

Overview

HP StorageWorks Modular SAN Array 1000

The HP StorageWorks Modular SAN 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 StorageWorks 4314 Enclosures for a maximum storage capacity of 6 TB when using the new 146 GB 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 optional 3-port 2 Gb Fibre Channel hub that also fits inside – an ideal low cost solution for simple 2-node clustering. There is also a newly introduced 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.

An alternative firmware version, installed in place of the standard version, now enables support for OpenVMS and Tru64 UNIX. A copy of this alternative firmware ships with the msa1000 and is also downloadable at no charge from the HP msa1000 Web site. It replaces the existing firmware that ships with the MSA1000. Included with the firmware will be instructions on the procedure to upgrade the firmware in either a Tru64 UNIX or an OpenVMS environment

The msa1000 offers the following key features

- High performance controller(s) built on DAS to SAN {DtS} architecture for maximum investment protection
- 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 4200/4300 Enclosures
- Support for 1 Gb and 2 Gb Fibre Channel fabrics

What's new

- Multiple clusters and/or single server access to an individual msa1000.
- Support for concurrent access by servers with OpenVMS and Tru64 UNIX operating systems
- Redundancy (if present) retained while expanding number of drives or enlarging LUNs
- New 3-port embedded hub or 8-port switch option
- Ability to add an additional storage drive enclosure (42/4300) to a msa1000 without power cycling unit
- Support for larger and/or faster drives allowing total capacity to scale to 6 TB

Supported Alpha servers

- DS10, DS10L, DS20E, DS25
- ES40, ES45, ES47, ES80
- GS80, GS160, GS320, GS1280



MSA1000 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 over 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 or hubs, fans and power supplies in a 4U rackmount cabinet.
- **Scalability** – The msa1000 is easily expanded. The msa1000 cabinet scales to 2.0 TB, using fourteen, 146 GB, 1" HP Universal hard drives. By simply adding additional StorageWorks 4200/4300 Enclosures (two enclosures max), the msa1000 scales to 6.0 TB, using forty-two, 146 GB, 1" HP Universal hard drives – all within 10U of rack space.
- **msa Hub 2/3** – The optional msa Hub 2/3, to be installed within the msa1000, offers 2 Gb performance. With two ports accessible by the user, the msa hub 2/3 is the ideal interconnect for low-cost 2-node clustering or simple attaching two servers. A second msa hub 2/3 can be installed for redundancy. This hub ships with two SFPs included.
- **msa SAN switch 2/8** – The optional msa SAN switch 2/8 can also 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, redundant controllers, fabric switches or hubs for simple, fast installation and maintenance. Fans and power supplies are also hot plug replaceable.
- **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.

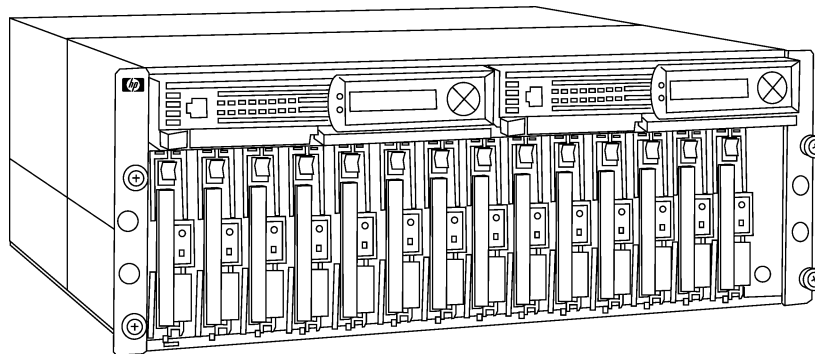
- **Fabric Support for 1 Gb and 2 Gb Infrastructure** – The msa1000 supports both 1 Gb and 2 Gb Fibre Channel fabrics to ensure that your investment in 1 Gb infrastructure is protected.
- **Optional embedded interconnects** – The msa SAN switch 2/8 or the msa hub 2/3 require no rack space as they are 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, is required for this connection and ships with the MSA1000. CLI commands are documented in the HP StorageWorks Modular SAN Array 1000 User Guide.
- **Management** – msa1000 events are logged in the OpenVMS or Tru64 UNIX error log and can be monitored with HP Analyze or other error log analysis tools.

Models

HP StorageWorks Modular SAN Array 1000 For Alpha Server Systems w/ OpenVMS and Tru64 UNIX	msa1000, with 256MB cache	201723-B22/ 3R-A4328-AA
	msa1000 Controller, with 256MB cache	218231-B22/ 3R-A4330-AA
	256 MB Cache 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
	msa HUB 2/8 (integrated)	286763-B21/ 3R-A3907-AA
	FCA2354 Host Adapter (Open VMS/Tru64 UNIX)	261329-B21/ DS-KGPSA-DA
	2 Gb SFP SW Transceiver Kit	221470-B21/ 3R-A2973-AA
	HP StorageWorks Enclosure Model 4314R	190209-001/ DS-SL13R-AA
	HP StorageWorks Dual bus Enclosure Model 4354R	190211-001/ DS-SL13R-BA



MSA1000 Components

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

Modular SAN 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 firmware upgrade code for Tru64 and OpenVMS and 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, 3-port hub, or msa SAN switch 2/8 and storage expansion enclosures.

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**
- Online 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.

- Fault Recovery**
- 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

msa Fibre Channel I/O Module Provides a single 2 Gb Fibre Channel connection per controller from the host side 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.

MSA1000 Components

msa Hub 2/3 The HP StorageWorks msa Hub 2/3 is a low-cost interconnect designed for clustering or low cost, high speed attachment of two servers to the msa1000, an entry-level storage area network (SAN) solution. The msa Hub 2/3 is a 3-port Fibre Channel Arbitrated Loop hub that is mounted on a blade that easily installs inside the msa1000 storage unit, saving valuable rack space. Two of these hubs may be installed for redundancy within the msa1000. The msa Hub 2/3 is not cascadable.

The hub presents the user with two SFP ports for simple direct attachment to two single or clustered servers without having to purchase an external interconnect device. It offers the most cost-effective solution for a user to enable a clustered server environment.

- **high-performance:** supports msa1000 with a 2 Gb interconnect capable of 200 MB/s speed
- **low cost:** supports the entry-level SAN array with the most cost effective option for 2-node clustering
- **compact:** imbeds in the msa1000, replacing the I/O module, saving valuable rack space
- **complete:** comes with two SW SFPs – no need for further investment

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. StorageWorks 2 Gb SFP SW Transceivers support distances up to 300 metres at 2 Gb and 500 metres 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 SAN Array 1000 User Guide for more information on the CLI commands

OS Support

Tru64 UNIX Support

- Tru64 UNIX v5.1A with PK4 and NHD6
- Tru64 UNIX v5.1B with IPK

OpenVMS Support

- OpenVMS v7.3-1 with TIMA (ECO) Kit
- OpenVMS v7.2-2 with TIMA (ECO) Kit
- OpenVMS v7.3 with TIMA (ECO) Kit

Service & Support, CarePaq 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 labour; 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.								
Service & Support, CarePaq and Warranty Information	<table><tr><td>Software Product Services</td><td><ul style="list-style-type: none">• 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 CarePaq 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.</td></tr><tr><td>Hardware Product Services</td><td><ul style="list-style-type: none">• 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</td></tr><tr><td>Installation and Startup Services</td><td><p>The Installation and Startup Service package provides installation and configuration of HP StorageWorks products. Major categories of work could include:</p><ul style="list-style-type: none">• 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</td></tr><tr><td>Warranty Upgrade Options</td><td><ul style="list-style-type: none">• 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</td></tr></table>	Software Product Services	<ul style="list-style-type: none">• 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 CarePaq 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	<ul style="list-style-type: none">• 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	<p>The Installation and Startup Service package provides installation and configuration of HP StorageWorks products. Major categories of work could include:</p> <ul style="list-style-type: none">• 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	Warranty Upgrade Options	<ul style="list-style-type: none">• 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
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Service & Support, CarePaq and Warranty Information

CarePaq Information	9x5, Next Business Day, On-Site Coverage, 3 years	FM-FCXHW-36
<i>Sample part numbers:</i>		103840-002
	9x5, 4-Hour Response, On-Site Coverage, 3 years	FM-FC4HR-36
		402165-002
	24x7, 4-Hour Response, On-Site Coverage, 3 years	FM-FC724-36
		402164-002
	9x5, Next Business Day, On-Site Coverage, 5 years	FM-FCXHW-60
		170183-002
	9x5, 4-Hour Response, On-Site Coverage, 5 years	FM-FC4HR-60
		170185-002
	24x7, 4-Hour Response, On-Site Coverage, 5 years	FM-FC724-60
		170187-002
	Hardware Installation	FM-FCINS-IN
		402162-002

- CarePaq is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage.
- CarePaq is not available for less than the product's warranty duration.
- CarePaq 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.
- CarePaq services are prepaid.

NOTE: For additional CarePaq (hardware & software) information, as well as orderable part numbers, please refer to the URL listed below:

English: <http://www.compaq.ca/English/productinfo/storage/storageworks.htm>

French: <http://www.compaq.ca/Francais/Produits/stockage/Storageworks.htm>

Configuration Information

STEP 1 – ORDER REQUIRED ITEMS

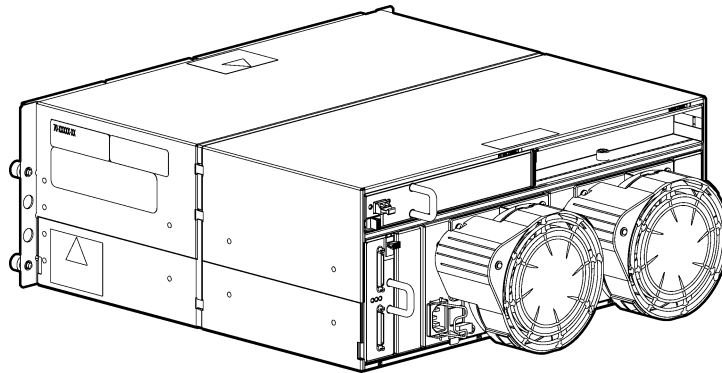
HP StorageWorks Modular SAN Array 1000

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
- (2) Power cables
- (2) 3-ft VHDCI to VHDCI SCSI cables

NOTE: Fibre Channel cables are ordered separately.

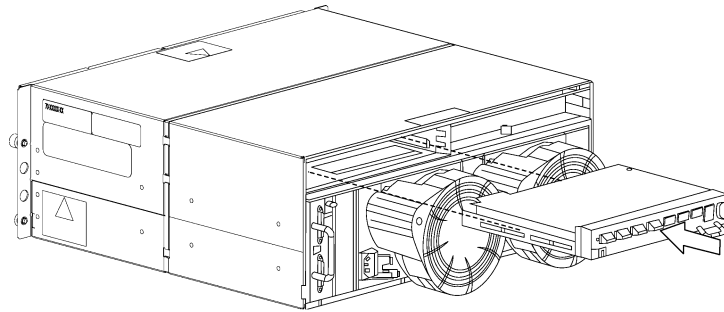


Configuration Information

STEP 2 – SELECT OPTIONAL NON-REDUNDANT MSA1000 SYSTEM OPTIONS

msa SAN Switch 2/8 (integrated) (Includes four 2Gb SFPs)	288247-B21
msa Hub 2/3 (integrated) (Includes two 2 Gb SFP transceivers)	286763-B21

NOTE: The msa Hub 2/3 has two external Fibre Channel ports, both of which already have 2 Gb transceivers installed. The msa SAN switch 2/8 has seven external ports, four of which have transceivers installed.

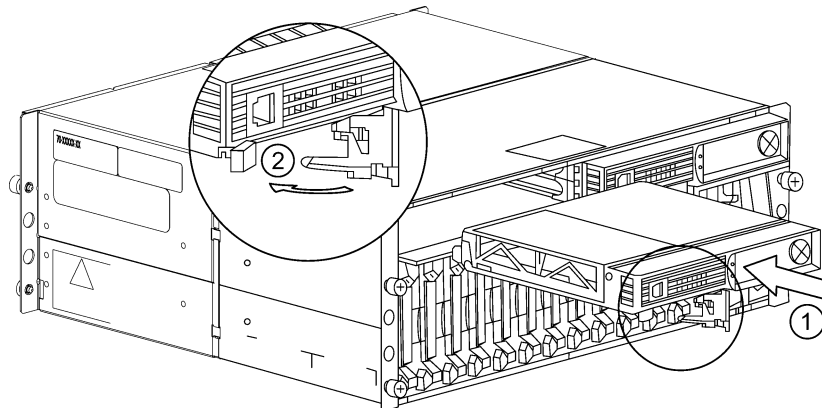


Configuration Information

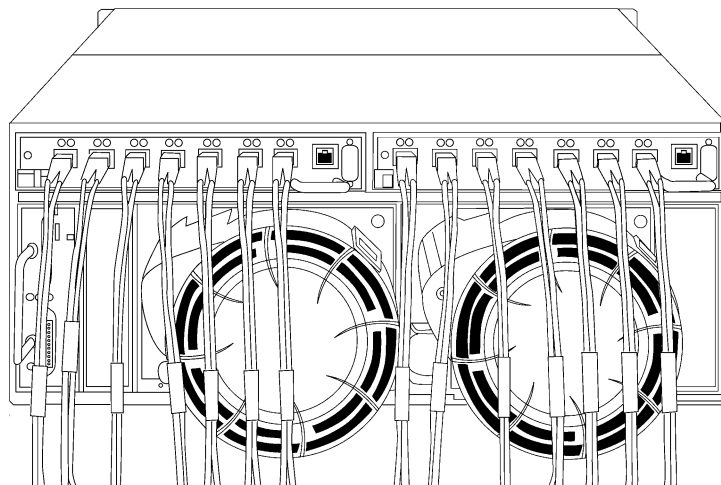
STEP 3 – CHOOSE REDUNDANT MSA1000 SYSTEM OPTIONS

Redundant Configuration	msa1000 Controller	218231-B22
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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 Hub 2/3 is not supported. When configuring the msa1000 for redundant controllers use either two msa Fibre Channel I/O Modules, two msa SAN switch 2/8s, or two msa Hub 2/3s.



msa Fibre Channel I/O Module (Includes 2 Gb SFP transceiver)	218960-B21
msa Hub 2/3 (integrated) (Includes two 2Gb SFP transceivers)	286763-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
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2 Gb Fibre Channel Fabric "Infrastructure" family of switches

NOTE: "Infrastructure" switches above are interoperable only with HP StorageWorks MSA SAN Switch 2/8, SAN Switch 2/8EL, 2/16, 2/32, core 2/64 products and all Power Pak models. They are also interoperable with designated discontinued 1 Gb SAN Switch models.

HP StorageWorks core 2/64 PowerPak	332178-B21
HP StorageWorks core 2/64	254508-B21
HP StorageWorks SAN Switch 2/32 PowerPak	333764-B21
HP StorageWorks SAN Switch 2/32	240603-B21
HP StorageWorks SAN Switch 2/16 PowerPak	322119-B21
HP StorageWorks SAN Switch 2/16	322118-B21
HP StorageWorks SAN Switch 2/16-EL	283056-B21
HP StorageWorks SAN Switch 2/8 PowerPak	322121-B21
HP StorageWorks SAN Switch 2/8-EL	322120-B21
HP StorageWorks MSA SAN Switch 2/8 (Includes four 2 Gb SFP transceivers)	288247-B21
Fabric Watch for 8 and 16 port switches	324504-B21
ISL Trunking kit for 8 and 16 port switches	324506-B21
Advanced Performance Monitor for 8 and 16 port switches	324507-B21
Quick Loop for 8 and 16 port switches	324508-B21
Remote Switch for 8 and 16 port switches	325891-B21
Extended Fabric for 8 and 16 port switches	324505-B21
HP StorageWorks PowerPak Bundle for 2 Gb Brocade Based 8 and 16 port Switches(Trunking, Perf Monitor, remote switch, fabric watch, extended fabric)	325892-B21
HP StorageWorks 2/8-EL Upgrade license	325888-B21
Optional Rack mount kit for SAN Switch 2/8-EL and SAN Switch 2/16	331148-B21
Remote Switch for HP StorageWorks 2/64	330883-B21
ISL trunking for HP StorageWorks 2/64	325887-B21
• Extended fabric for HP StorageWorks 2/64	• 325886-B21

2 Gb Fibre Channel Fabric Switches, "High Availability" family of switches

NOTE: "High Availability" switches above are interoperable only with HP StorageWorks Director 2/140, Director 2/64, Edge Switch 2/32, Edge Switch 2/24, and the discontinued Edge Switch 2/16 products.

HP StorageWorks Director 2/140 (64-ports active)	316094-B21
HP StorageWorks director 2/64	286809-B21
HP StorageWorks edge switch 2/32 (16 active ports)	286810-B21
8-FlexPort upgrade for edge 2/32	302660-B21
HP StorageWorks Edge switch 2/24 (8 ports active)	316095-B21
8-FlexPort upgrade for edge 2/24	316096--B21

2 Gb Fibre Channel Integrated Hub

MSA Hub 2/3 (integrated option, comes complete with two SFPs)	286763-B21
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Configuration Information

STEP 4 – CHOOSE SUPPORTED OPTIONS FOR 2 GB OR 1 GB INFRASTRUCTURE *(continued)*

2 Gb Fibre Channel HBAs	FCA2354 Host Adapter (Tru64 UNIX, OpenVMS)	261329-B21
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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

Fibre Channel Cables for 1 Gb Fabric Switches and Hub	Use 1 Gb Fibre Channel cables when connecting the msa Fibre Channel I/O Module and FCA2354 HBA(s) to 1 Gb fabric switches or hubs.	
	2 m LC-SC Multi-Mode Fibre Channel Cable	221691-B21
	5 m LC-SC Multi-Mode Fibre Channel Cable	221691-B22
	15 m LC-SC Multi-Mode Fibre Channel Cable	221691-B23
	30 m LC-SC Multi-Mode Fibre Channel Cable	221691-B26
	50 m LC-SC Multi-Mode Fibre Channel Cable	221691-B27

STEP 5 – CHOOSE HARD DRIVES & STORAGEWORKS ENCLOSURES

Hard Drives	36.4 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1")	286713-B22
	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
	18.2 GB Pluggable Ultra320 Universal Hard Drive, 15,000 rpm (1")	286775-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

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

NOTE: For complete compatibility information, refer to the HP SCSI Hard Drive Compatibility table located at: <http://www.hp.com/>.

NOTE: This Web site is available in English only.

Configuration Information

STEP 5 – CHOOSE HARD DRIVES & STORAGEWORKS ENCLOSURES *(continued)*

StorageWorks Enclosures	The msa1000 cabinet holds fourteen 1" Universal Drives. Add one StorageWorks Enclosure to increase capacity up to 28 drives. Add two HP StorageWorks Enclosures to increase capacity up to the maximum of 42 drives.	
	HP StorageWorks Enclosure Model 4314R (Maximum of two can be connected to the msa1000)	190209-001
	HP StorageWorks Enclosure Model 4354R (Maximum of one can be connected to the msa1000)	190211-001

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 Information

CONFIGURATION EXAMPLES

Two Node Redundant Cluster Solution

Quantity	Description	Part Number
1	HP StorageWorks Modular SAN Array 1000	201723-B22
1	msa1000 Controller	218231-B22
2	msa Hub 2/3	286763-B21
4	Host Adapter	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

Quantity	Description	Part Number
1	HP StorageWorks Modular SAN Array 1000	201723-B22
1	msa1000 Controller	218231-B22
2	256 MB Cache Modules for Controller (one additional for each controller)	254786-B21
2	msa SAN Switch 2/8 (Includes four 2Gb SFP transceivers)	288247-B21
8	Host Adapter (appropriate model for operating system)	
8	2 m LC-LC Multi-Mode Fibre Channel Cable	221692-B21
2	StorageWorks Enclosure Model 4314R	190209-001
42	146.8 GB Pluggable Ultra320 Universal Hard Drive, 10,000 rpm (1")	286716-B22

Technical Specifications

MODULAR SAN 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 (centre)	
	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 StorageWorks 4200/4300 Enclosures	
Temperature Range	Operating	50° to 95°F/10° to 35°C
	Shipping	-22° to 122°F/-30° to 50°C
NOTE: Derated 1°C per 1,000 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	6 A Max
	Input Power (max)	549 W*
Heat Dissipation (max)	1876 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>		
msa1000 Cabinet	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
	Weight	Net 55 to 85 lb/24.95 to 38.56 kg
Shipping Packaging	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 SAN ARRAY 1000 CONTROLLER

User Interface	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). Added cache size must match original and if a second controller is employed, it too must have equally configured cache. ECC protection, battery-backed, and removable Standard, starting 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

MODULAR SAN 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

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

Technical Specifications

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 fibre	
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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