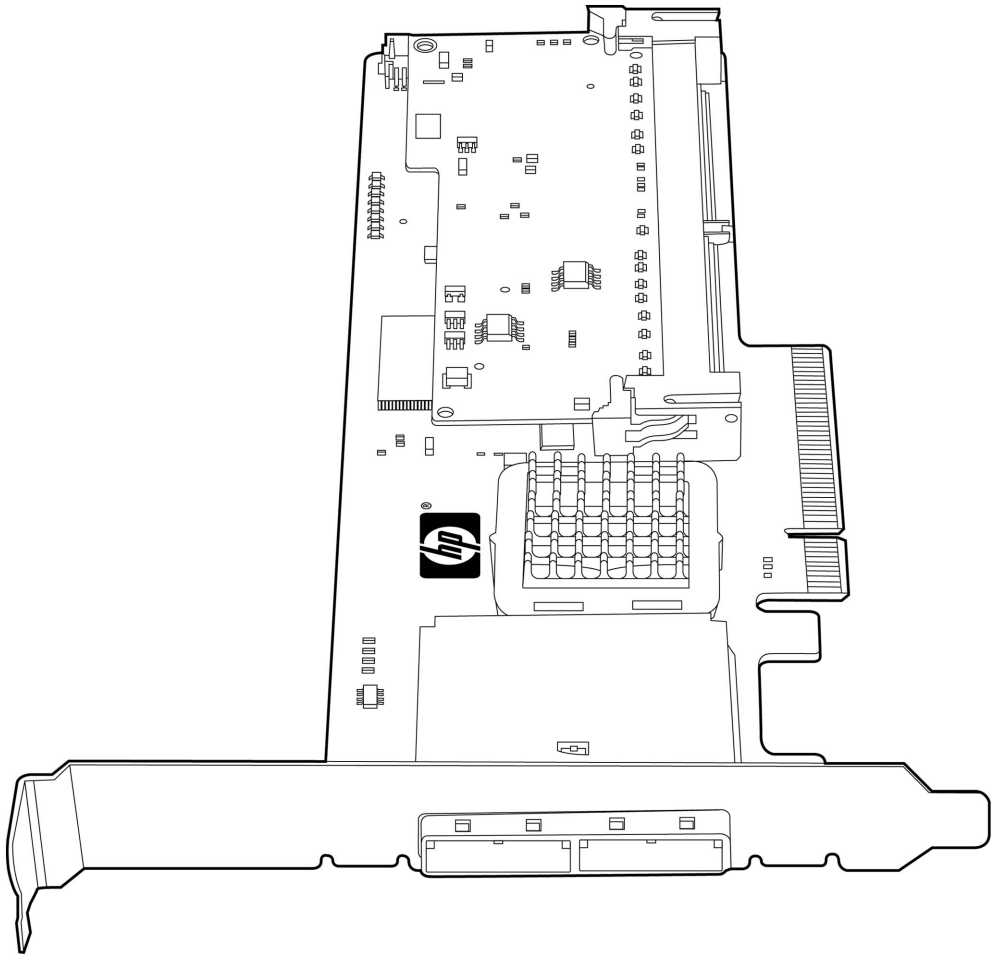
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QuickSpecs

HP Smart Array P411 Controller

Overview

The HP Smart Array P411 is HP's PCI Express (PCIe) 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, 5, 1+0 & 5+0 and can be upgraded with the 512MB battery-backed write cache (BBWC) or 512MB/1G Flash Backed Write Cache (FBWC) module and Smart Array Advanced via license key for RAID 6 &, 6 +0.



What's New

- Updating supported hard drives.

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Overview

Models

HP Smart Array P411 Controller	HP Smart Array P411/256 2-ports Ext PCIe x8 SAS Controller	462830-B21
	HP Smart Array P411/512 BBWC 2-ports Ext PCIe x8 SAS Controller	462832-B21
	HP Smart Array P411/512 FBWC 2-ports Ext PCIe x8 SAS Controller	578229-B21
	HP Smart Array P411/1G FBWC 2-ports Ext PCIe x8 SAS Controller	572531-B21

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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 60 Modular Smart Array,HP 70 Modular Smart Array, HP D2600 Disk Enclosure, HP D2700 Disk Enclosure, and HP 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

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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
Ports	• Eight (8) SAS physical links distributed across 2 external x4 miniSAS connectors.
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) • 256MB 40-bit wide DDR2-800MHz cache upgradeable to 512MB 72-bit wide DDR2-800MHz battery-backed write cache or 512MB / 1G 72-bitwide DDR2 flash backed write cache provides up to 4.2 GB/s maximum bandwidth • Write-back caching (with BBWC or FBWC)
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 for specific SATA hard drive capacities that support NCQ: http://h18000.www1.hp.com/products/quickspecs/11940_div/11940_div.html

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Standard Features

Capacity

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

- Up to 48TB of external storage per controller with 1 x HP MSA2040 SAN Storage and 12 x 4TB LFF SAS hard drives
- Up to 24TB of external storage per controller with 1 x HP MSA2040 SAN Storage and 24 x 1TB SFF SAS hard drives
- Up to 384TB of external storage per controller with 8 x HP D2600 Disk Enclosure and 96 x 4TB 3.5" SAS or SATA hard drives
- Up to 240TB of external storage per controller with 8 x HP D2700 Disk Enclosures and 200 x 1.2TB SFF SAS hard drives
- Up to 200 TB of external storage per controller with 8 x HP D2700 Disk Enclosures and 200 x 1TB SFF SATA hard drives

NOTE: Please check the website of the supported Disk Storage System to get the most recent information on maximum capacity.

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 Modular Smart Array Enclosures and HP Disk Enclosures.

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Standard Features

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.

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.

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 Modular Smart Array enclosures and HP Disk Enclosures

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Standard Features

Warranty

The warranty for this device is 3 years parts, labor and onsite.

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.

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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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)

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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

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Service and Support

Service and Support

HP Care Pack Services: Packaged server and storage services for increased uptime, productivity and ROI

When you buy HP server and storage products and solutions, it's also a good time to think about what levels of support you may need. Our portfolio of service options reduce deployment and management worries while helping you get the most out of your server and storage investments. We take a holistic approach to your environment, bridging servers, blades, storage, software and network infrastructures with our packaged HP Care Pack Services for servers and storage.

Protect your business beyond warranty

When it comes to robustness and reliability, standard computing equipment warranties have matured along with technology. Good news that can also create problems stemming from depending on standard warranties designed to only protect against product defects and some downtime causes. Using a standard approach to warranty uplifts, such as HP Care Pack Services, helps reduce downtime risks and provides operational consistency for mission-critical and standard business computing.

HP Care Pack Services: Upgrading or extending standard server and storage warranties cost effectively

HP Care Pack Services offer a standard reactive hardware and software support services suite sold separately, or combined with our Support Plus and Support Plus 24 services. The portfolio also provides a combination of integrated proactive and reactive services, such as Proactive 24 Service and Critical Service. In addition with HP Proactive Select, you can acquire the specific proactive constancy and technical services. HP Proactive Select menu offers a broad set of service options that you can mix and match depending on your specific requirements. Proactive service options include offers for server, storage, network, SAN device, software, environment and education services.

HP server and storage lifecycle support services offers a full spectrum of customer care-from technology support to complex migrations to complete managed services. HP Factory Express provides customization, integration and deployment services for turnkey solutions. HP Education Services offer flexible, comprehensive training on to help your IT staff get the most out of your server and storage investments. HP Financial solutions extend innovative financing and cost-effective asset management programs-from purchase to equipment retirement.

Learn more: www.hp.com/services/servers and www.hp.com/services/storage

NOTE: Care Pack Services availability may vary by product and country.

HP Care Pack Services are sold by HP and HP Authorized Service Partners:

- Services for customers purchasing from HP or an enterprise reseller are quoted using HP order configuration tools.
- Customers purchasing from a commercial reseller can find HP Care Pack Services at http://www.hp.com/go/lookuptool

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Service and Support

Recommended HP Care Pack Services for optimal satisfaction with your HP product

Recommended Services

Hardware Options Support

HP Care Packs provide support for all HP-branded hardware options qualified for inclusion in your server or storage solution. Any additional HP-qualified options installed within the server are covered at the same service level and for the same period as the server and no additional cost.

- Help improve or maintain system uptime
- Convenient onsite support
- Committed response time

http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EEE

3-Year HP Hardware Support Onsite Service, 4-hour response, 24x7

Provides you with rapid remote support and if required an HP authorized representative who will arrive on site any time and day of the year to begin hardware maintenance service within 4 hours of the service request being logged.

This service provides a trained HP service specialist to perform an installation that meets HP quality standards, for:

- Help improve or maintain system uptime
- Convenient onsite support
- Committed response time

http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EEE

HP Installation and Startup of HP ProLiant Servers

Provides for the installation of your new HP ProLiant server and operating system to assist you in bringing your new HP ProLiant server and operating system into operation in a timely and professional manner.

This service provides a trained HP service specialist to perform an installation that meets HP quality standards, for:

- Delivery of the service at a mutually scheduled time convenient to your organization
- Availability of an HP service specialist to answer basic questions during the onsite delivery of this service
- Custom installation as detailed in "Delivery specifications" or in a Statement of Work (SOW)
- Verification prior to installation that all service prerequisites are met

http://h20195.www2.hp.com/V2/GetPDF.aspx/5982?7572ENN

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Optional HP Care Pack Services that will enhance your HP product experience

Optional Services

3-Year HP Hardware Support Onsite Call-to-Repair (CTR) Service, 6- or 24-hour
As an alternative to our recommended support level, for customers who need committed call-to-repair for server hardware.

Provides your IT manager with a team of support specialists who will quickly begin troubleshooting the system to help return the hardware to operating condition within 6 or 24 hours of the initial service request to the HP Global Solution Center.

http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EN.pdf

3-Year HP Support Plus 24
As an alternative to our recommended support level, for customers who need access to responsive 24x7 hardware and software support plus software updates on HP and selected third party products:

For a higher return on your server and storage technology, our 3-year combined reactive support service delivers integrated onsite hardware/software support services available 24x7x365, including access to HP technical resources, 4-hour response onsite hardware support and software updates.

http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-6638EEE

HP Proactive Select Service
Customer needs on demand access to consulting, technical proactive services and education courses

Provides a flexible way to purchase HP best-in-class consultancy and technical services. You can buy Proactive Select Service Credits when you purchase your hardware and then use the credits over the next 12 months.

http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3842ENN

eSupport

HP eSupport is a portfolio of technology-based services that assist you with managing your business environment - from the desktop to the data center.

Support Portal
The HP support portal provides one-stop access to the information, tools and services you need to manage the daily operations of your IT environment.

Features include:

- Access to self-solve tools (including search technical knowledge base)
- Efficient logging and tracking of support cases
- Collaboration with other business and IT professionals
- Download of patches and drivers
- Access to diagnostic tools
- Proactive notification of relevant information

Access to certain features of the support portal requires an HP service agreement. To access the support portal, visit: http://www.hp.com/support

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Service and Support

	HP Insight Remote Support software delivers secure remote support for your HP Servers and Storage, 24 X 7, so you can spend less time solving problems and more time focused on your business. You can have your systems remotely monitored for hardware failure using secure technology that's been proven at thousands of companies around the world. In many cases, you can avoid problems before they occur.
Customer Technical Training	In today's cost-conscious business environment, IT professionals, developers, consultants and users face an interesting challenge: how to keep up with the latest technologies and expand important skills while delivering profitable results on current projects. To help address this challenge, HP offers innovative training solutions that help keep you up-to-date on virtualization, server, storage, Insight Control, Citrix, Microsoft® and open source/Linux-related topics-while spending less time away from business-critical activities.
HP Services Awards	HP Technology Services continues to be recognized for service and support excellence by customers, partners, industry organizations and publications around the world. Recent honors and award reflect our services team's dedications, technical expertise, professionalism and uncompromising commitment to customer satisfaction.
Additional Services Information	To learn more on HP ProLiant servers, HP BladeSystem servers and HP storage products, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: www.hp.com/services/proliant or www.hp.com/services/bladesystem or http://www.hp.com/services/storage

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Related Options

Upgrade Options

HP Optional Upgrades

HP 512MB P-Series Battery Backed Write Cache Upgrade	462967-B21
HP 650 mAh P-Series Battery **NOTE:** To enable BBWC on the 256MB cache.	462969-B21
HP 512MB Flash Backed Write Cache	534916-B21
HP 1GB Flash Backed Cache	534562-B21
HP Smart Array Advanced Pack including 1yr 24x7 Technical Support and Updates Single Server License **NOTE:** 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. **NOTE:** 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: http://www.hp.com/go/saap	516471-B21

HP Disk Storage Systems

MSA 2040 Storage

HP MSA 2040 SAS Dual Controller LFF Storage	C8S54A
HP MSA 2040 SAS Dual Controller SFF Storage	C8S55A

NOTE: Please see the supported MSA 2040 QuickSpecs for a list of compatible hard drives: http://h18004.www1.hp.com/products/quickspecs/14603_div/14603_div.html

Modular Smart Arrays

HP MSA60 Array **NOTE:** Supports 12 SFF drives, and SAS 3 Gb/s and SATA 1.5 Gb/s.	418408-B21
HP MSA70 Array **NOTE:** Supports 25 SFF drives, and SAS 3 Gb/s and SATA 1.5 Gb/s.	418800-B21

NOTE: Please see the QuickSpecs for additional information and a list of compatible hard drives:
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 (MSA70)

Disk Enclosures

HP D2000 Disk Enclosures

HP D2600 Disk Enclosure **NOTE:** Supports 12 LFF drives, and SAS 6 Gb/s and SATA 3 Gb/s.	AJ940A
HP D2700 Disk Enclosure **NOTE:** Supports 25 SFF drives, and SAS 6 Gb/s and SATA 3 Gb/s.	AJ941A

NOTE: Please see the QuickSpecs for additional information and a list of compatible hard drives:
http://h18000.www1.hp.com/products/quickspecs/13404_div/13404_div.html

HP 600 Modular Disk System

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Related Options

	HP MDS600 with Dual I/O Modules Disk 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	
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 StoreEver DAT 160 SAS Internal Tape Drive	Q1587A
	HP StoreEver DAT 160 SAS External Tape Drive	Q1588A
	HP DAT 320 SAS Internal Tape Drive	AJ830A
	HP DAT 320 SAS External Tape Drive	AJ828A
	HP StoreEver LTO-2 Ultrium 448 SAS External Drive	DW086A
	HP StoreEver LTO-3 Ultrium 920 SAS External Tape Drive	EH848A
	HP StoreEver LTO-4 Ultrium 1760 SAS External Tape Drive	EH920A
	HP LTO-4 Ultrium 1760 SAS (1) in 1U Rack-mount Kit	EH946A
	HP StoreEver LTO-4 Ultrium 1840 SAS External Tape Drive	EH861A
	Rack-mount Tape Drive Enclosures	
	HP 1U SAS Rack-mount Kit **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.	AE459A
	HP 3U SAS Rack-mount Kit **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.	AG576A
	SAS Tape Autoloaders	
	HP 1/8 G2 LTO-4 Ultrium 1760 SAS Tape Autoloader	AK377A
	HP 1/8 G2 Ultrium 920 SAS Autoloader	AH558A
	SAS Tape Libraries	
	HP MSL2024 1 LTO-4 Ultrium 1760 SAS Tape Library	AK378A
	HP MSL2024 Ultrium 920 SAS Tape Library	AH559A
	HP MSL4048 2 LTO-4 Ultrium 1760 SAS Tape Library	AK380A
	HP StorageWorks MSL4048 Ultrium 920 SAS Tape Library	AH560A
	HP MSL8096 2 LTO-4 Ultrium 1760 SAS Tape Library	AK382A
	HP StorageWorks MSL8096 2 Ultrium 920 SAS Tape Library	AH561A
	SAS Cables for Tape Drives and Automation	
	HP SAS Min-Min 1x-2M Cable Assembly Kit **NOTE:** Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	AE470A

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Related Options

HP SAS MIN-MIN 1X-4M Cable Assembly Kit **NOTE:** Use this cable to connect HP StorageWorks SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	AE465A
HP 2m External Mini-SAS to 4x1 Mini-SAS Cable **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.	AN975A
HP 4m External Mini-SAS to 4x1 Mini-SAS Cable **NOTE:** One cable is required for every four drives. Use this cable to connect HP MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.	AN976A

HP Optional Cables	**Mini SAS Cables**	
	HP Mini SAS to Mini SAS 28in Cable Assembly	496013-B21
	HP Mini SAS to Mini SAS 33in Cable Assembly	496014-B21
	HP Mini SAS to 8484 18in/24in Cable Assembly	496015-B21
	HP Mini SAS to 8484 32in/35in Cable Assembly	496016-B21
	Additional Cables	
	HP 15 Position 24in SFP Battery Cable Assembly	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
Memory Addressing	64-bit, supporting servers memory space greater than 4 GB
RAID Support	RAID 6, 6+0 (Advanced Data Guarding) **NOTE:** RAID 6, 6+0 can be enabled with either • Minimum of 256 MB cache with Battery kit or FBWC 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, 5+0 (Distributed Data Guarding) **NOTE:** 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

RETIRED: Retired products sold prior to the November 1, 2015 separation of Hewlett-Packard Company into Hewlett Packard Enterprise Company and HP Inc. may have older product names and model numbers that differ from current models.

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.