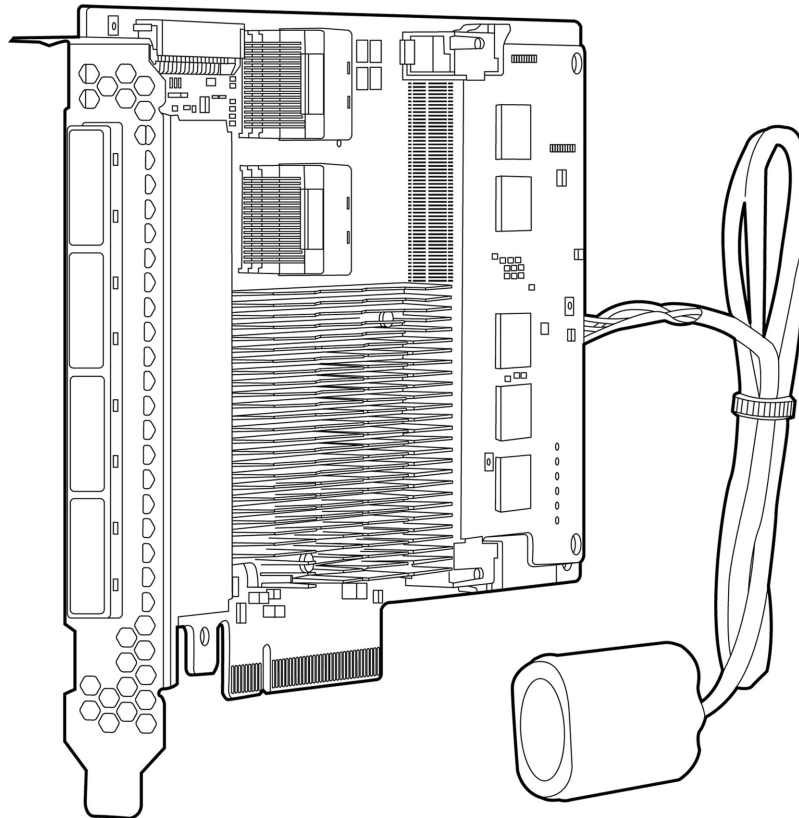


### Overview

The HP Smart Array P822 Controller is a Full height, 6 Gb/s, PCIe 3.0, Serial Attached SCSI (SAS) RAID controller that provides enterprise class, second generation storage performance, maximum external scalability, and data protection for select HP ProLiant Gen8 rack servers and tower servers.

It features two internal and four external SAS ports. Advanced storage functionality, including online RAID level migration with flash backed write cache (FBWC), global online spare, and pre-failure warning all result in increased server uptime. Data compatibility gives customers an easy upgrade path to future Smart Array Controllers.

HP Smart Array Advanced Pack 2.0 is included with this controller providing advanced functionality, including features such as RAID 1 ADM (Advanced Data Mirroring), making it easier for customers to protect their data.



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### What's New

- HP SmartCache is base feature of this controller that improves application workload performance by caching hot data to SSDs
  - Up to 4x better Solid State Disk (SSD) read performance with the SSD Smart Path firmware and driver based feature for Smart Array controllers
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### Overview

#### Models

**HP Smart Array P822  
Controller**

HP Smart Array P822/2GB FBWC 2-ports Int/4-ports Ext SAS Controller

615418-B21

### 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.

**Smart Carrier** is used across multiple HP Servers. 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/SATA)
  - Two Mini SAS 4i connectors for attachment to internal drive backplanes
  - 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.
  - 6 Gb/s SATA technology delivers up to 600 MB/s for directly attached SATA drives.
  - Mix-and-match SAS and SATA drives. Deploy drive technology as needed to fit the computing environment.
  - Support for SAS tape drives, SAS tape autoloaders and SAS tape libraries.
- Host interface (PCI-e)
  - PCI-e 3.0 8x host interface provides up to 8 GiB/s in each direction
- RAID controller features
  - 2GB flash-backed write cache (not all of which is available for user data)
  - RAID 0, 1, 1+0, 5, 6, 50, 60, and 1 ADM
  - Recovery ROM protects against ROM corruption
- Smart Array Advanced Pack 2.0 license key included (see below)
- The HP SSD Smart Path feature included in the Smart Array software stack improves SSD read performance by bypassing the Smart Array firmware for the optimal performance path to the SSD.
- The HP SmartCache licensed feature (available as an additional option) is a controller-based read caching solution in a DAS environment that caches the most frequently accessed data ("hot" data) onto lower latency SSDs to dynamically accelerate application workloads.
- 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 Intelligent Provisioning
- 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.
- SATA 2.6 (6 Gb/s and 3 Gb/s)

### Standard Features

- 24 SAS/SATA 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

### Storage Interface (SAS/SATA)

- PCI-e 3.0 (8 GT/s)
- Eight lane mechanical connector
- Electrically supports one, four, and eight lanes

### Host Interface (PCI-e)

P822 includes a Sierra SRCv 8x6G SAS RAID-on-chip featuring:

- Eight SAS/SATA physical links, each supporting 6 and 3 Gb/s for SAS and SATA protocol
- Eight PCI-e 3.0 lanes each supporting 8 Gb/s
- DDR3-1600 MHz memory controller
- High performance MIPS-based multi-processor subsystem
- Hardware XOR and Reed-Solomon Engines for RAID 5 and RAID 6 acceleration

### RAID Processor and Expander

The P822 2GB array accelerator features a flash-backed write cache. If the cache DRAM contains data when power is lost, the data is copied into flash memory of 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

P822 supports the latest interface speed

Interface	Maximum bandwidth*	Notes
PCI-e	8 GiB/s (in each direction)	PCI-e 3.0 (8 lanes at 8 GT/s)
SAS/SATA	14.4GiB/s (in each direction)	SAS-2 (24 physical links at 6 Gb/s)
RAID cache	2 GB/s	DDR3-1600 MHz SDRAM (64-bit data and 8-bit ECC)

\* Not counting protocol overhead.

### Standard Features

**Native Command Queuing (NCQ)** 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.

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/13021_na/13021_na.html) for specific SATA hard drive capacities that support NCQ: [http://h18000.www1.hp.com/products/quickspecs/13021\\_na/13021\\_na.html](http://h18000.www1.hp.com/products/quickspecs/13021_na/13021_na.html)

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**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.

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**Number of Drives** P822 supports up to 227 drives. Examples:

- 27 internal drives plus eight HP D2700 Disk Enclosures with 25 drives each (227 drives)
- 27 internal drives plus eight HP D2600 Disk Enclosures with 12 drives each (123 drives)

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### 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.

### Standard Features

- **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.
  - **RAID 1 ADM (Advanced Data Mirroring)** allows customers to create mirrored RAID set using 3 identical hard drives. This provides customers with a 2nd "live spare" for RAID 1(+0) configurations. This allows customers to rebuild a failed drive in a RAID 1(+0) set without the array entering into a degraded state.
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### 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 that can tolerate data loss, and/or systems that have redundant and uninterruptible power supplies)
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### 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
-

### Standard Features

#### 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 Modular Smart Array Enclosures.

#### 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.

#### 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 Modular Smart Array enclosures

#### HP SSD SmartPath

The HP SSD Smart Path feature included in the Smart Array software stack improves Solid State Disk (SSD) read performance. The Smart Array driver chooses the optimum path to access each SSD. With up to 4x better SSD read performance, HP SSD Smart path chooses the optimum path to the SSD and accelerates reads for all RAID levels and RAID 0 writes. HP SSD Smart Path Requires updated firmware, drivers, and configurable utility available here: [www.hp.com/go/HPSSDSmartPath](http://www.hp.com/go/HPSSDSmartPath). HP SSD Smart Path is ideal for read intensive workloads and is included as a base feature on HP Smart Array P-series controllers. The following operating systems are supported by the HP SSD Smart Path feature

- Microsoft Windows 2008 Server
- Microsoft Windows 2008 R2 Server
- Microsoft Windows 2012 Server

#### HP SmartCache

The HP SmartCache licensed feature is a controller-based read caching solution in a DAS environment that caches the most frequently accessed data ("hot" data) onto lower latency SSDs to dynamically accelerate application workloads. HP SmartCache is supported on HP ProLiant Gen8 servers with one of the following controllers: P420i, P420, P421, P822 and P721m. HP SmartCache is an included feature on the P822 and

### Standard Features

P721 m/2G FBWC. The HP SmartCache architecture is flexible and supports any HP ProLiant Gen8 supported HDD for bulk storage and any HP ProLiant Gen8 supported SSD as an accelerator.

The basic HP SmartCache architecture is comprised of the following three elements:

- **Bulk storage:** The first element is the bulk storage device, which is any supported HDD attached to the HP Smart Array controller.
- **Accelerator:** The second element, the accelerator, is a faster/lower latency SSD device that caches data.
- **Metadata:** The final element is metadata, information held in a relatively small storage area that maps the location of information residing on the accelerator and bulk storage devices.

HP SmartCache is deployed and managed through the same management tool for HP Smart Array - the HP Array Configuration Utility (ACU). For more information please visit [www.hp.com/go/smartcache](http://www.hp.com/go/smartcache)

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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.

#### 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



### Compatibility

#### Servers

For up to date compatibility, please see the following URL for complete Smart Array P800/512MB Controller compatibility and support information:  
<http://h18006.www1.hp.com/products/servers/proliantstorage/arraycontrollers/index.html>

#### Operating Systems

Microsoft Windows Server  
Microsoft Windows Server Hyper-V  
Red Hat Enterprise Linux (RHEL)  
SUSE Linux Enterprise Server (SLES)  
VMware

**NOTE:** For more information on HP's Certified and Supported ProLiant Servers for OS and Virtualization Software and the latest listing of software drivers available for your server and Smart Array RAID controller, please visit our Support Matrix at: <http://www.hp.com/go/ossupport>

**NOTE:** For more Linux OS support and certification information, please visit:  
<http://h18004.www1.hp.com/products/servers/linux/>

#### Software Suite

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.

##### **HP Systems Insight Manager (SIM)**

- Provides the basic management features of system discovery and identification, single-event view, inventory data collection, and reporting
- Monitors over 1200 system wide parameters
- Smart Array performance monitoring
- Smart Array drive fault prediction

##### **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
- Command line interface (ACU-CLI) also available
- Runs offline for all supported operating systems
- Runs online on Windows and linux
- For online configuration on NetWare, use CPQONLIN

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

- ROM-based utility accessed by pressing F8 during system power up
- View, create, and delete arrays and logical volumes and assign an online spare drive
- Select the boot controller
- For more advanced array configurations, use ACU

##### **HP Array Diagnostic Utility (ADU)**

- In depth diagnostic and reporting utility for all Smart Array controllers
- Integrated with ACU
- Runs offline for all supported operating systems
- Runs online for Windows and Linux

##### **HP Smart Array SAS/SATA Event Notification Service (CISSESRV)**

### Compatibility

- Provides event notification to the Windows Server 2003 and Windows Server 2008 system event log and HP ProLiant integrated management log

#### HP Smart Array Advanced Pack 2.0 (license key included with P822)

- 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
- HP SmartCache - controller base caching to improve workload performance available when updating to the latest HP firmware. Please see [www.hp.com/go/smartcache](http://www.hp.com/go/smartcache) for more details  
**NOTE:** HP SmartCache requires the following: Min 1 or 2 GB FBWC module along with HP ProLiant Gen8 supported HDD(s) and SSD(s) for more information visit: [www.hp.com/go/smartcache](http://www.hp.com/go/smartcache)

### Service and Support

#### Service and Support

#### HP Technology Services

HP Technology Services offers you technical consultants and support expertise to solve your most complex infrastructure problems. We help keep your business running, boost availability, and avoid downtime.

#### Protect your business beyond warranty with HP Care Pack Services

When you buy HP Options, it's also a good time to think about what level of service you may need. HP Care Pack services provide total care and support expertise with committed response choices designed to meet your IT and business need.

HP Foundation Care services deliver scalable support-packages for HP industry-standard servers and software. You can choose the type and level of service that is most suitable for your business needs. New to this portfolio is HP Collaborative Support. If you are running business critical environments, HP offers Proactive Care or Critical Advantage. These services help you deliver high levels of application availability through proactive service management and advanced technical response.

Here is the support service recommendation from the Foundation Care and Proactive Care portfolio. For customized support service solution, HP can work with you to tailor a service solution for your unique support requirements using broader services portfolio of Foundation Care and Proactive Care.

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

#### Recommended Services **3-Year HP 24x7 4 hour Response, Proactive Care**

Helps optimize your systems and delivers high levels of application availability through proactive service management and advanced technical response. A skilled Technical Manager will own your query or issue end to end until resolved, delivering a single point of contact for you

**OR**

#### **3-Year HP 24x7 4 hour Response, HP Collaborative Support**

Provides problem resolution support across the stack of HW, firmware, and HP and 3rd party SW. In case the issue is with 3rd party SW, HP does known issue resolution. If HP cannot solve the issue, it will contact the third-party vendor and create a problem incident on your behalf  
<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-8232ENW.pdf>

#### **HP Installation of ProLiant Add On Options Service**

This easy-to-buy, easy-to-use HP Care Pack service helps ensure that your new HP hardware or software is installed smoothly, efficiently, and with minimal disruption of your IT and business operations

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### Service and Support

#### Related HP Care Pack Services to enhance your HP product experience

##### Related Services

##### **3-Year HP 24x7 4 hour Response, Proactive Care**

Helps optimize your systems and delivers high levels of application availability through proactive service management and advanced technical response. A skilled Technical Manager will own your query or issue end to end until resolved, delivering a single point of contact for you

**OR**

##### **3-Year HP 24x7 4 hour Response, Hardware Support Onsite Service**

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

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

##### **3-Year HP 6-hour Onsite Call-to-Repair, HP Collaborative Support**

Offers customers a single point of contact for server problem diagnosis, hardware problem resolution to return the hardware in operating condition within 6 hours of the initial service request to the HP Global Solution Center, and basic software problem diagnosis, fault isolation, and resolution if available to HP.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-8232ENW.pdf>

##### **HP Proactive Select Service**

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.pdf>

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##### **Insight Remote Support**

Provides 24 X 7 remote monitoring, proactive notifications, and problem resolution. Learn more

<http://www.hp.com/go/insightremotesupport>

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##### **HP Support Center**

Personalized online support portal with access to information, tools and experts to support HP business products. Submit support cases online, chat with HP experts, access support resources or collaborate with peers. Learn more <http://www.hp.com/go/hpsc>

HP's Support Center Mobile App\* allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalized IT support anywhere, anytime.

HP Insight Remote Support and HP Support Center are available at no additional cost with a HP warranty, HP Care Pack or HP contractual support agreement.

\*HP' Support Center Mobile App is subject to local availability

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##### **Parts and materials**

HP will provide HP-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements. Supplies and consumable parts will not be provided as part of this service; standard warranty terms and conditions apply. Parts and components that have exceeded their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual or the technical product data sheet will not be provided, repaired or replaced as part of this service.

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### Service and Support

**Warranty / Service Coverage**

For ProLiant servers and storage systems, this service covers HP-branded hardware options qualified for the server, purchased at the same time or afterward, internal to the enclosure, as well as external monitors up to 22" and tower UPS products; these items will be covered at the same service level and for the same coverage period as the server unless the maximum supported lifetime and/or the maximum usage limitation has been exceeded. Coverage of the UPS battery is not included; standard warranty terms and conditions apply.

The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by HP due to malfunction. It does not apply to any exchange of Disk or SSD/Flash Drives that have not failed. SSD/Flash Drives that are specified by HP as consumable parts and/or that have exceeded maximum supported lifetime and/or the maximum usage limit as set forth in the manufacturer's operating manual or the technical data sheet are not eligible for the defective media retention service feature option.

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**For more information**

To learn more on services for HP ESSN Options, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: <http://www.hp.com/services/proliant> or [www.hp.com/services/bladesystem](http://www.hp.com/services/bladesystem)

### Related Options

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

#### Hard Drives

##### **HP SAS Hot Plug SmartDrive Carriers for Gen8 Servers only**

##### **SAS Hot Plug with SmartDrive SFF (2.5-inch) Enterprise Drives**

HP 1.2TB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	697574-B21
HP 900GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652589-B21
HP 600GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652583-B21
HP 450GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652572-B21
HP 300GB 6G SAS 10K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652564-B21
HP 300GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652611-B21
HP 146GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652605-B21
HP 72GB 6G SAS 15K rpm SFF (2.5-inch) SC Enterprise 3yr Warranty Hard Drive	652597-B21

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

HP 1TB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652749-B21
HP 500GB 6G SAS 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	652745-B21

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

HP 600GB 6G SAS 15K rpm LFF (3.5-inch) SC Enterprise 3yr Warranty Hard Drive	652620-B21
HP 450GB 6G SAS 15K rpm LFF (3.5-inch) SC Enterprise 3yr Warranty Hard Drive	652615-B21

##### **SAS Hot Plug SmartDrive LFF (3.5-inch) Midline Drives**

HP 4TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	695510-B21
HP 3TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	652766-B21
HP 2TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	652757-B21
HP 1TB 6G SAS 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	652753-B21

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

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

##### **HP 6G SATA Hard Drives**

##### **6G SATA Hot Plug with SmartDrive SFF (2.5-inch) Midline (MDL) Drives**

HP 1TB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655710-B21
HP 500GB 6G SATA 7.2K rpm SFF (2.5-inch) SC Midline 1yr Warranty Hard Drive	655708-B21

##### **6G SATA Hot Plug with SmartDrive LFF (3.5-inch) Midline (MDL) Drives**

HP 4TB 6G SATA 7.2k rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	693687-B21
HP 3TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	628061-B21
HP 2TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	658079-B21
HP 1TB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	657750-B21
HP 500GB 6G SATA 7.2K rpm LFF (3.5-inch) SC Midline 1yr Warranty Hard Drive	658071-B21

##### **6G SATA Non-hot Plug LFF (3.5-inch) Midline (MDL) Drives**

HP 3TB 6G SATA 7.2K rpm LFF (3.5-inch) Non-hot plug Midline 1yr Warranty Hard Drive	628065-B21
HP 2TB 6G SATA 7.2K rpm LFF (3.5-inch) Non-hot plug Midline 1yr Warranty Hard Drive	659339-B21
HP 1TB 6G SATA 7.2K rpm LFF (3.5-inch) Non-hot plug Midline 1yr Warranty Hard Drive	659337-B21
HP 500GB 6G SATA 7.2K rpm LFF (3.5-inch) Non-hot plug Midline 1yr Warranty Hard Drive	659341-B21

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

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

### Related Options

#### HP Solid State Drives (SSD)

##### 6G SATA Value Endurance Hot Plug SFF (2.5-inch) Enterprise Boot Solid State Drives

HP 120GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive 717965-B21

HP 80GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Boot 3yr Wty Solid State Drive 734360-B21

##### 6G SATA Value Endurance Hot Plug LFF (3.5-inch) Enterprise Boot Solid State Drives

HP 120GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Boot 3yr Wty Solid State Drive 718171-B21

HP 80GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Boot 3yr Wty Solid State Drive 734362-B21

##### 6G SATA Value Endurance Hot Plug SFF (2.5-inch) Enterprise Value Solid State Drives

HP 800GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive 717973-B21

HP 480GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive 717971-B21

HP 240GB 6G SATA Value Endurance SFF 2.5-in SC Enterprise Value 3yr Wty Solid State Drive 717969-B21

##### 6G SATA Value Endurance Hot Plug LFF (3.5-inch) Enterprise Value Solid State Drives

HP 800GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive 718189-B21

HP 480GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive 718183-B21

HP 240GB 6G SATA Value Endurance LFF 3.5-in SC Enterprise Value 3yr Wty Solid State Drive 718177-B21

##### 6G SATA ME Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives

HP 800GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691868-B21

HP 400GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691866-B21

HP 200GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691864-B21

HP 100GB 6G SATA Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691862-B21

##### 6G SATA ME Hot Plug SFF (3.5-inch) Enterprise Mainstream Solid State Drives

HP 800GB 6G SATA Mainstream Endurance LFF 3.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691860-B21

HP 400GB 6G SATA Mainstream Endurance LFF 3.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691856-B21

HP 200GB 6G SATA Mainstream Endurance LFF 3.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691854-B21

HP 100GB 6G SATA Mainstream Endurance LFF 3.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 691852-B21

##### 6G SAS ME Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives

HP 800GB 6G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive 690829-B21

### Related Options

HP 400GB 6G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	690827-B21
HP 200GB 6G SAS Mainstream Endurance SFF 2.5-in SC Enterprise Mainstream 3yr Wty Solid State Drive	690825-B21
<b>6G SAS SLC Hot Plug SFF (2.5-inch) Enterprise Performance Solid State Drives</b>	
HP 400GB 6G SAS SLC SFF (2.5-inch) SC Enterprise Performance 3yr Warranty Solid State Drive	653082-B21
HP 200GB 6G SAS SLC SFF (2.5-inch) SC Enterprise Performance 3yr Warranty Solid State Drive	653078-B21
<b>3G SATA MLC Hot Plug SFF (2.5-inch) Enterprise Mainstream Solid State Drives</b>	
HP 400GB 3G SATA MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653120-B21
HP 200GB 3G SATA MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653118-B21
HP 100GB 3G SATA MLC SFF (2.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653112-B21
<b>3G SATA MLC Hot Plug LFF (3.5-inch) Enterprise Mainstream Solid State Drives</b>	
HP 400GB 3G SATA MLC LFF (3.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653126-B21
HP 200GB 3G SATA MLC LFF (3.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653124-B21
HP 100GB 3G SATA MLC LFF (3.5-inch) SC Enterprise Mainstream 3yr Warranty Solid State Drive	653122-B21

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

[http://h18000.www1.hp.com/products/quickspecs/14038\\_na/14038\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14038_na/14038_na.html)

**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.

**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.



### Related Options

#### Modular Storage Array

#### Disk Enclosures

##### HP 600 Modular Disk System

HP MDS600 with Dual I/O Modules Disk System

AJ866A

**NOTE:** P822+MDS600 support requires MDS600 firmware 3.60 and P822 firmware 3.04 or higher. And the maximum configuration with the P822 and MDS600 is 4 MDS600 drawers. This solution will be supported by all tier 1 P822 supported OS i.e. Windows Server, Red Hat Linux, SUSE Linux, & VMWare.

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

[http://h18000.www1.hp.com/products/quickspecs/13257\\_na/13257\\_na.html](http://h18000.www1.hp.com/products/quickspecs/13257_na/13257_na.html)

##### HP D6000 Disk Enclosure

HP D6000 Dual I/O Module Disk Enclosure

QQ695A

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

[http://h18000.www1.hp.com/products/quickspecs/14419\\_na/14419\\_na.html](http://h18000.www1.hp.com/products/quickspecs/14419_na/14419_na.html)

##### HP D2000 Disk Enclosures

HP D2600 Disk Enclosure

AJ940A

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

HP 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 and a list of compatible hard drives:

[http://h18000.www1.hp.com/products/quickspecs/13404\\_na/13404\\_na.html](http://h18000.www1.hp.com/products/quickspecs/13404_na/13404_na.html)

#### Tape Storage

#### 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 Internal Tape Drive

DW085A

HP StoreEver LTO-2 Ultrium 448 SAS External Drive

DW086A

HP Ultrium 920 SAS Internal Tape Drive

EH847A

HP StoreEver LTO-3 Ultrium 920 SAS External Tape Drive

EH848A

HP StoreEver LTO-4 Ultrium 1760 SAS Internal WW Tape Drive

EH919A

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-5 Ultrium 3000 SAS Internal Tape Drive

EH957A

HP StoreEver LTO-5 Ultrium 3000 SAS External Tape Drive

EH958A

HP StoreEver LTO-5 Ultrium 3280 SAS Internal Tape Drive

EH899A

HP StoreEver LTO-5 Ultrium 3280 SAS External Tape Drive

EH900A

#### Rack-mount Tape Drive Enclosures

HP 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.

### Related Options

HP 3U SAS Rack-mount Kit	AG576A
<b>NOTE:</b> 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.	
<b>Tape Autoloaders</b>	
HP 1/8 G2 LTO-4 Ultrium 1760 SAS Tape Autoloader	AK377A
HP 1/8 G2 Ultrium 920 SAS Autoloader	AH558A
HP 1/8 G2 LTO-5 Ultrium 3000 SAS Tape Autoloader	BL536A
<b>Tape Libraries</b>	
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 StorageWorks MSL8096 2 LTO-4 Ultrium 1760 SAS Drive Library	AH382A
<b>SAS Cables for Tape Drives and Automation</b>	
HP Mini-SAS Cable for LTO Internal Tape Drive	AP746A
<b>NOTE:</b> Use this cable to connect HP Ultrium 448, 920, 960, 1760 and 1840 SAS internal tape drives to Mini-SAS (SFF8087) ports. This replaces the existing cable connecting the HBA/controller to the disk backplane. This replacement cable has three channels for disks and 1 channel for the tape drive (SFF8482 port).	
HP SAS Min-Min 1x-2M Cable Assembly Kit	AE470A
<b>NOTE:</b> Use this cable to connect HP SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	
HP SAS MIN-MIN 1X-4M Cable Assembly Kit	AE465A
<b>NOTE:</b> Use this cable to connect HP SAS external tape devices to HP SAS controllers with external Mini-SAS (SFF8088) connectors.	
HP SAS MIN-MIN 3X1X-5M Cable Assembly Kit	AG452A
<b>NOTE:</b> This split cable connects internally to SAS Hard Drive Cage (3 channels) and externally to the tape drive (1 channel) with other connector attaching to the controller. The external cable, for the drive, requires a PCI slot to exit the server.	
HP 2m External Mini-SAS to 4x1 Mini-SAS Cable	AN975A
<b>NOTE:</b> One cable is required for every four drives. Use this cable to connect HP MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.	
HP 4m External Mini-SAS to 4x1 Mini-SAS Cable	AN976A
<b>NOTE:</b> One cable is required for every four drives. Use this cable to connect HP MSL SAS Tape Libraries to Mini-SAS (SFF8088) ports.	

### Mini SAS to Mini SAS Cables

HP Mini SAS Straight to Left 33in Cable Assembly	662899-B21
HP Mini SAS Straight to Straight 37in Cable Assembly	662897-B21
HP Double Mini SAS Y 36in Cable Assembly	662901-B21

### Technical Specifications

<b>Dimensions</b> (excluding bracket)	6.6 in x 4.4 in x 0.7 in (16.8 cm x 11.1 cm x 1.8 cm)
<b>PCI Card Size</b>	Full-height, 1/2 length, PCIe stand-up board
<b>PCI Label</b>	PCIe3 x8 (i.e., x8 mechanical, up to x8 electrical)
<b>PCI Link Rate</b>	x8 8 GT/s PCI-e (8 GB/s maximum bandwidth in each direction)
<b>SAS/SATA Connectivity</b>	2 Mini SAS 4i connectors 4 Mini SAS 4x connectors
<b>SAS/SATA Link Rate</b>	SAS protocol: 6 Gb/s, 3 Gb/s, or 1.5 Gb/s SATA protocol: 6 Gb/s or 3 Gb/s
<b>SAS/SATA Performance</b>	Controller supports a maximum of 14.4GB/s maximum bandwidth in each direction (allocated across all the connectors)
<b>RAID Cache</b>	2 GB 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>	DDR3-1600
<b>Software upgradeable Firmware</b>	Yes
<b>Maximum Drive Count</b>	227 drives
<b>System Memory Addressing</b>	64-bit, supporting servers memory space greater than 4 GiB
<b>RAID Support</b>	RAID 0 (Striping) RAID 1 (Mirroring) RAID 1+0 (Striping & Mirroring) RAID 5 (Distributed Data Guarding) RAID 6 (Advanced Data Guarding) RAID 50 RAID 60 RAID 1 ADM (Advanced Data Mirroring)
<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.