

Overview

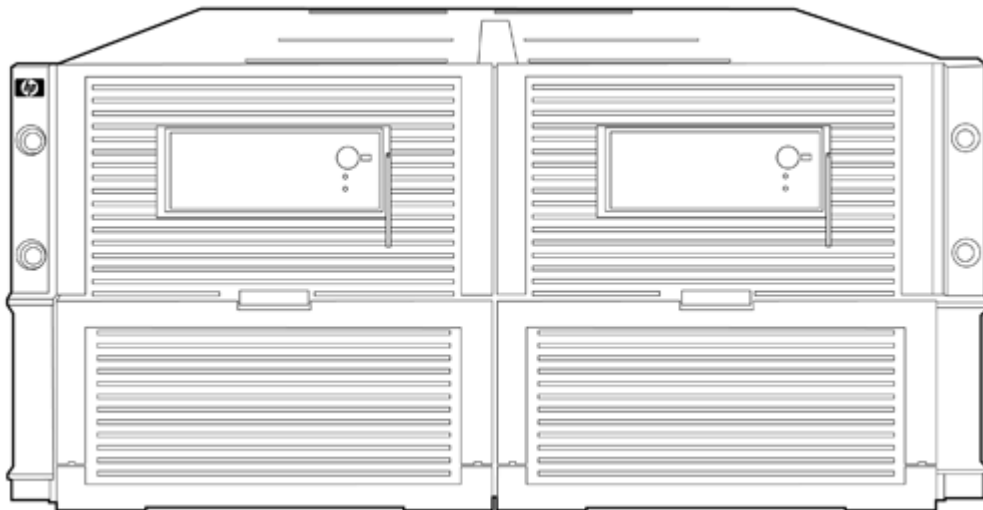
Finding it difficult to keep up with the growth in unstructured data? Looking for a cost-effective high capacity storage option?

With the new 6 Gb/s SAS HP D6000 Disk Enclosure, HP extends and redefines direct-attached storage for BladeSystem servers, combining the simplicity and cost effectiveness of direct-attached storage without sacrificing flexibility or performance. The D6000 can also be directly connected to selected ProLiant Gen8 servers using the Smart Array P421 and P822 Controllers using a standard 2M SAS cable; Single and Dual Domain (P822) environments The HP D6000 also supports the HP H221 and the H222 Host Bus Adapters (HBA)

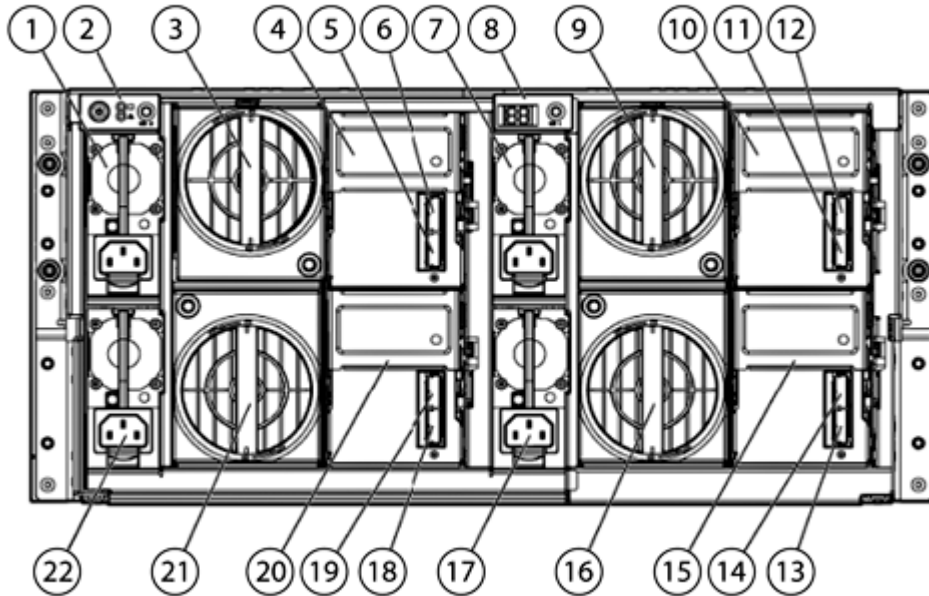
Use the D6000 as part of a straight-forward in-rack 6 Gb/s SAS implementation that delivers high-density, low-cost external zoned direct attach storage for HP BladeSystem servers. Easily configure storage on the fly with easy to use management software.

Up to six D6000 storage devices can be supported off a single BladeSystem enclosure for up to 1260 TB of capacity. End-to-end 6 Gb/s SAS connectivity enables a high performance storage solution using a HP Smart Array P721m or the P731m controller, 6 Gb/s SAS BL switches, and the D6000. 6 Gb/s host connectivity enables higher performance, eases configuration/deployment and broadens supported features of an D6000 using HP Smart Array P721m or the P731m controller and 6 Gb/s SAS BL switches.

For more information on Blade external SAS storage solutions for HP BladeSystem, see: www.hp.com/go/directconnect



Overview



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|----------------------------------|-------------------------------------|-------------------------------------|
| 1. Power supply 1 | 9. Fan module 1 (Drawer 1) | 17. Power supply 4 |
| 2. Power On/UID 2 status panel | 10. Primary I/O module (Drawer 1) | 18. SAS 1 connector |
| 3. Fan module 1 (Drawer 2) | 11. SAS 1 connector | 19. SAS 2 connector |
| 4. Primary I/O module (Drawer 2) | 12. SAS 2 connector | 20. Secondary I/O module (Drawer 2) |
| 5. SAS 1 connector | 13. SAS 1 connector | 21. Fan module 2 (Drawer 2) |
| 6. SAS 2 connector | 14. SAS 2 connector | 22. Power supply 2 |
| 7. Power supply 3 | 15. Secondary I/O module (Drawer 1) | |
| 8. UID 1 status pane | 16. Fan module 2 (Drawer 1) | |

What's New

- Adding support for the HP H221 and the H222 Host Bus Adapters
- Adding support for the new HP Smart Array P731m/2GB FBWC 6Gb 4-ports Ext Mezzanine SAS Controller

Overview

At A Glance

- 5U rackmount form factor
- Supports seventy (70) 3.5" LFF Universal hot pluggable SAS or SAS (Midline) MDL drives
- Two pull-out drive drawers support hot plug large form factor dual-ported SAS or SAS MDL drives in just 5U of rack space (35 hot plug drives per drawer)
- 6 Gb/s front-end SAS connectivity using 6 Gb/s SAS BL switches in the interconnect bays, and HP Smart Array P721m or P731m controllers in each BladeSystem server (**NOTE: D6000 support requires Blade switch firmware to be 3.0.8.0 or higher**)
- The D6000 can also be directly connected to selected ProLiant Gen8 servers using the Smart Array P421 and P822 Controllers using a standard 2M SAS cable; Single and Dual Domain environments. Only P822 supports Dual Domain. No zoning.
- The D6000 also supports the HP H221 or the H222 Host Bus Adapters
- Using the Virtual SAS Manager (VSM) in the HP SAS BL switch, assign or 'zone' D6000 drive bays directly to BladeSystem server bay
- Additional option kit with two dual port I/O modules is added for SAS drives, creating a dual domain environment. A single BladeSystem enclosure supports up to six D6000 's externally. 3-0-0 warranty

Deployment Guide

For detailed deployment information, see the HP direct connect external SAS storage for HP BladeSystem deployment guide. Select Manuals under Resources for HP D6000 Disk Enclosure:

<http://www.hp.com/go/d6000/manuals>

Features and Benefits

Key Features

High density, low cost SAS storage for BladeSystem and ProLiant DL/ML servers

- 70 LFF Universal SAS or SAS MDL drives in 5U
- Two pull-out drive drawers support hot plug large form factor dual-ported SAS or SAS MDL drives in just 5U of rack space
- Each pull-out drive drawer is supported by a redundant set of hot plug power supplies and redundant hot plug fans. Straight forward SAS architecture provides zoned direct attach storage for BladeSystem servers; just a Smart Array P721m or the P731m controllers in the Blade server, a dual or single 6 Gb/s SAS BL switches in the chassis connected to an D6000.
- Connect directly to selected ProLiant Gen8 servers with the Smart Array P421 and P822 Controllers using a standard 2M SAS cable; Single and Dual Domain environments. Only P822 supports Dual Domain. No zoning.
- HP HBAs H221 and H222 are also supported.

Build BladeSystem server storage on the fly

- D6000 drive bays are assigned or 'zoned' to individual blade bays using SAS 2.0 zoning capabilities. Use the Virtual SAS Manager (VSM) in the 6 Gb/s SAS BL switch to dynamically assign up to 100 drives to specific BladeSystem servers, without complex configuration or re-cabling. Drives zoned to each server appear as local storage to that server. This allows complete flexibility to reconfigure quickly and easily without moving cables
- With zoned direct attached storage capabilities; server administrators can build local storage on the fly according to their configuration requirements.
- Quickly deploy and expand capacity by configuring additional drive bays to a P721m or the P731m Smart Array Controllers without moving a single cable.

HP reliability

Familiar Smart Array technology of the Smart Array Controllers enables support for RAID levels

- Keeps data available and server running while a failed drive is being replaced; two fault tolerance configurations are supported for the internal connections including:
- RAID 0 (striping) provides no extra data protection
- RAID 1 (mirroring) protects against failure of one drive
- RAID 1+0 (mirroring and striping) protects against failure of one drive (and failure of particular multiple drives)
- RAID 5 (distributed data guarding) protects against failure of one drive
- RAID 6 with ADG (Advanced Data Guarding): This is the highest level of fault tolerance
- RAID 50 (RAID 5+0) protects against failure of one drive (and failure of particular multiple drives)
- RAID 60 (RAID 6+0) allows administrators to split the RAID 6 storage across multiple external boxes
- RAID 1 ADM (Advanced Data Mirroring) allows customers to create mirrored RAID set using 3 identical hard drives

Product Technology

SAS

6 Gb/s SAS

Modular Chassis

5U, 70 Large Form Factor Universal SAS or SAS MDL drive bays

Drives available

Serial Attached SCSI (SAS) enterprise-class drives designed for high volume 24x7 usage. SAS Midline (MDL) are usually reserved for archival of data as they are both relatively inexpensive and are available in very large capacities. The D6000 can accommodate both SAS and SAS MDL drives within the same enclosure. SAS drive performance can be approximately 30% greater than SAS MDL performance on sequential host IO. SAS performance excels in sequential lower latency response time and random IO per second transaction

Features and Benefits

| | |
|---|---|
| Scalability | performance due to higher rpm disk speeds yielding lower seek times. Up to 70 SAS or SAS MDL 3.5" hot plug hard drives per D6000 A single BladeSystem enclosure supports up to six D6000 's externally. |
| RAID | RAID is provided by the Smart Array P721m, P731m, P421, and P822 Controllers |
| Power supplies | Includes four redundant 1200W 12V hot plug power supplies. |
| Fans | <ul style="list-style-type: none">• Includes four redundant hot plug fan |
| Configuration and Management Tools | SAS BL switch for use with BladeSystem servers: Use the Virtual SAS Manager (VSM) to dynamically assign drive bays in the D6000 to each BladeSystem server bay, without complex configuration or re-cabling. This allows complete flexibility to reconfigure quickly and easily without moving cables. Smart Array Controller: Array Configuration Utility (ACU) provides configuration and management of hard drives, and supports online array capacity expansion, logical drive extension, assignment of online spares and RAID or stripe size migration. |
| Management/Health Utilities | Active hardware management using HP SIM: Manage the array with the highly refined HP Systems Insight Manager. Smart Components are available to easily update firmware. A convenient Integrated Management Log records hundreds of events and stores them in an easy-to-view format. |

Family Information

Supported Servers

HP BladeSystem Servers
HP ProLiant BL420c Gen8
HP ProLiant BL460c Gen8
HP ProLiant BL465c Gen8
HP ProLiant BL660c Gen8
HP ProLiant Gen8 Servers
HP ProLiant Gen8 DL and ML servers that support HP Smart Array Controllers P421 and P822

NOTE: Some servers listed above may be discontinued.

NOTE: For more information on internal vs. external connections, please refer to proper blade QuickSpecs please visit: <http://h18000.www1.hp.com/products/quickspecs/division/12534.html>

Supported OS

Microsoft Windows 2003
Microsoft Windows 2008 R2
Microsoft Windows Server 2012
SLES 10 SP3
SLES 11 SP1
Red Hat Enterprise Linux 5
Red Hat Enterprise Linux 6
VMware ESX 4.1
VMware ESX 5.0

Service and Support, HP Care Pack, and Warranty Information

Warranty

3-0-0 warranty

Three-year parts exchange, next business day delivery

NOTE: The warranties of the hard drive options purchased for the D6000 are different for SAS hard drives versus SAS Midline (MDL) hard drives. SAS hard drive options have a three year warranty and SAS MDL hard drive options have a one year warranty.

Warranty Upgrade Options

- Response - Upgrade on-site response from next business day to same day 4-hour response or 6 Hour Call To Repair
- Coverage - Extend hours of coverage from next business day to 9 hours x 5 days to 24 hours x 7 days
- Duration Select duration of coverage for a period of 1, 3, 4 or 5 years

Service and Support

Technology Services for increased uptime, productivity and ROI

TRUST HP storage technology experts for every level of service and support. Our integrated portfolio of Services for storage help customers reduce costs, optimize data, streamline storage management, and improve backup and recovery. Capitalizing on HP Storage Systems' capabilities requires a service partner who understands your increasingly complex environment. Team with the people who know HP infrastructure hardware and software best—the experienced professionals at HP Services.

Protect your business beyond warranty

Warranty protects against manufacturer defects, however warranty uplifts, such as HP Care Pack Services protect the business—by reducing downtime risks and providing operational consistency for mission-critical and standard business computing.

What HP Storage Technology Services can do for you

HP Storage Technology Services can help you design, deploy, test, integrate, support, and manage IT and infrastructure solutions. HP storage lifecycle support services offers a full spectrum of customer care—from technology support to complex migrations to complete managed services.

Choose the right level of support, deployment and integration services

HP support recommendations are designed to help you enhance technology operations and lower risk—and make it easier for you to seek the right balance between affordability and service-level commitments. Depending on your individual support needs, choose from three levels of care that cover the entire lifecycle to better address your needs—Optimized Care, Standard Care, and Basic Care. If none of our support recommendations meet your needs, we can tailor a service solution for your unique support requirements. Only HP brings together deep expertise, proactive and business critical support and a strong partner network—plus, a full set of infrastructure services designed to power a Converged Infrastructure.

Optimized Care - delivers best performance and stability through deployment and proactive management

HP Proactive Care 24x7 - for a higher return on your storage investment, Proactive Care delivers hardware and software support services designed specifically for your technology; rapid access to Advanced Solution Center Specialists plus, Firmware/Software management and best practice advice. Customers can optimize the return on their IT investment and realize the advantage of running their business critical applications on virtualized/x86 infrastructure.

Plus, 20 credits per year, select from an extensive menu of consultancy and technical services, such as onsite firmware upgrades, health checks, assessments, and education.

Basic Care - Minimum recommended support

3-Year Support Plus 24 - For a higher return on your server and storage investment, HP Support Plus 24 provides integrated hardware and software support services designed specifically for your technology. Available 24x7, this 3-year combined reactive support option delivers onsite hardware support and over-

Service and Support, HP Care Pack, and Warranty Information

the-phone software support around-the-clock. Leverage the full strength of HP Technology Services - customers can trust the services professionals at HP to work collaboratively with them, putting our strategic and technical know-how to work across their entire infrastructure. Plus, 10 credits per year, select from an extensive menu of consultancy and technical services, such as onsite firmware upgrades, health checks, assessments, and education.

Remote Support Tools

HP Insight Remote Support:- Available at no additional cost to all warranty, HP Care Pack Service and service agreement customers, uses proven technology to deliver secure, reliable 24x7 remote monitoring, diagnosis and problem resolution.

Link to Datasheet is as follows: <http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-4676ENW.pdf>

Additional services to accelerate technology investment ROI

Blade system Firmware Analysis: Provides firmware and software analysis for one 3PAR Storage System, EVA, or P2000 (MSA) array and all SAN switches and HBAs between the array and up to 30 servers or blade servers. Alternatively, covers one P4000 (LeftHand) SAN cluster of up to 10 nodes or one X9000 Network Storage System. Does not include firmware or software installation.

Hardware and Software Asset Inventory: In industry-standard and blade environments, it can be difficult to track the many hardware and software assets. Customers' tools and manual methods may not provide complete or detailed results. This service provides a comprehensive review of the HP and non-HP hardware and software installed in a Customer's IT environment. This service is designed to discover up to 1,000 devices located at the same site of a customer's environment. The ASM can provide pricing for larger environments with more than 1,000 devices.

HP Blade system Health Check Service: The objective of the service is to deliver a holistic assessment of the Blade System infrastructure and compliance with best practices

Additional Options available where Proactive Care is part of the BSO recommendation

HP Personalized Support - HP Personalized Support is an option for Proactive Care customers. It provides an assigned HP Account Support Manager (ASM) who provides a trusted advisor role for the customer. The ASM delivers an annual support plan, two support reviews per year and four days of operational and technical advice.

HP Personalized Support Additional Day - Customers who require more time than is provided by the Personalized Support option can elect to purchase additional days through the Personalized Support Additional Day option. The time may be used to provide extra support reviews and/or more operational & technical advice.

3Y Proactive Select 30 Credit Service

Additional Options available where Proactive Care is not a part of the BSO recommendation:

3 years HP Proactive Select 30 Credit Service

HP 1Y HP Proactive Select 10 Credit Service

For more information

www.hp.com/services/storage

To learn more on HP Storage Services, please contact your HP sales representative or HP Authorized

Service and Support, HP Care Pack, and Warranty Information

Channel Partner

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 www.hp.com/go/lookuptool

Configuration Information

Step 1: D6000 Disk Enclosure

| Model | Model Description | Part Number |
|-------|--|-------------|
| D6000 | <p>HP D6000 Dual I/O Module Disk Enclosure</p> <p>NOTE: Base model for SAS and SAS Midline (MDL) drives. Add QQ696A when using dual-ported SAS drives to create a dual domain environment.</p> <p>NOTE: Includes four hot plug power supplies for n+2 redundancy and four hot plug fans for n+1 redundancy.</p> <p>NOTE: Includes two right angle and two left angle power cords.</p> | QQ695A |
| | <p>HP D6000 Disk Enclosure Dual I/O Module Kit</p> <p>NOTE: Add QQ696A option kit to QQ695A when using dual-ported SAS drives to create a dual domain environment.</p> | QQ696A |
| | <p>HP D6000 w/35 2TB 6G SAS 7.2K LFF Dual port MDL HDD 70TB Bundle</p> <p>NOTE: Includes D6000 with (35) 2TB LFF Midline SAS drives, (4) dual port I/O modules, redundant power supplies and redundant fans</p> | QQ697A |
| | <p>HP D6000 w/70 2TB 6G SAS 7.2K LFF Dual port MDL HDD 140TB Bundle</p> <p>NOTE: Includes D6000 with (70) 2TB LFF Midline SAS drives, (4) dual port I/O modules, redundant power supplies and redundant fans</p> | QQ698A |
| | <p>HP D6000 w/35 3TB 6G SAS 7.2K LFF Dual port MDL HDD 105TB Bundle</p> <p>NOTE: Includes D6000 with (70) 3TB LFF Midline SAS drives, (4) dual port I/O modules, redundant power supplies and redundant fans</p> | QQ699A |
| | <p>HP D6000 w/70 3TB 6G SAS 7.2K LFF Dual port MDL HDD 210TB Bundle</p> <p>NOTE: Includes D6000 with (70) 3TB LFF Midline SAS drives, (4) dual port I/O modules, redundant power supplies and redundant fans.</p> | QQ700A |

Configuration Information

Step 2: Choose Supported Options

| | | Part Number |
|--|--|--------------------|
| HP Smart Array P721m controller | HP Smart Array P721m/2G FBWC 4-ports Ext Mezzanine SAS Controller | 650072-B21 |
| | HP Smart Array P731m/2GB FBWC 6Gb 4-ports Ext Mezzanine SAS Controller | 698535-B21 |
| HP Smart Array P421 controller | HP Smart Array P421/1GB FBWC 6Gb 2-ports Ext SAS Controller | 631673-B21 |
| | HP Smart Array P421/2GB FBWC 6Gb 2-ports Ext SAS Controller | 631674-B21 |
| HP Smart Array P822 controller | HP Smart Array P822/2GB FBWC 2-ports Int/4-ports Ext SAS Controller | 615418-B21 |
| HP Host Bus Adapters (HBAs) | HP H221 Host Bus Adapter | 650931-B21 |
| | HP H222 Host Bus Adapter | 650926-B21 |
| HP 6 Gb/s SAS BL Switch | HP 6Gb SAS Switch Single Pack for HP BladeSystem c-Class | BK763A |
| | HP 6Gb SAS Switch Dual Pack for HP BladeSystem c-Class | BK764A |

Step 2b - SAS Cable

Model Description

| | |
|-----------------------------------|------------|
| HP External Mini SAS 1m Cable ALL | 407337-B21 |
| HP External Mini SAS 2m Cable | 407339-B21 |

Step 3 - D6000 Drive Options

3.5" SAS Midline (MDL) Drives

| | |
|---|------------|
| HP 4TB 6G SAS 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive | 693689-B21 |
| HP 3TB 6G SAS 7.2K rpm LFF (3.5-inch) Midline 1yr Warranty Hard Drive | 625031-B21 |
| HP 2TB 6G SAS 7.2K rpm LFF (3.5-inch) Dual Port Midline 1yr Warranty Hard Drive | 507616-B21 |
| HP 1TB 6G SAS 7.2K rpm LFF (3.5-inch) Dual Port Midline 1yr Warranty Hard Drive | 507614-B21 |

3.5" SAS Drives

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

Configuration Information

Step 4: Choose Rack Options

Choose HP Rack 10000 series Cabinets for the D6000

The increasing power of new high-performance processor technology requires increased cooling efficiency for rack-mounted servers. The 10000 Series Racks provide enhanced airflow for maximum cooling, allowing these racks to be fully loaded with servers using the latest processors.

<http://h18004.www1.hp.com/products/servers/proliantstorage/racks/10000series/index.html>

NOTE: An D6000 fully loaded with drives weighs 320lbs.

NOTE: HP has not tested or validated the D6000 with any third-party racks. Before installing the D6000 in a third-party rack, be sure to properly scope the limitations of the rack. Before proceeding with the installation, consider the following:

- You must fully understand the static and dynamic load carrying capacity of the rack and be sure that it can accommodate the weight of the D6000 .
- If the D6000 is not sitting atop a Blade c-Class enclosure or another D6000 or MDS600 in a 3rd party rack , then install a 1U tray (part no 501037-B21) beneath the D6000 to ensure proper support
- Be sure sufficient clearance exists for cabling, installation and removal of the enclosure, actuation of the rack doors, and full articulation of the drive drawers

NOTE: Please note that while configured as CTO, a maximum of four D6000 is supported in a 42u standard rack (AF002A) and five in a 42u deep rack(AF092A). The 47U deep rack (AF094A) will also be limited to a maximum of five D6000 for CTO config. But additional D6000 can still be ordered as BTOs. Customers can then install them into racks at the customer site for a maximum of six D6000 per rack. The quantity of D6000 units supported in a rack is dependent upon the other components configured in the rack relative to the rack weight limit.

Technical Specifications

| | | | |
|--------------|--|-------------------------------|--|
| D6000 | INPUT POWER (per power supply) | Rated Line Voltage | 90 to 132 VAC 180 to 264 VAC |
| | | Rated Input Frequency | 47 to 63 Hz |
| | | Rated Input Current | 10A (at 100 VAC), 7.8A (at 200VAC) |
| | TEMPERATURE AND HUMIDITY RANGES | Rated Input Power | 964 W (at 100 VAC), 1412 W (at 240 VAC) |
| | | Operating Temperature | 50° to 95° F (10° to 35° C) NOTE: Maximum Rated 10°C per/hr (50°F/hr) |
| | | Storage Temperature | -22° to 140° F (-30° to 60° C) NOTE: Maximum Rated 20°C/hr (68°F/hr) |
| | | Operating Humidity | 10% to 90% relative humidity (Rh), 28° C (82.4° F) maximum wet bulb temperature, non-condensing |
| | | Non-Operating Humidity | 5% to 95% relative humidity (Rh), 38.7° C (101.66° F) maximum wet bulb temperature, non-condensing |
| | PHYSICAL | Length | 89.12 cm |
| | | Width | 44.7 cm (17.6 in) |
| | | Height | 22.1 cm (8.7 in) |
| | | Chassis Weight | 72.58 kg (160 lb) with no hard drives installed |
| | | Weight | 145 kg (320 lb) with hard drives installed |

| | | | |
|------------------------------------|----------------------------------|----------------|---------------------------------|
| Power Consumption (maximum) | Power consumption at 208V | | |
| | Drive Type | Typical | Service Position Maximum |
| | 7200 RPM SAS MDL | 800W | 1140W |
| | 10K 400G SAS | 940W | 1340W |
| | 15K SAS | 1280W | 1710W |
| | Power consumption at 120V | | |
| | Drive Type | Typical | Service Position Maximum |
| | 7200 RPM SAS MDL | 1000W | 1500W |
| | 10K 400G SAS | 1100W | 1600W |
| | 15K SAS | 1320W | 1770W |

NOTE: Input Power and Heat Dissipation specifications are maximum values and apply to worst-case conditions at full rated power supply load. The power/heat dissipation for your installation will vary depending on the equipment configuration.

NOTE: Temperature ratings shown are for sea level. An altitude derating of 1°C per 300 m (1.8°F per 1,000 ft) to 3048 m (10,000 ft) is applicable. No direct sunlight allowed. The upper limit may be limited by the type and number of options installed.

NOTE: Storage maximum humidity of 95% is based on a maximum temperature of 45°C (113°F). Altitude maximum for storage corresponds to a pressure minimum of 70 KPa.

NOTE: The "service position maximum" column is the test result with the drawers open.

| | |
|---|--------------------------------|
| Upgradeable Firmware | Offline |
| Disk Drives and Enclosure Protocol Support | HP 3.5" SAS and SAS MDL 6 Gb/s |

Technical Specifications

| | | |
|-------------------|------------------------|--------------------------------|
| I/O Module | Connector Type | External mini-SAS 4x (SFF8088) |
| | Number of Ports | Two |

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The information contained herein is subject to change without notice.

The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

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