

Overview

The HP StorageWorks 60 Modular Smart Array enclosure is a 2U Serial Attach SCSI (SAS) disk drive storage enclosure supporting 3.5" SAS and Serial ATA (SATA) drives. This enclosure delivers industry-leading data performance, availability, storage density, and upgradeability to meet customers' demanding and growing storage needs. This enclosure is designed to support 3.5" Universal SAS or SATA hard drive form factors. The MSA60 enclosure supports direct attach storage (DAS) to HP ProLiant and HP Integrity Servers. The MSA60 supports the cascading of shelves in a 1+3 configuration to allow a maximum of 48 drives in an 8U configuration behind each of the two external ports on the HP Smart Array P800 or the HP Smart Array E500 for a total of 96 drives in 8 enclosures (this single controller port incorporates four lanes for a total max throughput of 12Gb/s for SAS). The MSA60 also supports the HP Smart Array P600 controller. Behind the single external port on the HP Smart Array P600 controller 1+3 cascading allows a maximum of 48 drives in an 8U configuration.

For HP-UX and Open VMS environments on HP Integrity Servers the MSA60 supports the HP (AH303A) SC44Ge Host Bus Adapter. Behind the single external port on the HP (AH303A) SC44Ge Host Bus Adapter 1+3 cascading allows a maximum of 48 drives in an 8U configuration. The HP (AH303A) SC44Ge Host Bus Adapter will only support HP-UX and Open VMS environments and will be available on all rack mounted HP Integrity Servers with PCIe slots.

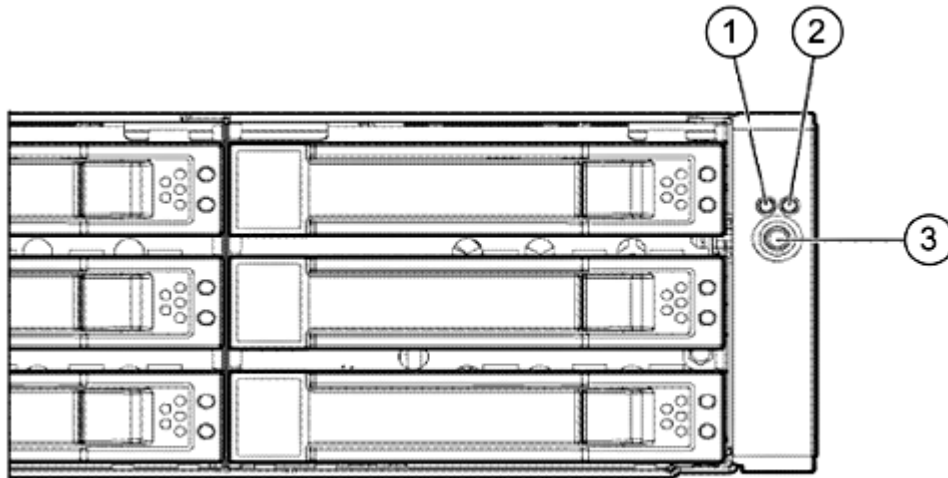
What's New

- Dual Domain (Only with the HP (AH303A) SC44Ge Host Bus Adapter - will only support HP-UX and Open VMS environments and will be available on selected HP Integrity Servers only)
 - Dual domain SAS creates redundant pathways 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) failure, external cable failure, expander failure, cable pulls, expander failure and failure in a spanned disk (JBOD) environments.
- The HP StorageWorks Dual Domain I/O Module Option Kit (hereafter referred to as "I/O Module") builds on the current MSA60 design by providing a field upgrade Option Kit for dual I/O module. The I/O module will enable transition from single domain to dual domain capability to the MSA60 for customers looking for higher levels of redundancy and reliability.
- The addition of the I/O Module with the HP SC44Ge Host Bus Adapter adds support for Multi Initiator JBOD Clusters. It will support HP-UX and Open VMS on selected HP Integrity servers only. The MSA60 with the I/O Module and the HP SC44Ge Host Bus Adapter will not support ProLiant servers. Multi Initiator JBOD clusters are supported with dual port SAS drives only.
- Support for HP Serviceguard software on HP-UX with HP-UX 11iv2/11iv3 only. HP Serviceguard monitors the health of each node and rapidly responds to failures in a way that minimizes or eliminates application downtime.

NOTE: HP Integrity servers that are supported:

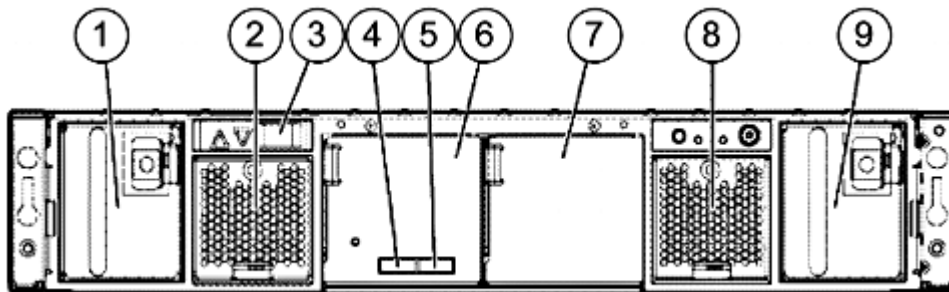
rx2660, rx3600, rx6600, rx7640, rx8640, Superdome sx2000 (only the version that support PCI-e cards)

Overview



Front panel LEDs and buttons

1. Heartbeat LED
2. Fault LED
3. UID button/LED



Rear Panel components

- | | |
|--|-------------------|
| 1. Power Supply 1 | 6. I/O module bay |
| 2. System fan 1 | 7. I/O module bay |
| 3. Dual 7 segment display board (for future use) | 8. System fan 2 |
| 4. SAS in connector | 9. Power supply 2 |
| 5. SAS out connector | |

Overview

At A Glance

- 2U rackmount form factor
- 3 Gb/s SAS host connectivity
- Multi Initiator support (HP-UX and Open VMS on selected HP Integrity Servers) with dual port SAS drives only
- Supports HP SAS 3 Gb/s disk drives, (36 GB, 72 GB, 146 GB and 300 GB capacities)
- Supports HP SATA 1.5 Gb/s disk drives, (250 GB, 500 GB, & 750 GB capacities)
- Maximum storage capacity of 3.6 TB (with twelve HP SAS 3 Gb/s,) or 9TB (with twelve HP SATA 1.5 Gb/s 750 GB hard drives)
- 1+3 Cascade support (behind a single SAS port)
- Supports boot from storage
- Redundant hot-plug power supplies and fans standard
- Addition of second I/O Module adds Dual Domain capability providing higher level of redundancy and reliability

Standard Features

Modular Smart Array Family

The HP StorageWorks Modular Smart Array family delivers simple, affordable storage technology to meet today's demanding and growing IT needs. These storage solutions offer the best price/performance and best price/availability features for direct attach environments, small clusters, workgroups and entry-level SAN environments. Each solution is designed for easy deployment, secure operation, and reduced management costs while driving rapid return on investment.

MSA60

The HP StorageWorks MSA60 Enclosure (hereafter referred to as "MSA60") is a disk drive storage enclosure with 3 Gb/s SAS host connectivity. These enclosures deliver industry-leading availability, storage density, and upgradeability to meet customers' demanding and growing storage needs. The MSA60 delivers the ideal mix of low-cost and high capacity, for minimum I/O workloads such as reference data, archival, and disk-to-disk backup.

Key Features

- 2U rackmount form factor
- SAS host interface
- Multi Initiator support (HP-UX and Open VMS on selected HP Integrity Servers) with dual port SAS drives only
- Supports twelve 3.5" hot pluggable drives
- Ability to support 36GB, 72GB, 146GB & 300GB 3.5" 3Gb/s SAS drives
- Ability to support 250GB, 500GB & 750GB 3.5" 1.5Gb/s SATA drives
- Modular design
- 1+3 Cascade support (behind a single SAS port)
- SATA 1.5Gb/s - Delivering data transfer rates greater than 100MB/s
- Provides storage capacity of up to 9TB per enclosure (using 750GB SATA disk drives)
- Hot pluggable disk drives, power supplies, and fans
- Redundant fans and power supplies ship as standard equipment with base enclosure
- Each MSA60 enclosure comes with dual power supplies that are sufficient to provide power to the enclosure and maintain normal operating levels
- Integrated Environmental Monitoring - Monitors environmental conditions within the enclosure and components such as the power supply, fans and temperature
- Easy removal of parts provides better serviceability. No tools are required!
- Supports MS Windows 2003, Red Hat Linux, SUSE Linux, Novell NetWare, HP-UX 11iv2 and 11iv3, Open VMS 8.3 1H
- Supported with Smart Array P800, the Smart Array E500 or the Smart Array P600 controller for HP ProLiant Servers and HP Integrity Servers
- Attached to HP SC44Ge Host Bus Adapter for HP-UX and Open VMS support on selected HP Integrity Servers (servers that support PCI-e cards)
- Supported with ACU, ORCA and HP Systems Insight Manager through configuration utilities provided via the Smart Array controller
- RoHS compliant
- 3 year limited warranty (MSA60 enclosure only)
- Pre-Failure warranty that covers SAS and SATA disk drives (See note below)

NOTE: Customer must be running HP Systems Insight Manager in order to qualify for Pre-Failure warranty. The enclosure is only covered for the warranty period of the drive (3 years for SAS and 1 year for SATA drives).

Product Highlights

High Levels of Storage Density, Data Protection, and Functionality

- **Storage Capacity** – The MSA60 enclosure supports up to twelve SAS drives for a maximum capacity of 3.6TB SAS drives or 9TB with SATA drives
- **Data Protection** – MSA60 is designed for a high level of data protection. It includes redundant fans and power supplies (standard), and support for various RAID level including RAID6 with ADG (depending upon the Smart Array Controller used)
- **Dual Domain** - Dual domain SAS creates redundant pathways 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.
- **Storage Manageability** – The MSA60 features familiar configuration and management tools such as Array Configuration Utility (ACU) and HP Systems Insight Manager (SIM). Online Management Features include: Online Capacity Expansion, Online RAID Level Migration, Online Stripe Size Migration, Online Spares (Global)
- **Choice of Computing Platform** – The MSA60 is designed and qualified for HP ProLiant and HP Integrity servers
- **Advanced Data Guarding (RAID 6 with ADG) 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.

Low Total Cost of Ownership

The modular, scalable design of the MSA60 provides an extremely flexible platform. You can buy what you need today and purchase additional capacity as your data storage needs grow, instead of making a large up-front investment. Additional drives and enclosures can be easily added as your needs dictate.

- **Cascading** – The MSA60 has the unique capability of cascading up to 4 – four enclosures behind a single SAS port (depends on the Smart Array Controller).
- **Tiered Storage** - MSA60 supports mixing SAS and SATA drives in the same enclosure, allowing you to more effectively utilize mission critical storage where you need it most.
- **Universal SATA Hard Drive** - Since the MSA60 supports HP Universal SATA drives, your investment in disk drives is protected and cost is minimized as you add new drives.
- **Pre-Failure Warranty** – Drives installed in a MSA60 and monitored under HP Systems Insight Manager are supported by a Pre-Failure (replacement) Warranty (3 years for SAS and 1 year for SATA drives). Pre-Failure Warranty allows for the replacement of designated drives in MSA60 before they actually fail when using HP Systems Insight Manager on HP ProLiant or HP Integrity servers.
NOTE: Some operating systems may not support all of these features.
- **Integrated Configuration and Management Tools** – The MSA60 utilizes the standard, integrated set of Smart Array management and utility software for HP ProLiant Servers. These tools consistently lower the cost of ownership by reducing training and technical expertise necessary to install and maintain HP server storage. HP-UX and Open VMS uses HP Integrity ODE for storage enclosure support.

MSA60 Components

MSA60 Enclosure

The 2U array houses up to twelve 3.5" Universal hot pluggable SAS or SATA drives. Each MSA60 includes the following standard components:

- MSA60 base enclosure with redundant power supplies and fan modules
- Rack mounting hardware kit
- 0.5m mini-SAS cable
- Two AC power cords and two PDU interconnect cords

Smart Array P800 Features

- HP's highest performing 16-port PCI-express controller with expander support
- Expander support enables the addition of external storage, allowing increased number of drives for increased performance
- Provides highest level of data protection standard by using RAID 6 with Advanced Data Guarding
- Supports a maximum total of 104 hard drives (96 drives across eight enclosures plus 8 drives in the server internal backplane)

Smart Array E500 Features

- HP's first external connect only PCI Express (PCIe) Serial Attached SCSI (SAS) RAID controller
- Expander support enables the addition of external storage, allowing increased number of drives for increased performance
- Offers RAID 0, 1 & 0+1 and can be upgraded with battery-backed write cache (BBWC) module for RAID 5
- Supports a maximum total of 108 hard drives

HP (AH303A) SC44Ge Host Bus Adapter

- SAS technology delivers high performance and data bandwidth up to 3 Gbps per physical link.
- PCI Express x8 capable
- PCIe x8 (2.5 GB/s bandwidth)

RAID

Several fault tolerant configurations keep data available and servers running while drives are being replaced – RAID levels that offer fault tolerance include:

- RAID 6 with ADG: Allocates the equivalence of two parity drives across multiple drives and allows simultaneous write operations.
- Distributed Data Guarding (RAID 5): Allocates parity data across multiple drives and allows simultaneous write operations.
- Drive Mirroring (RAID 1 and 1+0 Striped Mirroring): Allocates half of the drive array to data and the other half to mirrored data, providing two copies of every file.

Dual Domain (NEW)

Dual domain SAS creates redundant pathways 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) failure, external cable failure, expander failure, failure in a spanned disk (JBOD) environments.

Software Components

Utilities	The MSA60 utilizes a single, consistent set of utility software for storage and RAID management, setup, configuration and troubleshooting. This consistency reduces the cost of ownership by reducing the training and technical expertise necessary to install and maintain your HP server storage solution.
Configuration Utilities	Array Configuration Utility (ACU) [On-line for Microsoft and Linux, Remote Web-Based & Off-line] Option ROM Configuration for Arrays (ORCA), NetWare ACU CPQONLIN (only online support no Web based support)
Management/Health Utilities	HP Systems Insight Manager

Array Configuration Utility (ACU)	<ul style="list-style-type: none">● Provides a graphical view of HP drive array configurations.● Easy to use Wizards for configuration.● Web Based ACU supports On-Line, Remote Web Based and Off-line configuration.● Supports on-line configuration for Microsoft, NetWare and Linux.
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HP Systems Insight Manager	<ul style="list-style-type: none">● Powerful storage, server and server option management tool.● Monitor storage from a remote central location.● Browser based Insight Manager 7 provides full access from anywhere on the Intranet, eliminating the need for a dedicated Insight Manager console.
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Supported Operating Systems	<ul style="list-style-type: none">● HPUX 11iv2/11iv3● Microsoft Windows 2003/R2 Standard x64● Microsoft Windows Server 2003/R2 Enterprise● Microsoft Windows Server 2003/R2 Enterprise x64● Microsoft Windows Server 2003 on Itanium● Microsoft Windows 2004/R2 Web● Microsoft Windows 2003/R2 SBS● Novell Open Enterprise Server, NetWare 6.5 SPS● Open VMS V8.3 1H● Red Hat Enterprise Linux● Red Hat Enterprise Linux 3 (AMD64/EM64T)● Red Hat Enterprise Linux 4 for IA64● Red Hat Enterprise Linux 5 for IA64● SUSE Linux Enterprise Server● SUSE Linux Enterprise Server 10 for IA64● SCO OpenServer 5.0.7, 6● SCO UnixWare 7.1.3● SCO UnixWare 7.1.4
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NOTE: HPUX 11iv2/11iv3 (for Dual Domain only)

Needs I/O Module (#AG779A), and HP SC44Ge Host Bus Adapter

Qualified for the following HP Integrity servers:

rx2660, rx3600, rx6600, rx7640, rx8640, Superdome sx2000 (only the version that support PCI-e cards)

NOTE: Open VMS (for Dual Domain only)

Needs I/O Module (#AG779A), and HP (AH303A) SC44Ge Host Bus Adapter

Qualified for the following HP Integrity servers:

rx2660, rx3600, rx6600, rx7640, rx8640, Superdome sx2000 (only the version that support PCI-e cards)

Software Components

Service and Support

Three-year limited parts only warranty, including hardware diagnostic support, pre-failure warranty (coverage of hard drives, memory and processors). The warranty is fully supported by HP Services and a worldwide network of resellers and service providers. In addition 90-day's getting started software telephone support may be covered under the warranty or available for an additional fee. Enhancements to warranty services are available through HP Care Pack services.

NOTE: The MSA60 has a limited 3 year parts only warranty. The SAS drives have a 3 year warranty SATA drives have a 1 year warranty

Care Pack services provide a range of life cycle support options that let you choose the service levels that meet your business requirements, from basic to mission-critical.

A full range of HP Care Pack hardware and software services are available including:

- Installation and start up
- Education courses
- Extended onsite hardware coverage hours from same business day 13 hours, 5 day to 24 hours, 7 days call window with options including 4-hour response or 6-hour Call To Repair
- Comprehensive range of software technical support for Microsoft, Linux, ProLiant Essentials solutions helping to deliver high level of application availability. Response times range from 30 minutes for critical problems to 2 hours.
- System Management, Performance Services and Mission Critical Support Solution

Service includes HP branded hardware options qualified for the storage enclosure, purchased at the same time or afterwards, internal to the enclosure. These will be covered at the same service level and coverage period as the storage enclosure.

NOTE: For more information on HP Care Pack services, contact any of our worldwide sales offices or resellers or visit our worldwide Web site on the Internet at: <http://www.hp.com/hps/carepack>

NOTE: For more complete information on HP Services offerings, customers and resellers, please visit us at: <http://www.hp.com/hps>

NOTE: Additional information regarding worldwide limited warranty and technical support is available at: <http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html>

HP Care Pack Information Flexible Support

1 Year Support

HA101A1-87G
HA103A1-87G
HA104A1-87G
HA105A1-87G
HA109A1-87G
HA110A1-87G
HA111A1-87G

3 Year Support

HA112A1-87G
HA101A3-87G
HA103A3-87G
HA104A3-87G
HA105A3-87G
HA109A3-87G

Service and Support, HP Care Pack, and Warranty Information

		HA110A3-87G
		HA111A3-87G
		HA112A3-87G
	4 Year Support	HA101A4-87G
		HA103A4-87G
		HA104A4-87G
		HA105A4-87G
		HA109A4-87G
		HA110A4-87G
		HA111A4-87G
		HA112A4-87G
	5 Year Support	HA101A5-87G
		HA103A5-87G
		HA104A5-87G
		HA105A5-87G
		HA109A5-87G
		HA110A5-87G
		HA111A5-87G
		HA112A5-87G
		HA113A1-564
Fixed Care Packs	Installation & Start-Up	UF297E
	HP 1Y NBD,9X5 MSA60 HW Support	UF298E
	HP 1Y 4h 13x5 MSA60 HW Support	UF299E
	HP 1Y 4h 24x7 MSA60 HW Support	UF300E
	HP 1y 6h CTR MSA60 HW Support	UF301E
	HP 3y NBD 9x5 MSA60 HW Support	UF302E
	HP 3y 4h 13x5 MSA60 HW Support	UF303E
	HP 3y 4h 24x7 MSA60 HW Support	UF304E
	HP 3y 6h CTR MSA60 HW Support	UF305PE
	HP 1y PW NBD MSA60 HW Support	UF306PE
	HP 1y PW 4h 13x5 MSA60 HW Support	UF307PE
	HP 1y PW 4h 24x7 MSA60 HW Support	UF308PE
	HP 1y PW 6h CTR MSA60 HW Support	U8132E
	Hardware Installation, Electronic	

Configuration Information

Step 1: Base Configuration

Model	Shipping Dimensions	Part Number
MSA60	35.25 x 23.5 x 15.75 in (89.5 x 59.7 x 40.0 cm)	418408-B21
I/O Module (NEW)	HP StorageWorks Modular Dual Domain I/O Module Option Kit NOTE: The I/O Module is a field upgradeable Option Kit the addition of which in the MSA60 will allow dual domain capability providing higher level of redundancy and reliability. HP (AH303A) SC44Ge Host Bus Adapter required. Supports only HP-UX and Open VMS on selected HP Integrity Servers only.	AG779A
MSA60 bundles	HP StorageWorks MSA60 1.8TB SAS HDD Bundle (MSA60 w/12 146 GB 15K SAS LFF SP HDD)	AG822A
	HP StorageWorks MSA60 9TB SATA HDD Bundle (MSA60 w/12 750 GB SATA 7.2K LFF SP HDD)	AG823A
	HP StorageWorks MSA60 3.6TB SAS HDD Bundle (MSA60 w/12 300 GB 15K SAS LFF SP HDD) NOTE: Drives in the bundles are Single Port drives only NOTE: The MSA60 bundles will be available in the Americas, Asia Pacific (AP) and Japan only. They will not be available in Europe, Middle East and Africa.	AG824A

Step 2: Array Controllers

	Description	Part Number
Smart Array Controllers Supported (Single Domain)	HP ProLiant Servers	
	HP Smart Array P800 controller	381513-B21
	HP Smart Array E500 controller	435129-B21
	HP Smart Array P600/256 BBWC Controller	337972-B21
	HP Integrity Servers	
	HP Smart Array P800 controller	AD335A
	HP Smart Array E500 controller	AH226A
SAS Controllers Supported (Dual Domain)	HP Smart Array P600/256 BBWC Controller	337972-B21
	NOTE: The Smart Array P600 supports the cascading of shelves in a 1+3 configuration to allow a maximum of 48 drives in an 8U configuration behind or the HP Smart Array P600 controller as the P600 has only a single external port.	
	NOTE: : The Smart Array E500 offers RAID 0, 1 and 0+1 and can be upgraded with ProLiant server to RAID 5 with battery-backed write cache (BBWC) module - 383280-B21.	
SAS Controllers Supported (Dual Domain)	HP Integrity Servers	
	HP SC44Ge Host Bus Adapter	AH303A
	NOTE: Only HP-UX and Open VMS on selected HP Integrity servers supported. HP Integrity servers that are supported: rx2660, rx3600, rx6600, rx7640, rx8640, Superdome sx2000 (only the version that support PCI-e cards).	

Configuration Information

Step 3: Choose HP ProLiant Server(s)/HP Integrity Server(s)

Server Compatibility	HP ProLiant ML310 G3
	HP ProLiant ML310 G4
	HP ProLiant ML350 G5
	HP ProLiant ML370 G5
	HP ProLiant ML570 G4
	HP ProLiant DL320 G4
	HP ProLiant DL320 G5
	HP ProLiant DL320s
	HP ProLiant DL360 G5
	HP ProLiant DL365
	HP ProLiant DL380 G5
	HP ProLiant DL385 G5
	HP ProLiant DL580 G4
	HP ProLiant DL585 G2
	HP Integrity Server rx2660 with combination PCIx/PCIe riser only
	HP Integrity Server rx3600 with combination PCIx/PCIe backplane only
	HP Integrity Server rx6600 with combination PCIx/PCIe backplane only
	HP integrity Server rx7640 with combination PCIx/PCIe only
	HP integrity Server rx8640 with combination PCIx/PCIe only
	HP integrity Server sx2000 with combination PCIx/PCIe only

NOTE: HP ProLiant servers above may not support all Smart Array controllers, see matrix on: <ftp://ftp.compaq.com/pub/products/servers/ProLiantstorage/arraycontrollers/compatibility-matrix.pdf>

NOTE: HP Integrity Server home: http://www.hp.com/products1/serverconnectivity/support_matrices.html

Step 4: Choose Hard Drives

SAS Drives	HP 36GB 3G 15K SAS SP HDD (3.5-inch)	375868-B21
	HP 72GB 3G 15K SAS SP HDD (3.5-inch)	375870-B21
	HP 146GB 3G 15K SAS SP HDD (3.5-inch)	375872-B21
	HP 300GB 3G 15K SAS SP HDD (3.5-inch)	431944-B21
	HP 72GB 3G 15K SAS DP HDD (3.5-inch)	384852-B21
	HP 146GB 3G 15K SAS DP HDD (3.5-inch)	384854-B21
	HP 300GB 3G 15K SAS DP HDD (3.5-inch)	416127-B21

NOTE: In a single domain environment Dual Port (DP) SAS drives will function as Single Port (SP) drives only.

NOTE: Only Dual Port (DP) SAS drives will work in the Dual Domain environment. Dual Domain environment requires the HP StorageWorks I/O Module Option (# AG779A).

SATA Drives	HP 750 GB 1.5G SATA 7.2K 3.5" HDD	432341-B21
	HP 500 GB 1.5G SATA 7.2K 3.5" HDD	395473-B21
	HP 250 GB 1.5G SATA 7.2K 3.5" HDD	349239-B21

NOTE: SATA drives are not Dual Port drives

NOTE: There is a known compatibility issue with some early 3.5" SATA HDD that will make them unable to be used with the MSA20. Customers should verify that they are not using hard drive part number 356536-002/003 (spare 353044-001).

The following SATA hard drives require SATA FirmWare flash in order to work properly. They are:

Configuration Information

500GB SATA 1.5 - Model # 6H500F0, min F/W rev: HA431DD0
 80GB RoHS Mask Rom SATA 1.5, Model # 6L080M0, min F/W rev BACE1GG0
 160GB RoHS Mask Rom SATA 1.5, Model # 6L160M0, min F/W rev BACE1GG0
 250GB RoHS Mask Rom SATA 1.5, Model # 6L250S0, min F/W rev BACE1GG0

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.

Step 5: Choose Rack Option

HP Racks	HP Universal Rack 10642 G2 Pallet ALL	AF001A
	HP Universal Rack 10642 G2 Shock Rack	AF002A
	HP Universal Rack 10642 G2 Crated ALL	AF003A
	HP Universal Rack 10642 G2 w/Ext Shock Rack	AF004A
	HP Universal Rack 10636 G2 Pallet ALL	AF011A
	HP Universal Rack 10636 G2 Shock Rack	AF012A
	HP Universal Rack 10636 G2 Crated ALL	AF013A
	HP Universal Rack 10636 G2 w/Ext Shock Rack	AF014A
	HP Module Cooling System	AF092A
	HP Rack S10614 (14U) Rack Cabinet – Shock Pallet	292302-B22

Step 6: Choose Cables

Cable Options	Cables used for connecting the HP Smart Array P800/512 BBWC Controller (P/N 381513-B21 or AD335A) or the HP Smart Array E500 (P/N 435129-B21 or AH226A) to MSA60	
	Mini SAS 4x 2M Cable All	407339-B21*
	Mini SAS 4x 4M Cable All	432238-B21*
	Mini SAS 4x 6M Cable All	432239-B21*
	* #OD1 will appear after this part number on your sales order if factory integration is indicated.	
	Cables used for connecting the HP Smart Array P600/512 BBWC Controller (P/N 337972-B21) or the HP SC44Ge Host Bus Adapter (P/N AH303A) to MSA60	
	SAS 4x to Mini SAS 4x 2M	419571-B21*
	SAS 4x to Mini SAS 4x 4M	419572-B21*
	SAS 4x to Mini SAS 4x 6M	419573-B21*
	*#OD1 will appear after this part number on your sales order if factory integration is indicated.	

Technical Specifications

LED Indicators for Drive Modules (2)	Online (bottom) Drive Failure/ID (top)
LED Indicators on Front Panel	Heartbeat LED Fault LED UID button/LED
LED Indicators on Rear Panel (6)	I/O Module LED UID button/LED Heartbeat LED Fault LED Power On/Standby button/system power LED Power supply LED
Host Interface	SAS 3 Gb/s
Maximum Number of Drives	Up to twelve, 3.5" SAS or SATA drives
Temperature Range	Operating 50° to 95° F (10° to 35° C) Shipping -40° to 150° F (-40° to 66° C) NOTE: Rated 1°C per 1000 feet of elevation to 10,000 ft.
Relative Humidity	Operating 10% to 90% Non-operating Up to 95%
Input Power Requirements	Rated Input Voltage 100 to 240 VAC Rated Input Frequency 50 to 60 Hz Rated Input Current 3.9A at 110 VAC typical, 6A Maximum Input Power (max) 345 W
Heat Dissipation (maximum)	1175 Btu/hr* <i>*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.</i>
User Interface	Controller display with Status indicators (2) and push buttons (4) on front of controller
Logical Drives (LUN)	Up to 32 Logical drives when connected to P800 Smart Array controller
Maximum Logical Drive Size	> 2 TB
RAID Support	RAID 6 with ADG (Advanced Data Guarding) RAID 5 (Distributed Data Guarding) RAID 1 + 0 (Mirroring and Striping) RAID 1 (Mirroring) RAID 0 (Striping)
Upgradeable Firmware	4MB Flashable
Disk Drives and Enclosure Protocol Support	HP 3.5" SAS 3 Gb/s
I/O Module	Connector Type IPass (mini-SAS) Number of Ports Two (one IN, other is OUT)

Technical Specifications

MSA60 Enclosure	2U Rack Form Factor	
	Dimensions (HxWxD)	3.47 x 17.64 x 23.25 in (8.8 x 44.8 x 59 cm)
	Weight (base unit)	34 lb (15.4 kg)
	Weight (with all drives)	54 lb (24.6 kg)

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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.