

Overview

Introduction

The HP StorageWorks Modular Smart Array 1000 is a 2 Gb Fibre Channel storage system designed for the entry-level to mid-range Storage Area Network (SAN). Designed to reduce the complexity, expense and risk of SAN deployment, the MSA1000 is a scaleable, high performance storage system built with investment protection in mind. The modular design of the MSA1000 allows the user to easily add storage capacity on an as needed basis.

The MSA1000 combines the array controller shelf and the drive shelf, which holds up to fourteen 1" universal disk drives in a single 4U rackmount cabinet. More storage can be easily deployed with the addition of up to two drive enclosures for a maximum storage capacity of 12 TB when using the new 300GB drives. The MSA1000 provides the latest 2 Gb Fibre Channel technology to the hosts. Besides the single port 2 Gb Fibre Channel I/O module that comes standard, there is an 8-port switch that mounts internally, featuring a low cost per port option that saves rack space. The MSA1000 provides Ultra3 SCSI connections to the hard drives and uses the HP Universal 1" Ultra2, Ultra3, and/or Ultra320 drives. By utilizing SCSI drives, the MSA1000 lowers the total cost of ownership and extends the customer's hardware investments into the future.

With the introduction of the newest controller firmware version 4.32 or later it is no longer necessary to replace the standard firmware with an alternative version. For those users needing to upgrade an older MSA1000 with the newer firmware, it can be downloaded at no charge at

<http://www.hp.com/go/msa1000>

Key Features

The HP StorageWorks MSA1000 offers the following key features:

- High performance controller(s)
- 4U rackmount design combining both the controller and disk shelf
- 2 Gb Fibre Channel host connections
- Ultra3 SCSI connections to drives Support for HP Ultra2, Ultra3, and Ultra320 Universal 1" Drives
- Scaleable from 3 to 42 drives via HP StorageWorks MSA30 Enclosures, up to 12TB
- Support for 1 Gb and 2 Gb Fibre Channel fabrics

What's new

- Support for new 300GB10K and 146GB15K hard drives
- New single and dual-channel HBAs
- Qualification of new firmware version 4.32
- Broader Alpha Server support
- Added Cisco C-Series switch support

Supported Alpha servers	<ul style="list-style-type: none">● DS10, DS15, DS10L, DS20E, DS25● ES40, ES45, ES47, ES80● GS60, GS60E, GS80, GS140, GS160, GS320, GS1280● AS800, AS4x00, AS8x00
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Cluster size supported	Tru64 UNIX TruCluster: 4 nodes OpenVMS: 8 nodes
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Number of clusters	1
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Single Cluster and Simultaneous Single Server Support	Yes
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Boot from SAN	Yes
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All configurations require a switch (FC-AL hubs are NOT supported) Yes

Product Highlights

High Levels of Performance, Scalability, and Functionality

- **Performance** - The MSA1000 and its components have been designed using the latest industry standard 2 Gb interconnects and Fibre Channel technology. Performance tests indicate a data transmission rate of up to 30,000 IOPS and bandwidth of up to 200 MB per second. (Single MSA1000 Controller).
- **Modular Chassis** - The modular design of the MSA1000 cabinet supports up to fourteen 1" Universal hard drives, redundant controllers, 2 Gb embedded fabric switches, fans and power supplies in a 4U rackmount cabinet.
- **Scalability** - The MSA1000 is easily expanded. The MSA1000 cabinet scales to 3TB, using fourteen 300GB, 1" HP Universal hard drives. By simply adding additional HP StorageWorks MSA30 Enclosures (two enclosures max), the MSA1000 scales to 12.TB, using forty-two, 300GB, 1" HP Universal hard drives - all within 10U of rack space.
- **MSA SAN switch 2/8** - The optional MSA SAN Switch 2/8 can be installed within the MSA1000. With seven ports accessible by the user, the MSA SAN Switch 2/8 is the ideal interconnect for cost effective multiple clusters or nodes or connection to other HP SAN switches from the HP interconnect family of switches. A second MSA SAN Switch 2/8 can be installed for redundancy. This switch ships with four SFPs included.
- **Hot Plug Expansion and Replacement Support** - The MSA1000 supports hot plug expansion and replacement of hard drives, Fabric Switches or hubs for simple, fast installation and maintenance. Fans and power supplies are also hot plug replaceable. Second controllers are bound by different guidelines depending on the operating system. Refer to the latest MSA1000 Release Notes for restrictions.
- **Advanced Data Guarding (RAID ADG) Fault Tolerance** - 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.

Low Total Cost of Ownership

The modular and scalable design of the MSA1000 provides an extremely flexibly platform. You can buy what you need today and purchase additional capacity and performance as your data storage needs grow, instead of making a large up-front investment. Additional drives, controllers, cache, fabric switches and storage enclosures can easily be added, as your storage needs change.

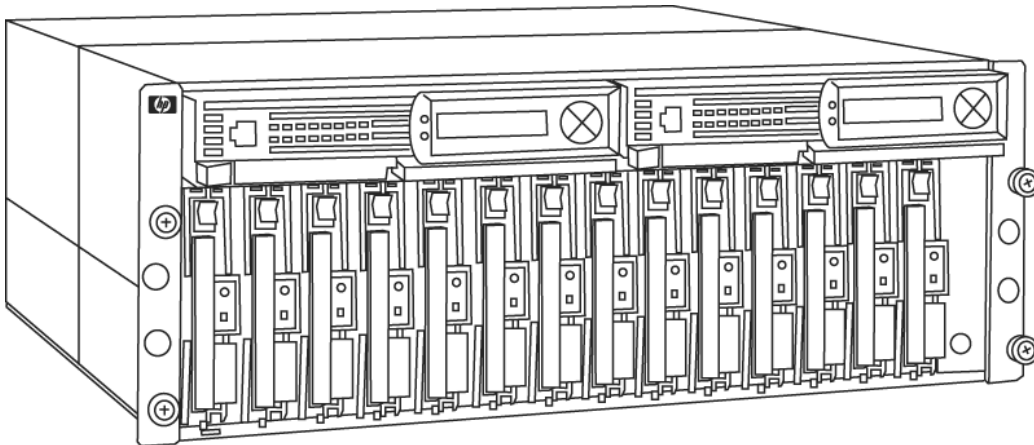
- **Fabric Support for 1 Gb and 2 Gb Infrastructure** - The MSA1000 supports both 1 Gb and 2 Gb Fibre Channel fabrics to ensure that your investment in 1 Gb infrastructure is protected.
- **Optional embedded interconnects** - The MSA SAN switch 2/8 requires no rack space as it is installed in the MSA1000's chassis. This not only saves valuable rack space (up to 2U saved) but also eliminates some of the cabling needed with external interconnects.
- **Universal Hard Drive** - Since the MSA1000 supports HP Universal 1" Ultra2, Ultra3 and Ultra320 drives, cost is minimized as you add new drives.

Configuration

- **Command Line Interface (CLI)** - A connection between a standard ANSI terminal or terminal emulator and the MSA1000 is required to use the command line interface (CLI) to configure and manage the MSA1000. A custom serial cable, part number 259992-001, ships with the MSA1000 and is required for this connection. CLI commands are documented in the HP StorageWorks Modular Smart Array 1000 User Guide.
- **Management** - MSA1000 events are logged in the Tru64 UNIX or OpenVMS error logs and can be monitored with HP Analyze or other error log analysis tools.

Models

HP StorageWorks Modular Smart Array 1000 For Alpha Server Systems with Tru64 UNIX or OpenVMS	MSA1000, with 256MB cache	201723-B22/ 3R-A4328-AA
	MSA1000 Controller, with 256MB cache	218231-B22/ 3R-A4330-AA
	256 MB Cache upgrade module for Controller	254786-B21/ 3R-A3954-AA
	MSA Fibre Channel I/O Module	218960-B21/ 3R-A2969-AA
	MSA SAN Switch 2/8 (integrated)	288247-B21/ 3R-A4289-AA
	FCA2384 2 Gb PCI-X Host Adapter (OpenVMS/Tru64 UNIX)	302784-B21 DS-KGPSA-EA
	FCA2684 - HP StorageWorks 2 Gb, Single Channel, 133 MHz PCI-X-to-Fibre Channel Host Bus Adapter for Tru64 UNIX and future support for OpenVMS	DS-A5132-AA
	FCA2684DC - HP StorageWorks 2 Gb, Dual Channel, 133 MHz PCI-X-to-Fibre Channel Host Bus Adapter for Tru64 UNIX and future support of OpenVMS	DS-A5134-AA
	1Gb FC Host Bus Adapter (Tru64 UNIX , OpenVMS)	168794-B21 DS-KGPSA-CA
	2 Gb SFP SW Transceiver Kit	221470-B21/ 3R-A2973-AA
	Modular Smart Array 30 (MSA30) drive enclosure, single bus	302969-B21
	Modular Smart Array 30 (MSA30) drive enclosure, dual bus	302970-B21



MSA1000 Components

With the following components, your storage capacity and performance can be scaled to new levels:

Modular Smart Array 1000 The 4U cabinet houses up to fourteen 1" Universal hot pluggable Ultra2, Ultra3, and/or Ultra320 drives. Each MSA1000 includes the following standard components: (1) MSA1000 Controller, (1) MSA Fibre Channel I/O Module with a single SFP, dual hot pluggable fans/power supplies and power cables, (2) 3' VHDCI to VHDCI SCSI cables to connect expansion enclosures, documentation and a CD Kit containing a support software CD.

The modular design of the MSA1000 makes it possible to add redundant controllers, redundant single port Fibre Channel I/O Modules, or MSA SAN Switch 2/8 and storage expansion enclosures.

When connected to an Alphaserver there must be a switch used as an interconnect. This can be one of the supported external switches or the optional embedded MSA SAN Switch 2/8. The MSA 3-port Hub is not supported.

MSA1000 Controller

The MSA1000 Controller is an integrated RAID controller with an integrated LCD/LED status display and 256 MB read/write battery-backed cache (expandable to 512 MB per controller). One MSA1000 Controller is included with the MSA1000; a redundant MSA1000 Controller is an option.

Key Features

- Redundant controller support with mirrored cache
- Fabric, Private Loop & Public Loop Support
- Auto Negotiated F, FL & L Port Login
- RAID 0, 1, 1+0, 5 and ADG
- 2 Gb/1 Gb Frequency Agile
- Primary & Secondary Inter-Controller Link (ICL)
- configurable with Command Line Interface (CLI)

MSA1000 Controller Management Features

- **Access Control Lists (ACL):** allows multiple hosts to access a single MSA1000 storage system. Host access can be defined all the way down to a logical volume level.
- **RAID Level Migration:** allows for online post-configuration change to RAID level without destroying data or volume information.
- **Online Capacity Expansion:** lets you add storage to an operational MSA1000-reducing expensive server downtime.
- **Global Online Spare:** reduces the risk of data loss by facilitating automatic rebuilds after a drive failure

Fault Tolerance

Several fault tolerant configurations, which keep data available and servers running while drives are being replaced, are supported including:

- **Advanced Data Guarding (RAID 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, (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.
- **Minimizes downtime, reconstructs data, and facilitates a quick recovery from drive failure**
- **Online Spares:** If a failure occurs, recovery begins with an online spare and data is reconstructed automatically. Multiple online spares can be assigned per array and used across multiple arrays. It is also possible to assign different online spares across different arrays.
- **Array Accelerator:** Onboard, battery-backed cache memory protects data in the event of a power failure. In the unlikely event of a controller failure, the battery-backed cache will save critical user data for up to three days

Fault Recovery

MSA Fibre Channel I/O Module

Provides a single 2 Gb Fibre Channel connection per controller into the MSA1000. The MSA Fibre Channel I/O Module includes one 2 Gb, Short Wave Small-Form-Factor-Pluggable Transceiver (SFP). A second MSA Fibre Channel I/O Module can be installed for redundancy when a redundant controller is used. A FC switch must always be used as an interconnect between the host HBAs and an MSA1000. Direct connect is not supported.

MSA1000 Components

MSA SAN switch 2/8

The HP StorageWorks MSA SAN switch 2/8 is a new optional switch embedded on a blade, for mounting internal to an MSA1000. The MSA SAN Switch 2/8 offers low price per port and full scalability, doing so while taking zero rack space, even in a redundant configuration. It ships with four SFPs installed. Because of its low cost per port it is the most cost effective method of enabling the larger SAN. It is interoperable with the HP line of SAN interconnect family of FC switches.

- eight 2 Gb ports: 1 to controller, 7 user accessible
- product ships with 4 SFPs installed
- no E-port restriction, accepts all optional software
- interoperates with external SAN Switch 2 Gb switches
- configuration and management methodology common with SAN Switch product line, same methods as installed base of 30,000+ HP SAN Switches

2 Gb Small-Form-Factor-Pluggable (SFP) SW Transceiver Kit

2 Gb Small-Form-Factor-Pluggable (SFP) SW Transceivers are industry standard connection devices, which hot plug into 2 Gb infrastructure components such as 2 Gb Fabric Switches. HP StorageWorks 2 Gb SFP SW Transceivers support distances up to 300 meters at 2 Gb and 500 meters at 1 Gb using multi-mode fiber optic cable.

Multi-Mode Fibre Channel Cables

Multi-Mode Fibre Channel cables provide a thin, flexible cabling solution that is immune to electromagnetic interference. HP offers cables to connect the MSA1000 to both 2 Gb and 1 Gb Fibre Channel infrastructures. LC to LC cables are used when connecting the MSA1000 to other 2 Gb Fibre Channel components because both connections will utilize small-form-factor-transceivers. LC to SC cables are used when connecting the MSA1000 to 1 Gb Fibre Channel components. 1 Gb components use the larger GBIC style transceivers.

Software Components

Command Line Interface (CLI)

The command line interface (CLI) is used to configure and manage the MSA1000. Additionally, the CLI can be used to display system information and status. See the HP StorageWorks Modular Smart Array 1000 User Guide for more information on the CLI commands.

OS Support

Tru64 UNIX Support

OpenVMS Support

- Tru64 UNIX v5.1A with PK6 and NHD7
- Tru64 UNIX v5.1B with PK3 and NHD7
- OpenVMS v7.2-2 with TIMA kit VMS722 FIBRE SCSI-V0600
- OpenVMS v7.3-1 with TIMA kit VMS731 FIBRE SCSI-V0600
- OpenVMS v7.3-2 with TIMA kit VMS732 FIBRE SCSI-V0300

Service and Support, HP Care Pack and Warranty Information

Storage Service Packages The Storage Services Packaging takes the existing storage product along with the existing services and creates a package of the storage hardware and appropriate services. The increased level of support provides for a higher level of storage system availability for the customer. The package includes 24x7 support with a 4-hour response for 3 years as well as installation and startup service.

Warranty Three-year Limited Warranty for MSA1000s, Fibre Channel Cables and SFP Transceivers; 3 years parts exchange; 1 year labor; 1 year on-site; next business day response. Options for the MSA1000 carry their own warranty. Refer to HP's Limited Warranty Statement for further details.

Software Product Services

- HP warrants only that the Software media will be free of physical defects for a period of ninety (90) days from delivery.
- Upgrades to the 90 day media defect warranty are available as HP Care Pack services. These services are available to upgrade the warranty to (1 or 3) full year of 9 hours by 5 days (or 24x7) software advisory and remedial software telephone support, new version license rights, and media and documentation distribution service.

Hardware Product Services

- Installation services
- On-site maintenance (includes warranty support)
- Response time upgrades during the warranty period
- Post-warranty coverage
- RAID setup and performance consulting via statement of work
- Migration service consulting via statement of work

Installation and Startup Services The Installation and Startup Service package provides installation and configuration of HP StorageWorks products. Major categories of work could include:

- Pre-installation consulting and planning
 - Hardware installation, configuration and verification
 - RAID array configuration and initialization
 - Installation, configuration and verification of StorageWorks software
 - Service tools installed, configured and verified
 - Customer orientation
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Warranty Upgrade Options

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

Service and Support, HP Care Pack and Warranty Information

HP Care Pack Information	Fixed Price Care Pack Part Numbers	Part Number
	(Supported through all ordering systems)	
	3 Yr next Day/Onsite	U6355A
	3 Yr next Day/Onsite, Electronic	U6355E
	3 Yr Same Day/Onsite	U6356A
	3 Yr Same Day/Onsite, Electronic	U6356E
	3 Yr 7x24/Onsite	U6357A
	3 Yr 7x24/Onsite, Electronic	U6357E
	4 Yr Same Day/Onsite	U9398A
	4 Yr Same Day/Onsite, Electronic	U9398E
	4 Yr 7x24/Onsite	U9399A
	4 Yr 7x24/Onsite, Electronic	U9399E
	5 Yr Same Day/Onsite	U9400A
	5 Yr Same Day/Onsite, Electronic	U9400E
	5 Yr 7x24/Onsite	U9401A
	5 Yr 7x24/Onsite, Electronic	U9401E
	6 Hr. Call To Repair/Onsite	U9934A
	6 Hr. Call To Repair/Onsite, Electronic	U9934E
	Hardware Installation	U4368A
	Hardware Installation, Electronic	U4368E

- HP Care Pack is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage.
- HP Care Pack is not available for less than the product's warranty duration.
- HP Care Pack is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required.
- HP Care Pack services are prepaid.

NOTE: For additional HP Care Pack (hardware & software) information on European and other countries, as well as orderable part numbers, please refer to the URL listed below:

<http://h18005.www1.hp.com/services/carepaq/index.html>

Configuration Information

Step 1 - Order Required Items

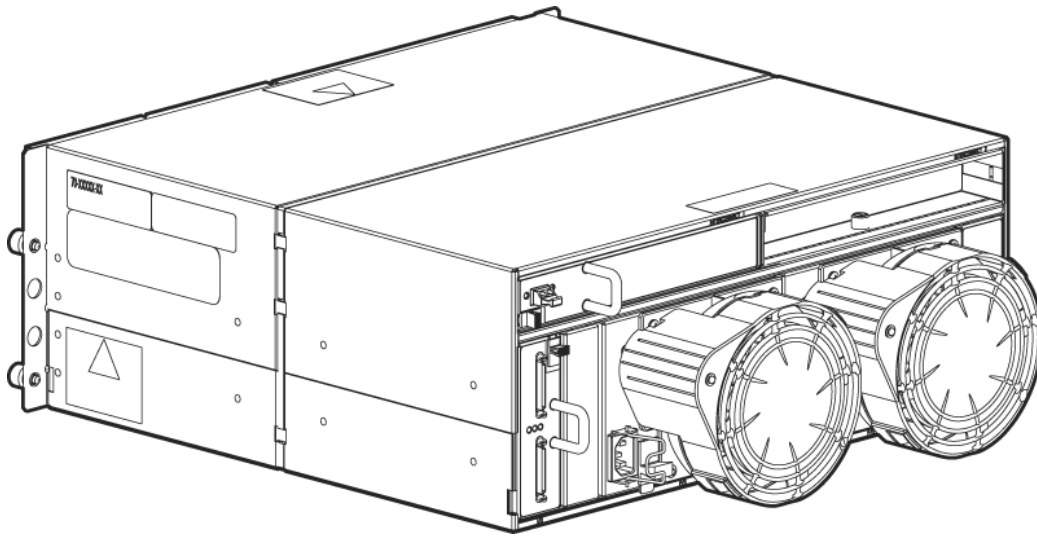
HP StorageWorks Modular Smart Array 1000

201723-B22

Includes:

- (1) MSA1000 Controller with 256 MB cache
- (1) MSA Fibre Channel I/O Module with 2 Gb SFP SW Transceiver
- Redundant Hot Pluggable Power Supply/blower assemblies
- Universal Rackmounting Kit
- MSA1000 Support CD & Documentation for Tru64 UNIX & OpenVMS
- (2) Power cables
- (1) custom serial cable

NOTE: Fibre Channel cables are ordered separately.

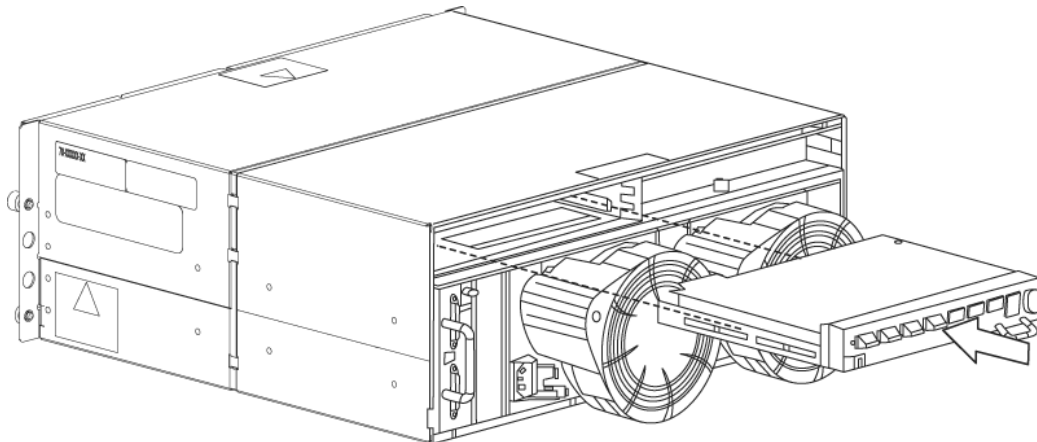


Step 2 - Select Optional Non-Redundant MSA1000 System Options

MSA SAN Switch 2/8 (integrated) (Includes four 2Gb SFPs)

288247-B21

NOTE: The MSA SAN Switch 2/8 has seven external ports, four of which have transceivers installed.



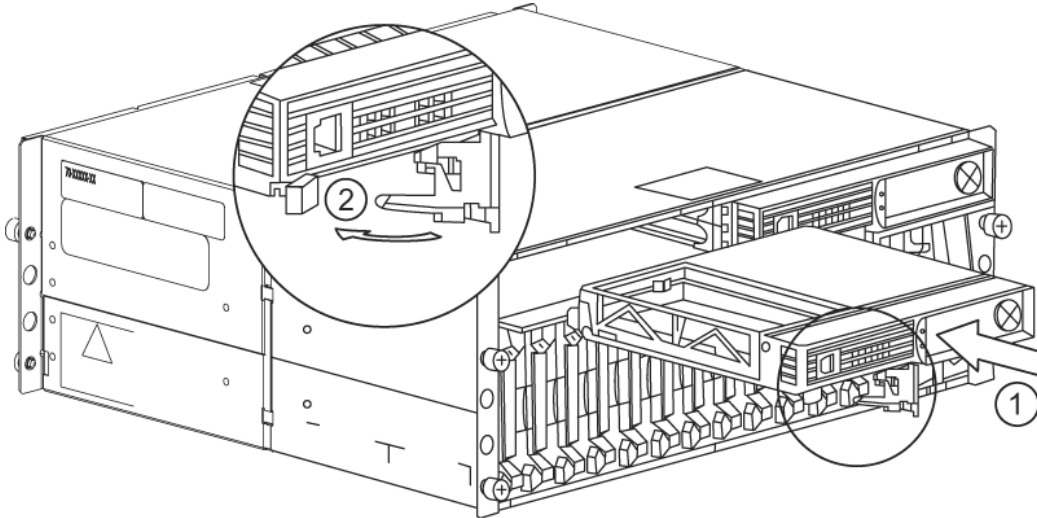
Configuration Information

Step 3 - Choose Redundant MSA1000 System Options

MSA1000 Controller

218231-B22

NOTE: Redundant configurations require two Host Adapters per server, an additional controller for each server. Mixing of the MSA Fibre Channel I/O Modular and the MSA SAN Switch 2/8 is not supported. When configuring the MSA1000 for redundant controllers use either two MSA Fibre Channel I/O Modules or two MSA SAN Switch 2/8s. There must always be a switch between the Alpha server(s) and the MSA1000. Direct connect is not supported.

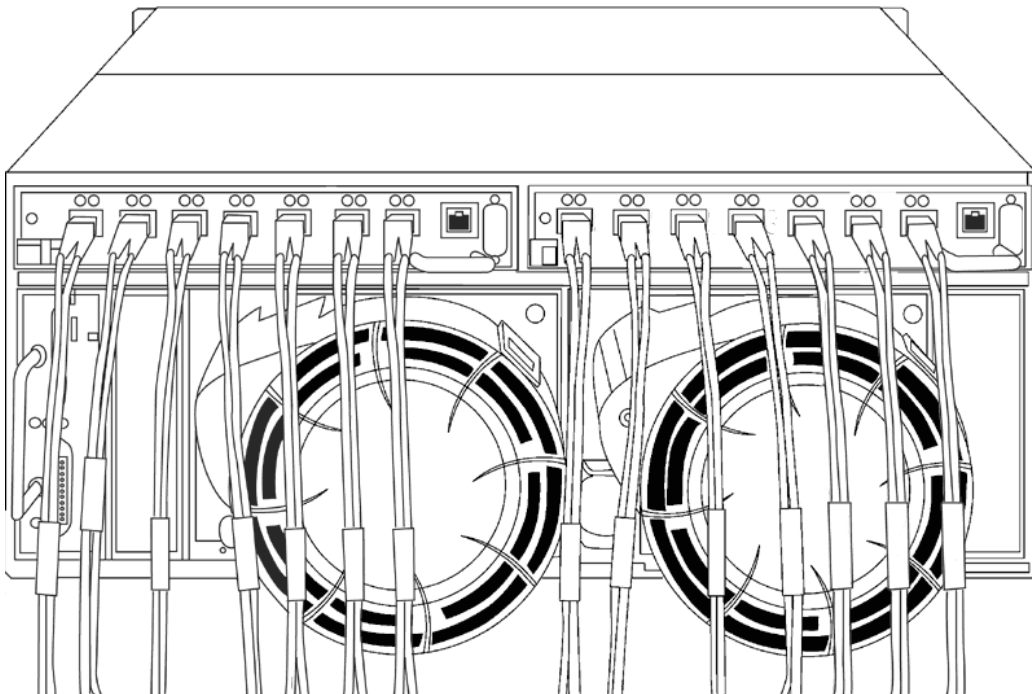


MSA Fibre Channel I/O Module

218960-B21

MSA SAN Switch 2/8 (integrated) (Includes four 2Gb SFP transceivers)

288247-B21



Configuration Information

Step 4 - Choose Supported Options For 2 Gb or 1 Gb Infrastructure

2 Gb Fibre Channel Transceiver (SFP)	2 Gb SFP SW Transceiver Kit	221470-B21
2 Gb Fibre Channel Fabric "B-series" family of switches	HP StorageWorks MSA SAN Switch 2/8 (embedded option for MSA1000 only) NOTE: Includes four 2Gb SFP transceivers.	288247-B21
	HP StorageWorks SAN Switch 2/8V	AA979A
	HP StorageWorks SAN Switch 2/8V Power Pack	AA980A
	HP StorageWorks SAN Switch 2/16V	AA978A
	HP StorageWorks SAN Switch 2/16N	AA990A
	HP StorageWorks SAN Switch 2/16N Power Pack	AA977A
	HP StorageWorks SAN Switch 2/16	322118-B21
	HP StorageWorks SAN Switch 2/16 Power Pack	322119-B21
	HP StorageWorks SAN Switch 2/32	240603-B21
	HP StorageWorks SAN Switch 2/32 Power Pack	333764-B21
	HP StorageWorks core 2/64	332177-B22
	HP StorageWorks core 2/64 Power Pack	332178-B22
	HP StorageWorks SAN Director 2/128	AA981A
	HP StorageWorks SAN Director 2/128 Power Pack	AA982A
2 Gb Fibre Channel Fabric "C-Series" family of switches	Cisco MDS 9506 Multilayer Director w/OSFPs	A7471A
	Cisco MDS 9509 Multilayer Director w/0 SFPs	A7462A
	Cisco MDS 9216 Multilayer Fabric Switch	A7473A
	Cisco MDS 9120 Fabric Switch w/0 SFPs	A7426A
	Cisco MDS 9140 Fabric Switch w/0 SFPs	A7427A
	NOTE: For "C-Series" information refer to: http://hp.com/go/SAN	
2 Gb Fibre Channel Fabric "M-series" family of switches	HP StorageWorks Edge Switch 2/32 NOTE: 16 active ports. Ships with 16 SFPs	286810-B21
	8-FlexPort upgrade for Edge 2/32	302660-B21
	HP StorageWorks Edge Switch 2/24 NOTE: 8 ports active. Ships with 8 SFPs	316095-B21
	8-FlexPort upgrade for Edge 2/24, includes transceivers	316096-B21
	HP StorageWorks Edge Switch 2/12 NOTE: 4 ports active. Ships with 4 SFPs	348406-B21
	4-FlexPort upgrade for edge 2/12, includes transceivers	348407-B21

Configuration Information

2 Gb Fibre Channel HBAs	FCA2354 2 Gb PCI Host Adapter (Open VMS/Tru64 UNIX)	261329-B21
	FCA2384 2 Gb PCI-X Host Adapter (OpenVMS/Tru64 UNIX)	302784-B21 DS-KGPSA-EA
	FCA2684 - HP StorageWorks 2 Gb, Single Channel, 133 MHz PCI-X-to-Fibre Channel Host Bus Adapter for Tru64 UNIX and future support for OpenVMS	DS-A5132-AA
	FCA2684DC - HP StorageWorks 2 Gb, Dual Channel, 133 MHz PCI-X-to-Fibre Channel Host Bus Adapter for Tru64 UNIX and future support of OpenVMS	DS-A5134-AA
	1Gb FC Host Bus Adapter (Tru64 UNIX , OpenVMS)	168794-B21 DS-KGPSA-CA

Fibre Channel Cables for 2 Gb Infrastructure	Use 2 Gb Fibre Channel cables when connecting the MSA Fibre Channel I/O Module or the MSA Fabric Switch 6 to FCA2101 HBA(s)	
	2 m LC-LC Multi-Mode Fibre Channel Cable	221692-B21
	5 m LC-LC Multi-Mode Fibre Channel Cable	221692-B22
	15 m LC-LC Multi-Mode Fibre Channel Cable	221692-B23
	30 m LC-LC Multi-Mode Fibre Channel Cable	221692-B26
	50 m LC-LC Multi-Mode Fibre Channel Cable	221692-B27

Step 5 - Choose Hard Drives & HP StorageWorks Enclosures

Hard Drives	72.8 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1")	286714-B22
	146.8 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1")	286716-B22
	300 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1")	350964-B22
	36.4 GB Pluggable Ultra320 Universal Hard Drive, 15,000 rpm (1")	286776-B22
	72.8 GB Pluggable Ultra320 Universal Hard Drive, 15,000 rpm (1")	286778-B22
	146.8 GB Pluggable Ultra320 Universal Hard Drive, 15,000 rpm (1")	347708-B22

***NOTE:** All Ultra320 Universal Hard Drives are backward compatible to U2 or U3 speeds.

HP StorageWorks Enclosures	The MSA1000 cabinet holds fourteen 1" Universal Drives. Add one HP StorageWorks Enclosure to increase capacity up to 28 drives. Add two HP StorageWorks Enclosures to increase capacity up to the maximum of 42 drives.	
	Modular Smart Array 30 (MSA30) drive enclosure, single bus	302969-B21
	Modular Smart Array 30 (MSA30) drive enclosure, dual bus	302970-B21

Configuration Information

Step 6 - Choose Rack Options

9142 Rack	120663-B21, -B22, -B23
9136 Rack	120664-B21, -B22, -B23
9122 Rack	120665-B21, -B22, -B23
9842 Rack	222192-B21
10647 (47U) rack	245160-B21, -B23
10642 (42U) rack	245161-B21, -B22, -B23
10636 (36U) rack	245162-B21, -B22, -B23
10622 (22U) rack	245163-B21, -B22, -B23
H9A10 Cab	H9A10-XX
H9A15 Cab	H9A15-XX

Configuration Examples

Two Node Redundant Cluster Solution Example

Quantity	Description	Part Number
1	HP StorageWorks Modular Smart Array 1000	201723-B22
1	additional MSA1000 Controller	218231-B22
2	MSA SAN switch 2/8 (embedded)	288247-B21
4	Host Adapter (example)	261329-B21
4	2 m LC-LC Multi-Mode Fibre Channel Cable	221692-B21
14	36.4 GB Pluggable Ultra320 Universal Hard Drive, 15K	286776-B21

4 Host, 6TB, Redundant SAN Solution Example

Quantity	Description	Part Number
1	HP StorageWorks Modular Smart Array 1000	201723-B22
1	additional MSA1000 Controller	218231-B22
2	256 MB Cache Modules for Controller (one additional for each controller)	254786-B21
2	SAN Switch 2/16-EL	283056-B21
8	Host Adapter (example)	261329-B21
8	2 m LC-LC Multi-Mode Fibre Channel Cable	221692-B21
2	HP StorageWorks Enclosure Model 4314R	190209-001
42	146.8 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1")	286716-B22

Technical Specifications

Modular Smart Array 1000 LED Indicators on Front (3)	Power	
	Fault detected in one or more sub-systems	
	Fault in Enclosure Management	
LED Indicators for Drive Modules (3)	Drive Access (center)	
	Online (left)	
	Drive Failure (right)	
LED Indicators on Rear Panel (4)	Power Supply/Blower Assembly Fault (1)	
	EMU (3) Power, A bus, B bus	
Interface	Ultra3 SCSI to Hard Drives	
	2 Gb Fibre Channel to Hosts	
Maximum Number of Drives	Fourteen, 1-inch HP Ultra2, Ultra3 or Ultra 320 Universal Hard Drives (MSA1000 Cabinet); expandable to 42 using two additional HP StorageWorks 4200/4300 Enclosures	
Temperature Range	Operating	50° to 95° F (10° to 35° C)
	Shipping	-22° to 122° F (-30° to 50° C)
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	6 A Max
	Input Power (max)	549 W*
Heat Dissipation (max)	1876 Btu/hr*	
MSA1000 Cabinet	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.	
	4U Rack Form Factor	
	Dimensions (H x W x D)	6.9 x 19 x 20.5 in (17.5 x 48.3 x 52.1 cm)
Shipping Packaging	Weight	Net 55 to 85 lb (24.95 to 38.56 kg)
	Dimensions (L x W x D)	28.5 x 14.81 x 33.13 in (72.4 x 37.6 x 84.1 cm)
	Weight (Gross)	75 to 105 lb (34.02 to 47.63 kg)

Technical Specifications

Modular Smart Array 1000 User Interface Controller		Controller Display with Status Indicators (2) and Push Buttons (4) Status Indicators on front of Controller (16)
	Electrical Interface	LVD (Low Voltage Differential)
	Protocol Support	Wide Ultra3 SCSI (160 MB/s per channel)
	SCSI Ports	4-channel: 2 external/2 Internal
	Drives Supported	Up to 42 drives
	Maximum Capacity	6.0 TB (42 drives x 146 GB)
	Logical Drives	Up to 32 logical drives
	RAID Support	RAID ADG (Advanced Data Guarding) RAID 5 (Distributed Data Guarding) RAID 1+0 (Striping & Mirroring) RAID 0 (Striping)
	Cache Memory	Up to 512 MB Read/Write (256 MB modules). If redundant controllers are used they must have equally configured cache ECC protection, battery-backed, and removable Standard as of November 19, 2002: 256 MB cache memory (single module)
	Cache Batteries	Up to three days of redundant battery life, removable for easy replacement
	Upgradeable Firmware	2 MB flashable ROM
	Disk Drive and Enclosure Protocol Support	HP Ultra 320, Ultra3, and Ultra2 SCSI 1-inch Universal drives
	Packaging	Dimensions (L x W x D) 17 x 12.5 x 7.75 in (43.2 x 31.75 x 19.7 cm) Weight (Gross) 6 lb (2.72 kg)
<hr/>		
Modular Smart Array Fibre Channel I/O Module	Connector Type	LC
	Number of Fibre Channel Ports	One 2 Gb Fibre Channel Port using removable Small-Form-Factor-Pluggable Transceiver (SFP)
	Bandwidth	200 MB/s
	Operation Modes	Fibre Channel Class 2 and 3 connectionless service
	Protocols Supported	Fibre Channel
	Packaging	Dimensions (L x W x D) 17 x 12.5 x 7.75 in (43.2 x 31.75 x 19.7 cm) Weight (Gross) 6 lb (2.72 kg)
<hr/>		
FCA2354 Host Adapter	Connector Type	LC
	Protocol	SCSI, IP
	Data Transfer Method	64-bit/66 MHz PCI
	Maximum Transfer Rate	200 MB/s
	Packaging	Dimensions (L x W x D) 11 x 8.5 x 3 in (27.9 x 21.6 x 7.6 cm) Weight (Gross) 1 lb (0.45 kg)
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Multi-Mode Fibre Channel Cables Kits	Cable Type	LC-LC (2 Gb to 2 Gb connections) and LC-SC (2 Gb to 1 Gb connections) 50 Micron multi-mode Fiber
	Available Cable Lengths	6.5 ft, 16.4 ft, and 49.2 ft (2 m, 5 m, and 15 m)
	Packaging	Dimensions (L x W x D) 11.5 x 9 x 1.5 in (29.2 x 22.8 x 3.8 cm) Weight (Gross) 0.75 to 1 lb (0.34 to 0.45 kg)
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Technical Specifications

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