DAT Internal Tape Drive	AP747A

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<b>SAS to Mini SAS Cables</b>	Mini-SAS to Mini-SAS, 8.00"	496012-B21
	Mini-SAS to Mini-SAS, 25.50" & 28.00"	496013-B21
	Mini-SAS to Mini-SAS, 33.00"	496014-B21

### Technical Specifications

<b>Dimensions</b>	PCIe full-height card Not including bracket 6.6 in x 4.376 in (167.65 mm x 111.15 mm) Including bracket 12.283 in x 4.376 in (312 mm x 111.15 mm)
<b>Disk Drive Transfer rate</b>	6Gb/s SAS (Serial Attached SCSI) 3.0Gb/s SATA (Serial ATA)
<b>SAS Connectors</b>	8 Mini SAS 4i connectors (2 connecting to controller and up to 6 connectors to attach 3 drive cages) 1 Mini SAS 4x connector (for tape attach)
<b>SAS Speed</b>	If attached via 2 cables to a Smart Array P410 Controller or Smart Array P410i Controller the total available bandwidth is 4.8GB/s. If attached via 1 cable to a Smart Array P410 Controller or Smart Array P410i Controller the total available bandwidth is 2.4GB/s.
<b>Logical Drives Supported</b>	Up to 64 logical drives when connected to a Smart Array P410 Controller or Smart Array P410i Controller.
<b>Maximum Logical Drive Capacity</b>	14 TB using 14, 1TB SATA drives in RAID 0
<b>Upgradeable Firmware</b>	<b>NOTE: Via Smart Array P410 Controller or Smart Array P410i Controller.</b> Upgradeable Firmware via HP Firmware CD or <a href="http://www.hp.com/cgi-bin/hpsupport/index.pl">http://www.hp.com/cgi-bin/hpsupport/index.pl</a>

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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.

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