

Installation Guide

HP StorageWorks 1500 Modular Smart Array

Product Version:

Controller firmware 5.xx or earlier, with active/passive support
Controller firmware 6.xx or later, with active/active support

Third Edition (May 2006)

Part Number: 355901-003

This document details procedures for installing an HP StorageWorks 1500 Modular Smart Array controller shelf (MSA1500) and its attached storage enclosures. This guide is a companion to the MSA1500 Configuration Overview poster.

Note: Two versions of firmware are available for the MSA1500: active/passive and active/active. For more information, see [Step 1: Review and confirm your plans](#) (in this guide) and the Compatibility Matrixes on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.



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Contents

About this Guide	7
Prerequisites	8
Related documentation	9
Document conventions	10
Text symbols	10
Equipment symbols	11
Rack stability	12
Getting help	13
HP installation and configuration assistance	13
HP technical support	14
HP storage web site	14
HP authorized reseller	14
1 Installation Procedures - All Deployments	15
Step 1: Review and confirm your plans	17
Determine which version MSA controller firmware to use	17
Complete the planning worksheet on the Configuration Overview poster	19
Go to the Internet for the most recent MSA and SAN information	20
Review MSA installation best practices	22
Plan your storage configuration	28
System and performance expectations	28
Striping methods	29
RAID levels	29
Hard drive sizes and types	30
Spare drives	31
Array sizing (capacity)	31
Step 2: Prepare your site	32
Provide adequate structural support for the floor	32
Provide adequate clearance space and ventilation	32
Provide adequate and redundant sources of power	32

Step 3: Install MSA option kits	34
Step 4: Rack the MSA and the storage enclosures	35
Rack installation best practices	35
Step 5: Install the hard drives	41
Step 6: Prepare your servers	42
Step 7: Install the HBA in your servers	43
Step 8: Prepare your switches	44
Step 9: Connect the cables	45
Cabling best practices	45
Connecting the SCSI cables	46
Recommended SCSI cable connections	46
Supported and unsupported SCSI connections	47
Connecting the MSA to SATA storage enclosures	48
Connecting the MSA to SCSI storage enclosures	49
Connecting the Fibre Channel cables	50
Connecting Fibre Channel cables in a single-path configuration	51
Connecting Fibre Channel cables in a multi-path configuration	52
Connecting the power cords	53
Step 10: Power on the devices	55
Verify the operating status of the MSA	56
View the LEDs on the MSA	56
Read the messages on the controller display panel	57
Verify the operating status of the storage enclosures	58
Verify the operating status of the Fibre Channel switches	58
Verify the operating status of the servers	58
Step 11: Configure your MSA	59
Obtain desired controller firmware and Support Software CD versions	59
Determine which storage configuration utility to use	61
About the MSA Command Line Interface	61
About the Array Configuration Utility	62
About the Array Configuration Utility - Command Line Interface	63
Configure the MSA	64
2 Configuration Procedures - Windows Environments	65
Prerequisites	65
Installing MSA-specific components on the servers	66
Updating MSA controller firmware (if necessary)	69
Configuring the storage	70

3	Configuration Procedures - Linux Environments	71
	Prerequisites	71
	Installing MSA-specific components on the servers	72
	Updating MSA controller firmware (if necessary)	75
	Configuring the storage	76
4	Configuration Procedures - HP-UX Environments	77
	Prerequisites	77
	Additional HP-UX support notes	78
	Installing the ACU-CLI on the servers (optional)	80
	Updating MSA controller firmware (if necessary)	81
	Configuring the storage	82
5	Configuration Procedures - OpenVMS Environments	83
	Prerequisites	83
	Obtaining World Wide Port Names	84
	Installing the current Fibre_SCSI patch on the servers	85
	Updating MSA controller firmware (if necessary)	86
	Configuring the storage	87
	Assigning ID Numbers to the Controllers and LUNs	88
6	Configuration Procedures - Tru64 UNIX Environments	89
	Prerequisites	89
	Updating MSA controller firmware (if necessary)	90
	Configuring the storage	91
A	Regulatory Notices	93
	Regulatory Compliance identification numbers	93
	Federal Communications Commission notice	93
	Modifications	93
	Cables	93
	Canadian notice (Avis Canadien)	94
	European Union notice	94
	Japanese notice	94
	Japanese power cord notice	95
	BSMI notice	95
	Laser compliance	95
	Battery replacement notice	96
	Disposal of waste equipment by users in private households in the European Union	97

B Electrostatic Discharge	99
Prevention methods	99
Grounding methods	100
C Worksheets	101
Index	115

About this Guide

This guide provides information about installing an MSA1500, whether into an existing or new SAN, and is organized as follows:

- Chapter 1: [Installation Procedures - All Deployments](#)
- Chapters 2-6: Configuration Procedures - for each Operating System

To use this guide, follow all instructions in Chapter 1, and then proceed to the chapter for your specific operating system for some additional setup and configuration tasks.

Note:

- If a supplier is installing or configuring your MSA1500, provide them with this guide and verify that they complete the information tables in [“Worksheets”](#) on page 101.
 - For information about having HP install and configure your MSA1500, see [“Getting help”](#) on page 13.
 - Before configuring your MSA1500, review the information in [“Step 1: Review and confirm your plans”](#) on page 17.
-

Prerequisites

- Determine who will install and configure your MSA.
A moderate knowledge level about SANs and their components is required to install this storage array system.
If you are not familiar with installing and configuring storage array systems in a SAN, HP can install your MSA for you. For more information, see “[Getting help](#)” on page 13.
- Complete the Planning Worksheet on the Configuration Overview poster.
The Configuration Overview poster is a companion to this Installation Guide and should be used to verify that you have all of the necessary and supported components for successfully installing your MSA in your operating system environment.
- Become familiar with and periodically review content on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.
 - Go to the **Technical documents** page to locate and read the latest documentation, including *Release Notes* (late-breaking and supplemental information about the MSA), and the *Compatibility Matrix* (important reference information and specifications).
 - Go to the **Software, Firmware & Drivers** page to learn about recent firmware enhancements and support options.

Related documentation

The following (and other) MSA-related documents are available on the Documentation CD (included in the shipping carton with the MSA) or on the Technical documents page of the MSA1500 web site:

<http://www.hp.com/go/msa1500cs>.

- *HP StorageWorks MSA1500 Configuration Overview (printed)*
- *HP StorageWorks Modular Smart Array 1500 Maintenance and Service Guide*
- *HP StorageWorks Modular Smart Array 1000/1500 Command Line Interface User Guide*
- *HP StorageWorks Modular Smart Array 1000 Controller Reference Guide*
- *HP Array Configuration Utility User Guide*
- *HP Modular Smart Array 1500 Compatibility Matrix*
- HP StorageWorks Modular Smart Array 1500 Application Notes, including:
 - Migrating to Active/Active array controllers in Windows Environments
 - Migrating to Active/Active array controllers in Linux Environments
 - Migrating to Active/Active array controllers in HP-UX Environments

Additional related documentation can be found on the following web sites:

- HP SAN Design Guide: <http://www.hp.com/go/san>

Document conventions

The document conventions included in [Table 1](#) apply in most cases.

Table 1: Document Conventions

Element	Convention
Cross-reference links	Figure 1
Key and field names, menu items, buttons, and dialog box titles	Bold
File names, application names, and text emphasis	<i>Italics</i>
User input, command and directory names, and system responses (output and messages)	Monospace font COMMAND NAMES are uppercase monospace font unless they are case sensitive
Variables	<monospace, italic font>
Web Site addresses	Underlined sans serif font text: http://www.hp.com

Text symbols

The following symbols may be found in the text of this guide. They have the following meanings:



WARNING: Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.



Caution: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

Note: Text set off in this manner presents commentary, sidelights, or interesting points of information.

Equipment symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings:



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

WARNING: To reduce the risk of personal injury from electrical shock hazards, do not open this enclosure.



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

WARNING: To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

WARNING: To reduce the risk of personal injury from a hot component, allow the surface to cool before touching.



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

WARNING: To reduce the risk of personal injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack stability

Rack stability protects personnel and equipment.



WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - In single rack installations, the stabilizing feet are attached to the rack.
 - In multiple rack installations, the racks are coupled.
 - Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.
-

Getting help

If you have questions after reading this guide, contact an HP authorized service provider or access our web site: <http://www.hp.com>.

Note: HP call centers use product and serial numbers to validate warranty entitlement. Most HP products can provide product number, serial number and firmware revision electronically through the use of supplied management or diagnostic utilities, eliminating the need to physically inspect or remove products from installed enclosures. You may be directed by HP to run these utilities to gather required entitlement information.

HP installation and configuration assistance

A moderate level of SAN-related knowledge is required to successfully install this product. If you are not familiar with installing and configuring storage array systems in a SAN, HP can install your MSA for you.

For more information, access our Services web site: <http://www.hp.com/services>.

Depending on your needs, different levels of assistance are available.

For example, the service package listed under **Infrastructure Services>Network Storage Services>HP StorageWorks Disk Arrays** includes:

- Physical installation of the MSA
- Virtual disk design and configuration of the MSA
- Service planning
- Service deployment
- Installation Verification Testing (IVT)
- Customer orientation

HP technical support

Telephone numbers for worldwide technical support are listed on the following HP web site: <http://www.hp.com/support/>. From this web site, select the country of origin.

Note: For continuous quality improvement, calls may be recorded or monitored.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers, model names, and model numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

HP storage web site

The HP storage web site has the latest information about this and other HP storage products: <http://www.hp.com/country/us/eng/prodserve/storage.html>. From this web site, select the appropriate product or solution.

HP authorized reseller

For the name of your nearest HP authorized reseller, refer to the HP web site for locations and telephone numbers: <http://www.hp.com>.

Installation Procedures - All Deployments



Installing and configuring your MSA includes the following steps, each of which is illustrated in [Figure 1](#) and discussed in this chapter:

- [Step 1: Review and confirm your plans](#), page 17
- [Step 2: Prepare your site](#), page 32
- [Step 3: Install MSA option kits](#), page 34
- [Step 4: Rack the MSA and the storage enclosures](#), page 35
- [Step 5: Install the hard drives](#), page 41
- [Step 6: Prepare your servers](#), page 42
- [Step 7: Install the HBA in your servers](#), page 43
- [Step 8: Prepare your switches](#), page 44
- [Step 9: Connect the cables](#), page 45
- [Step 10: Power on the devices](#), page 55
- [Step 11: Configure your MSA](#), page 59

Note:

- HP recommends installing and configuring your MSA in the sequence of steps listed in this guide. Specific dependencies exist, and if you deviate from this sequence, you may have to uninstall and then reinstall the device.
 - If a supplier is installing or configuring the MSA for you, provide them with this guide and verify that they complete the information in [“Worksheets”](#) on page 101.
 - For information about HP installing and configuring your MSA, see [“Getting help”](#) on page 13.
-

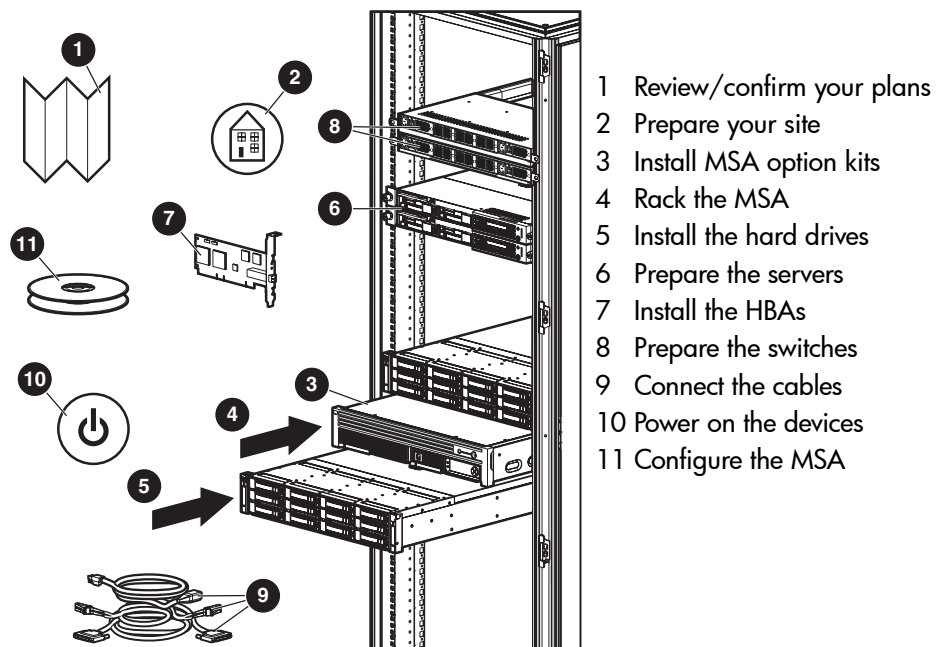
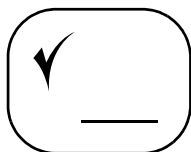


Figure 1: Overview of MSA installation procedures

Step 1: Review and confirm your plans



Before installing the MSA, HP recommends thorough research and study to develop the best installation and configuration plan for your environment. Proper planning ensures a successful installation.

- [Determine which version MSA controller firmware to use](#)
- [Complete the planning worksheet on the Configuration Overview poster](#)
- [Go to the Internet for the most recent MSA and SAN information](#)
- [Review MSA installation best practices](#)
- [Plan your storage configuration](#)

Determine which version MSA controller firmware to use

Multiple versions of MSA controller firmware are available; these versions use different processing methods, support different operating systems, and have different hardware compatibility requirements.

When determining which MSA controller firmware version (and associated Support Software CD) to use, review the requirements and information in the Compatibility Matrix documents, release notes, and other MSA announcements.

The following environmental variables affect your decision:

- Variety of operating systems in the SAN
- Variety of storage devices in the SAN
- Number of controllers in this MSA (single or dual)
- Failover software tool to use (dual-control configurations)

Table 2 shows, by controller configuration, the supported operating systems and available MSA controller firmware and support software CD versions.

Table 2: MSA controller firmware comparison

	Supported operating systems	Controller firmware version	Support Software CD version
Single controller active/passive (Shipping configuration)	<ul style="list-style-type: none"> ■ Windows ■ Linux ■ NetWare ■ HP-UX ■ SCO 	4.xx or 5.xx	7.55 or later
Dual controllers active/passive	<ul style="list-style-type: none"> ■ Windows ■ Linux ■ NetWare 	4.xx or 5.xx	7.55 or later
Dual controllers active/active (Upgraded configuration)	<ul style="list-style-type: none"> ■ Windows ■ Linux ■ HP-UX ■ SCO ■ OpenVMS ■ Tru64 UNIX 	6.xx or later	7.57 or later

Note: The MSA ships with a single controller and active/passive firmware pre-installed. If you plan to install an additional MSA controller and are interested in upgrading to active/active, consider the complexity of your SAN, including the variety of device types, operating systems, failover tools, and access requirements.

Note: Confirm the latest list of supported operating systems, servers, Host Bus Adapters, other hardware and software components and any homogeneous/heterogeneous limitations for the different MSA1500 firmware versions. See the two versions (active/active and active/passive) of the MSA1500 Compatibility Matrix, available on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Complete the planning worksheet on the Configuration Overview poster

The printed Configuration Overview poster, included in the shipping carton, is a companion to this Installation Guide, and should be completed before installing your MSA.

Use the poster to:

- Gather all of the components necessary for installing your MSA
- Verify that the components you plan to use are supported for use with the MSA and your operating system environment
- Record important information about the components that you plan to use
- Learn about this installation process

Record system information in the worksheets in Appendix C: “[Worksheets](#)” on page 101 or on the poster.

Information in these worksheets is required for multi-pathing, future configuration changes, and troubleshooting purposes.

Note: If a supplier is installing the MSA for you, be sure that they complete these worksheets.

Go to the Internet for the most recent MSA and SAN information

HP recommends going to the following web sites to learn more about MSA devices and Storage Area Networks (SANs). Information found at these web sites may offer suggestions, alternatives, or changes to your installation plans.

Table 3: MSA1500 and SAN-related web sites

Web Site	Content
<p>MSA1500 www.hp.com/go/msa1500cs</p>	<p>Latest MSA1500 information, including:</p> <ul style="list-style-type: none"> ■ Release Notes - latest MSA1500 information ■ Compatibility Matrix - supported components ■ QuickSpecs - technical information ■ Link to the MSA1500-specific Support web site
<p>Support http://www.hp.com/support</p>	<p>Latest support information about all HP products, including the MSA1500:</p> <ul style="list-style-type: none"> ■ Available downloads for firmware, software, and drivers ■ Troubleshooting information, including all outstanding customer advisories
<p>SAN Infrastructure www.hp.com/go/san</p>	<p>HP switch and HBA information</p> <p>Locate, print, and read the SAN Design Reference Guide, which details SAN design considerations and rules, common topologies, security, and best practices.</p>
<p>HP Systems Insight Manager www.hp.com/go/hpsim</p>	<p>System management information</p> <p>Systems Insight Manager (SIM) is a client/server application used to remotely manage HP hardware in a network environment. SIM reports hardware fault conditions (failure and pre-failure) and collects data for reporting and graphing.</p>
<p>High Availability h18000.www1.hp.com/solutions/enterprise/highavailability/index.html</p>	<p>Clustering information</p> <p>In addition to specific information about clustering, this web site contains a variety of planning and best practices documents that are applicable to most server and storage sub-systems.</p>
<p>Secure Path www.hp.com/go/securepath</p>	<p>Multi-pathing software for Windows, Linux, and NetWare (active/passive environments only)</p> <p>A unique version of Secure Path is provided for each supported operating system. Versions are also available for MSA1000-MSA1500-only environments. If your SAN environment includes only MSA controllers, use the appropriate "Workgroup Edition" of Secure Path.</p>

Table 3: MSA1500 and SAN-related web sites

Web Site	Content
<p>HP MPIO Full Featured Failover and Manager http://h18006.www1.hp.com/products/sanworks/multipathoptions/index.html</p>	<p>Multi-pathing software for Windows (active/active environments only)</p> <p>Used in multi-pathing environments running active/active array controller firmware, HP MPIO Full Featured Failover and Manager manages, monitors, and maintains data paths between server and storage. If a path failure is detected, traffic fails over to an alternative path.</p> <p>Other multipath software already present on the host may not be compatible with HP Full Featured MPIO. See the MSA1500 Compatibility Matrix for details.</p> <p>MPIO is provided on the MSA Support Software CD.</p>
<p>HP MPIO Basic Failover http://h18006.www1.hp.com/products/sanworks/multipathoptions/index.html</p>	<p>Multi-pathing tool for Windows (active/passive environments only)</p> <p>Used in multi-pathing environments running <i>active/passive</i> array controller firmware, HP MPIO Basic Failover provides basic path failover and path recovery.</p> <p>Other multipath software already present on the host may not be compatible with HP Basic MPIO. See the MSA1500 Compatibility Matrix for details.</p>
<p>QLogic Driver for HBA Control and Multipathing http://h18006.www1.hp.com/products/sanworks/multipathoptions/index.html</p>	<p>Multi-pathing tool for Linux (active/passive and active/active environments)</p> <p>Used in multi-pathing environments running either active/passive or active/active firmware, QLogic Driver for HBA Control and Multipathing provides multipathing support for Linux environments.</p> <p>This and other HBA drivers are provided on the MSA Support Software CD.</p>
<p>Array Configuration Utility (ACU) Array Configuration Utility - Command Line Interface (ACU-CLI) h18006.www1.hp.com/products/servers/proliantstorage/software-management/acumatrix/index.html</p>	<p>Storage configuration software</p> <p>The Array Configuration Utility (ACU) is a browser-based tool used to configure an array controller and its storage.</p> <p>The Array Configuration Utility-Command Line Interface (ACU-CLI) is a command line interface used to configure an array controller and its storage. ACU-CLI is primarily used in HP-UX environments.</p> <p>The ACU and the ACU-CLI are provided on the MSA Support Software CD.</p>

Review MSA installation best practices

- Before installing your MSA (and periodically afterwards), go to the MSA1500 web site to confirm your installation plans and read current information about the device: <http://www.hp.com/go/msa1500cs>.
- Use the Configuration Overview poster to help gather all of the items required for your installation.
- Record information about your system in the provided worksheets. System information is needed when configuring the storage, entering connection information, setting up multi-pathing, and for future configuration changes and reference purposes. Use the “Configuration Planning Worksheet” on the Configuration Overview poster or “Worksheets” on page 101 of this guide.
- Install your MSA in the sequence listed in this guide. Several installation and configuration steps include dependencies and if you deviate from the listed sequence, you may have to uninstall and then reinstall your MSA. Difficulties that you encounter by not following the directions in this guide may result in lost time and lost revenue while troubleshooting the issues. For example, in a Windows environment, when you power up the server after installing the HBA for the MSA, Windows displays a “New Hardware Found” message and prompts to install an HBA driver. You must cancel out of this window or Windows will install an HBA driver that is unsupported for use with the MSA.
- When installing or updating HBA drivers, always use the drivers and installation scripts provided on the MSA Support Software CD and the MSA1500 web site. The MSA will not operate as intended if you update your HBA driver manually or use drivers obtained from the HBA manufacturer.
- Follow industry-standard practices when handling hard drives. Internal storage media can be damaged when drives are shaken, dropped, or roughly placed on a work surface. When removing a drive, press the release button, and then pull the drive only slightly out of the enclosure. Then, to allow time for the internal disk to stop rotating, wait approximately 10 seconds before completely removing the drive from the enclosure.

- Consider redundancies of power, storage, and data paths.
 - To provide redundant power, plug the two power supplies on the MSA into separate Uninterruptable Power Supplies (UPS) on separate sources of power. If you have only one UPS, maintain separate power paths by plugging one MSA power supply to the UPS on one power source and plug the other MSA power supply to a separate power source.
 - To provide redundant storage, configure your Logical Units (LUNs) using fault-tolerant Redundant Array of Independent Disks (RAID) levels and striping methods. Stripe the LUNs vertically across separate storage enclosures on different SCSI buses, including drives from each bus.
 - To provide redundant data paths, you must include two separate and isolated Fibre Channel fabrics and the associated hardware and software components in the configuration. You must include two MSA controllers, two Fibre Channel interconnect devices (switches/fabrics), and a minimum of two HBAs per server. In addition, multipathing software must be installed on each server with access to the MSA.
- If you are connecting the MSA to existing servers, you may need to re-install some of your management software after installing the MSA.
- If your environment includes multiple servers, HP recommends designating one of the servers as a management server, to centralize management tasks. It is on this server that you install management software such as the ACU, and it is from this server that you perform SAN management tasks.

Note: In dual-controller configurations (both active/active and active/passive), you must install some management software (such as the ACU and multipathing software), on each server with access to the MSA. For information about supported multipathing tools for your operating system environment, see the active/active or active/passive version of the Compatibility Matrix, available on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

- When assigning system names and aliases, use only the following characters:
 - Uppercase alpha characters (A-Z)
 - Lowercase alpha characters (a-z)
 - Numeric characters (0-9)
 - Special characters (! # + () ' ; , . and space)

- When planning and configuring the LUNs:
 - In direct connect environments or any environment using the ACU-CLI, a minimum of one storage LUN on the MSA must be configured and set to the appropriate host mode before connecting the MSA to the server.
 - When determining how many hard drives to include in an array and how many LUNs to create from that array, consider the I/O load of the data that will be stored on those LUNs, and, also consider that rebuild and expansion times increase with the number of drives.
 - Optimize performance and redundancy by striping the drives in the array across separate storage enclosures on different SCSI buses, especially in mirrored environments using RAID 1 or RAID 1+0.
 - In general, striping an array across many hard drives increases the total throughput on that array and delivers better I/O performance, but there is a performance trade-off when an array is divided into multiple LUNs. Too many LUNs on the same group of hard drives causes more drive seeking and a loss of throughput.
 - Customize the RAID level and striping method to the type of data that will be stored on the LUN.

Note: Depending on the number of drives included in an array, the ACU may suggest RAID 6 (ADG) as the default RAID level, which offers a high level of fault tolerance and usable disk capacity, but at a significant cost to I/O performance. For comparable fault tolerance but higher performance, consider using RAID 1+0 when fault tolerance is desired and performance is more important than usable capacity. Reserve RAID 6 for situations when fault tolerance is desired, but usable capacity is more important than performance.

- Set the ratio of read cache to write cache to prioritize writing in RAID 1, RAID 1+0, RAID 5, and RAID 6 (ADG) configurations to improve non-random write performance.
- Set the controller rebuild priority to medium or high to minimize exposure during a drive rebuild. During a drive rebuild, limit I/O activity from the attached servers.

- After configuring the LUNs, remember to:
 - Verify that all HBA connections to the MSA are recognized, *including both paths in a multipath configuration*. Each time the MSA is power-cycled, all *active* connections to the MSA are automatically detected and identified by their World Wide Port Name (WWPN). As needed, manually add the additional or *standby* connections.
 - Identify the operating system of each HBA connection to the MSA by setting the profile (also called Host Mode) of each connection. For example, on Windows systems set the profile to *Windows*.
 - Limit access to the LUNs to prevent unintended or unauthorized access. Although not required, HP strongly recommends this security measure. These settings are especially important in heterogeneous environments to prevent servers running different operating systems from accessing the same LUN. For each HBA connection, indicate the LUNs that it can access. In the ACU, enter Selective Storage Presentation (SSP) settings and, in the CLI, build Access Control Lists (ACL).
 - In active/active multipath configurations, distribute ownership of the LUNs between the two MSA controllers. Choose one of the following:
 - Automatic load balancing (Default)—MSA firmware initially assigns ownership of all LUNs to one of the two MSA controllers, and then automatically re-assigns LUN ownership evenly between the controllers based on I/O loads of the LUNs.
 - Manual load balancing—Through the ACU or the CLI, indicate the preferred path (controller ownership) for each LUN. This method is recommended for environments that are load balancing from the host.
 - In active/active multipath configurations, HP recommends that Fibre Channel HBA load balancing from the host (selectable in Windows and Linux environments), be turned Off for the MSA, because it can reduce performance.

- Schedule physical configuration changes during periods of low or no activity. If the system is performing rebuilds, RAID migrations, array expansions, logical disk extensions, or experiencing heavy I/O, avoid physical changes such as adding or replacing disk drives, or hot-plugging a controller or any other component. Hot adding or replacing a controller while under heavy I/O may cause a momentary pause, performance decrease, or loss of access to the MSA while the new controller is booting up. When the controller completes the start-up process, full functionality is restored.
- When servicing the controller in a single-controller MSA, do the following:
 - a. Ensure that a known, good backup is available.
 - b. Schedule a maintenance window.
 - c. From the servers, stop all access to the MSA.
 - d. Power off the MSA and disconnect the power cords.
 - e. Remove the controller for servicing or replacement.

Note: After completing the service and re-applying power to the MSA, if necessary, restart the server to rediscover the connection to the MSA controller.

For more information, see the *HP StorageWorks 1500 Modular Smart Array Maintenance and Service Guide*, available on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

- When servicing one (or both) controllers in a dual-controller MSA, do the following:

If *one* of the two controllers is marked as *failed*, remove the failed controller for servicing or replacement at any time.

If *both* controllers are operational and *both* need servicing, schedule a maintenance window and perform the service as for a single-controller configuration.

If *both* controllers are operational and *one* needs servicing, do the following to disable and then service the controller:

Note: The MSA operates in a non-redundant mode during this procedure.

- a. Access a supported management utility for the MSA.
- b. In the utility, disable the controller to be removed.
For details, see the utility online help or MSA user documentation.
- c. Wait for array controller disabled to display on the controller LCD panel.
- d. Remove the disabled controller for servicing or replacement.



Caution: If an operational controller is removed without first being disabled, the active controller might halt. To clear this fault condition, you must power-cycle the MSA.

For more information, see the *HP StorageWorks 1500 Modular Smart Array Maintenance and Service Guide*, available on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

- Periodically check the MSA web site for updates. HP may place new versions of MSA controller firmware (or other support items) on the Web. Updates include fixes to known issues, support for new features, and enhancements of existing features. For more information, see the *HP StorageWorks 1000/1500 Modular Smart Array firmware updating guide*, available on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Note: After updating MSA controller firmware, be sure to check the status of the MSA for unexpected issues. Verify the status of the assigned connections, profile types, redundancy settings, and storage configuration.

Plan your storage configuration

Proper planning of the system storage and its subsequent performance is critical to a successful deployment of your MSA. Improper planning or implementation can result in wasted storage space, degraded performance, or inability to expand the system to meet growing storage needs.

Considerations include:

- [System and performance expectations](#)
- [Striping methods](#)
- [RAID levels](#)
- [Hard drive sizes and types](#)
- [Spare drives](#)
- [Array sizing \(capacity\)](#)

System and performance expectations

To help you determine the best way to configure your storage, you must first rank the following three storage characteristics in order of importance:

- Fault tolerance (high availability)
- I/O performance
- Storage efficiency

With your priorities established, you can determine which striping method and RAID level to use.

As highlighted in the following sections on [Striping methods](#) and [RAID levels](#), some configuration methods offer greater fault tolerance, while other configuration methods offer better I/O performance or storage efficiency.

Striping methods

A storage array combines the capacity of several physical hard drives into one virtual unit called an array. These arrays are then presented to the operating system as a single disk device. The physical layout of an array can be one of two configurations:

- Vertical striping—Offers ultimate fault tolerance and performance, but at the price of storage efficiency.
- Horizontal striping—Allows for the creation of large arrays and efficient use of storage capacity, but at the price of I/O performance and less fault tolerance.

In a vertical configuration, an array uses hard drives from separate storage enclosures and different SCSI buses. In a horizontal configuration, the array uses multiple drives contained within the same storage enclosure.

RAID levels

In conjunction with the striping method, the assigned RAID level also determines the fault-tolerance, I/O performance, and storage efficiency of the LUN.

See [Table 4](#) on page 30 for a comparison list of the different RAID levels.

When selecting a RAID level for a LUN, consider the type of data that will be stored on the array. For example:

- For transitional data you may want to use RAID 0, which provides no fault tolerance, but provides rapid storage and access of large amounts of data.
- For critical data use a fault-tolerant RAID level, such as RAID 1, RAID 1+0, RAID 5, or RAID 6. Choose the RAID level that offers the desired combination of fault-tolerance, I/O performance, and storage efficiency.

Depending on the assigned RAID level, one or more drives within a LUN can fail without bringing the drive sub-system down.

Table 4: RAID level comparison

RAID Level	Alternative Name	I/O Performance	Fault Tolerance	Storage Efficiency
RAID 0	Data striping	Highest	None	Highest
RAID 1 RAID 1+0	Drive mirroring Data striping plus drive mirroring	High *	Highest *	Low
RAID 5	Data striping, with one set of distributed parity data	Medium	Medium	High
RAID 6	Data striping, with two sets of distributed parity data	Low	High	Medium
* Drives in the array need to be striped across separate enclosures on different SCSI buses.				

Note: For detailed information about the different RAID levels, refer to the *HP Array Configuration Utility User Guide*. This guide is available on the Web and the Documentation CD.

Hard drive sizes and types

Hard drives in each enclosure and included in the same array should be the same size and type. When drive sizes and types are mixed within a storage enclosure, the usable capacity and the processing ability of the entire storage sub-system is affected.

When hard drives of different types or sizes are included in the same enclosure, the processing characteristics of the entire enclosure are reduced to that of the slowest and smallest drive.

When hard drives of different sizes are included in a LUN, the LUN defaults to the smallest individual drive size and capacity in the larger drives is unused.

Spare drives

HP recommends including spare drives in your LUNs.

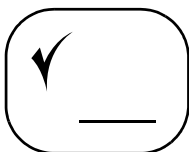
Spares are hard drives that are not active members of any particular LUN, but have been configured to be used in the event that a drive in one of the LUNs should fail. If a spare is present and a physical hard drive fails, the spare automatically replaces the failed drive as a member of the LUN and the process of rebuilding the information onto the spare automatically begins. The system uses the mirrored or parity information from the other member drives to reconstruct the data onto the spare.

Array sizing (capacity)

When planning for optimal file serving performance, you must determine the number of hard drives necessary to maintain an optimum performance level.

As a general rule, the greater the number of drives that are included in an array, the greater the performance level that can be achieved. However, the performance considerations are offset by fault tolerance considerations — the greater the number of drives in an array, the higher the probability of one or more failures in that array.

Step 2: Prepare your site



To ensure continuous, safe, and reliable operation of your equipment, place your system in an approved environment. You must provide adequate physical space, ventilation, and power.

Note: Consider using the HP Enterprise Configurator (eCO) to help you plan and configure racks and rack-mountable devices. The eCO is available on the HP web site: <http://h30099.www3.hp.com/configurator>.

In addition to the following discussion, see [Table 5, “MSA1500 specifications”](#) on page 33 for a detailed list of site requirements.

Provide adequate structural support for the floor

Calculate the total weight of your equipment and verify that your site can support the weight.

Provide adequate clearance space and ventilation

Be sure to provide adequate clearance around the front and back of the racks. Provide at least 25 inches (63.5 cm) in the front of the rack to allow the doors to open fully and provide at least 30 inches (76.2 cm) in the rear of the rack to allow for servicing and airflow.

If there are unused spaces in your rack, attach blanking panels across those empty spaces, to force the airflow through the components instead of through the open spaces.

Provide adequate and redundant sources of power

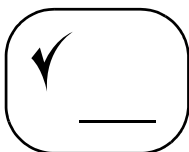
Make sure that you have two high-line power feeds installed near your computer. These two power sources usually come from the same external power grid, but occasionally may originate from different grids or even different sources entirely.

For protection against a power-source failure, obtain and include in your installation two UPS.

Table 5: MSA1500 specifications

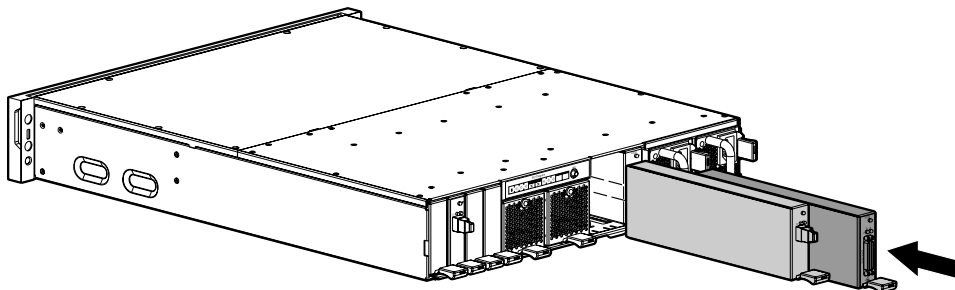
Parameter	Value
Dimensions: Height Width Depth	3.46 in (8.79 cm) 24.0 in (60.96 cm) 17.64 in (44.81 cm)
Weight Shipping configuration	41.6 lb (18.9 kg)
Input Power: Rated Input Voltage Rated Input Frequency Maximum Rated Input Current Maximum Input Power	100 to 240 VAC 47-63 Hz 1.3 A 160 W*
Heat Dissipation (max)	2187 Btu/hr*
Temperature Ranges: Operating temperature Shipping temperature	50° F to 95° F (10° C to 35° C) [derated 1.8° F (1° C) per 1000 ft (304.8 m) of elevation to 10,000 ft (3048 m)] -22° F to 122° F (-30° C to 50° C)
Relative Humidity (non-condensing): Operating Non-operating	10% to 90% up to 95%
Maximum Wet bulb Temperatures: Long term storage Short term storage	84.2° F (29° C) 86° F (30° C)
*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 varies depending on the equipment configuration.	

Step 3: Install MSA option kits



If your plans include adding any of the available option kits for the MSA, install them now. It is easier to install these options before racking the system.

Available option kits include: additional controller cache, additional SCSI I/O module, additional MSA controller, and additional Fibre Channel I/O module.



Note: Remove blanking panels only for the options being installed. For proper airflow and cooling, a blanking panel or component must be installed in the MSA chassis.

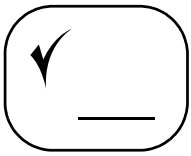
Note: When installing an additional MSA controller, you must also obtain and install an additional Fibre Channel I/O module. Multi-path environments must include separate and complete Fibre Channel fabrics and the associated hardware and software components, including two controllers, two Fibre Channel I/O modules, two Fibre Channel switches, and two HBAs in each server.

Note: When installing additional SCSI I/O modules, HP recommends populating the SCSI I/O module bays from right-to-left, so that the attached storage enclosures are added in pre-assigned box-number order. See [“Recommended SCSI cable connections”](#) on page 46 for more information.

For information about installing the options, refer to the instructions that came with the option kit.

Go to [Table 11: “MSA1500 Information”](#) on page 102 to record information about your option kits.

Step 4: Rack the MSA and the storage enclosures



The MSA and its supported storage enclosures can be installed into most standard server racks. To verify that the rack and the storage enclosures you plan to use are supported for use with the MSA and its storage enclosures, read the *Compatibility Matrix*, located on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.



Caution: Install hard drives in the enclosures only after securing the enclosures in the rack:

- An enclosure populated with hard drives is too heavy to lift safely.
- Movement of an enclosure during installation might damage the internal storage media of installed hard drives.

Go to **Table 11: “MSA1500 Information”** on page 102 to record information about your storage enclosures.

Rack installation best practices

In addition to industry-standard recommendations, consider the following:

- Locate the heaviest items, such as uninterruptable power supplies (UPS) and additional storage enclosures near the bottom of the rack.
- To accommodate using the shortest possible SCSI cables between the MSA and the storage enclosures, rack some of the storage enclosures above the MSA and some of the storage enclosures below the MSA.
- Install similar components next to each other in the rack. Because storage enclosures, switches, and servers are of differing depths, to accommodate working behind the rack, if you have more than one of a device, mount those devices adjacent to one another.



WARNING: To reduce the risk of personal injury or damage to the equipment, at least two people are required to lift the storage system during removal or installation, if the weight, as assembled for shipping, exceeds 22.7 kg (50 lb). If the system is being loaded into the rack above chest level, a third person **MUST** assist with aligning the system with the rails while the other two people support the weight of the system.



Caution: To prevent damage and to ease insertion of the device into the rack, support the weight of the device and keep it level when sliding it into the rack.

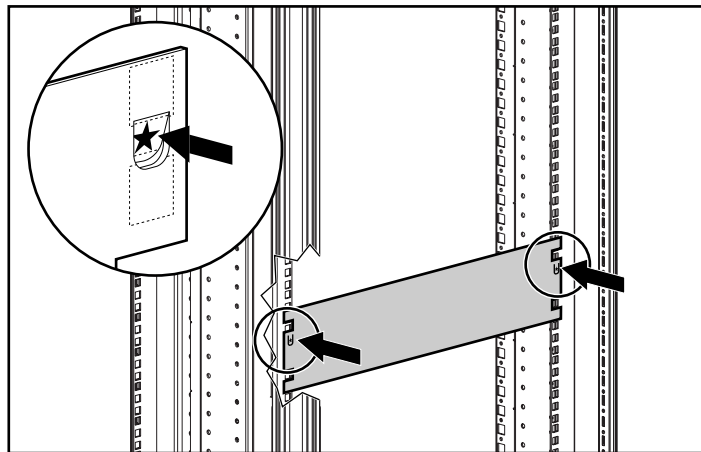


WARNING: To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks on the rack are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - The stabilizing feet are attached to the rack if it is a single-rack installation.
 - The racks are coupled together in multiple-rack installations.
 - Only one component in a rack is extended at a time. A rack may become unstable if more than one component is extended.
-

Use the following instructions to install the MSA and its storage enclosures:

1. Use the provided rack template as a guide to indicate where to place the rails for the component:
 - a. With the front of the template and the rack facing you, align the lower edge of the template with the bottom of the rack (or the top of the previous rack component.)
 - b. After verifying that the template is level, push the template tabs into the rack holes to hold the template in place.



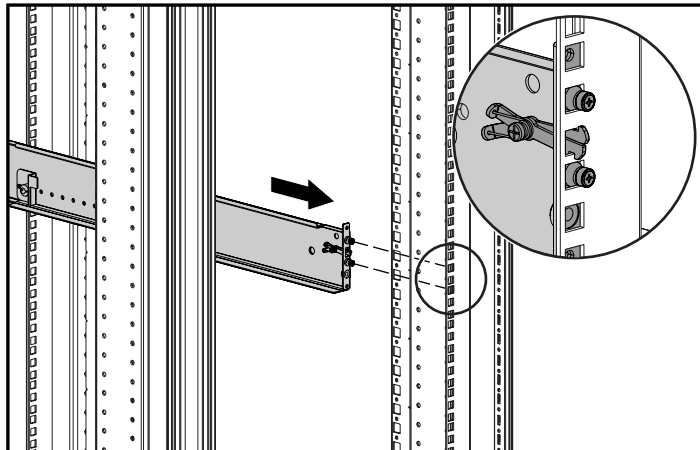
- c. Use a pencil to mark the required location of the scissor-like locking latches on the rails, as indicated by the template.
 - d. Repeat these steps to mark the back of the rack, using the information on the back of the template as a guide.
 2. If the holes in the rack uprights are round instead of square, remove the standard pins from the rails and replace them with the round-hole pins provided with the rail kit.



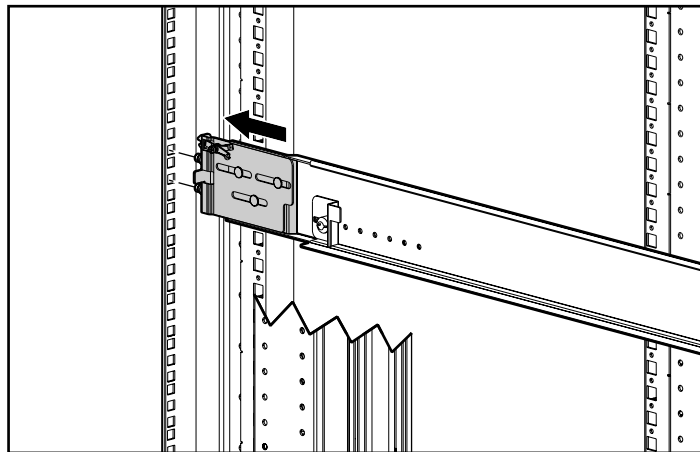
WARNING: The pins in the rails are load-bearing. Do not remove the standard pins except to replace them with the pins for round-hole racks.

3. Install the rails in the rack:
 - a. Identify the left (L) and right (R) rack rails by markings stamped into the rails.
 - b. Insert the front end of the right rack rail into the inside front of the rack until the pins extend through the holes marked during the rack template procedure.

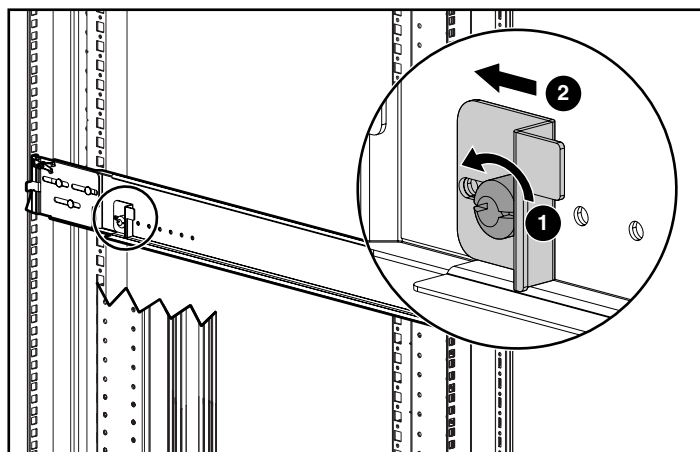
Note: Be sure that the scissor-type locking latch engages when the end of the rail seats into the rack uprights.



- c. Extend the back end of the rail toward the inside rear of the rack until the pins extend through the holes marked during the rack template procedure and the locking latch engages.

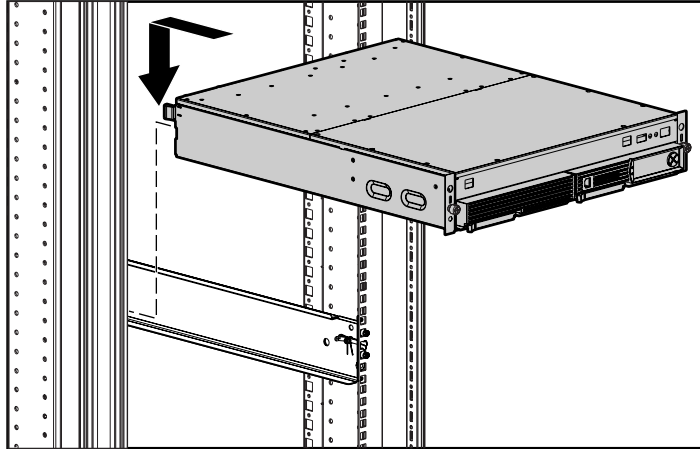


- d. Loosen the locking nut on the shipping retaining bracket and slide the bracket to the farthest position on the rear of the rail.

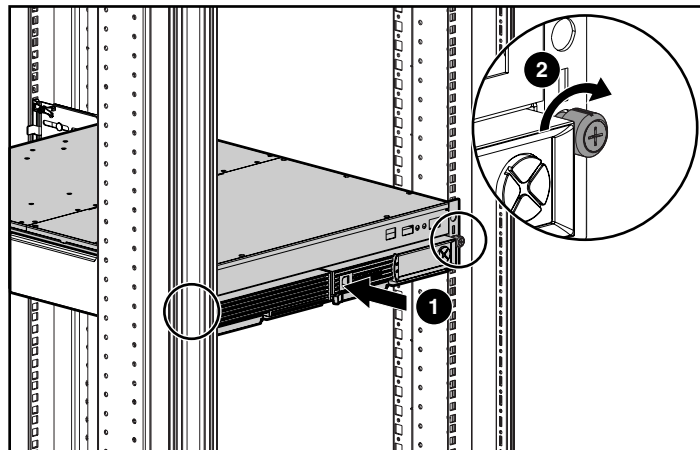


- e. Repeat steps a through d for the left rack rail.

4. Install the component in the rack:
 - a. Remove the bezel from the front of the device, align the device with the rails, and slide it into the rack.

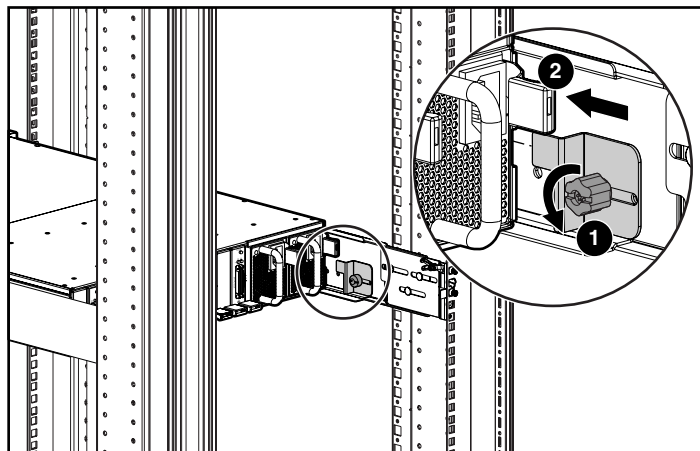


- b. Slide the device into the rack until the front edge is flush with the front of the rack (1).
 - c. Secure the device to the front of the rack using the provided thumbscrews on the front of the device (2) and then replace the front bezel.



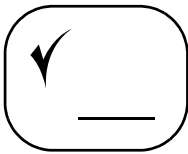
5. Secure the device in the rack:

- a. Loosen the thumbscrew on the shipping retaining bracket (1) and slide the bracket forward (2) until the tab engages the slot in the chassis.

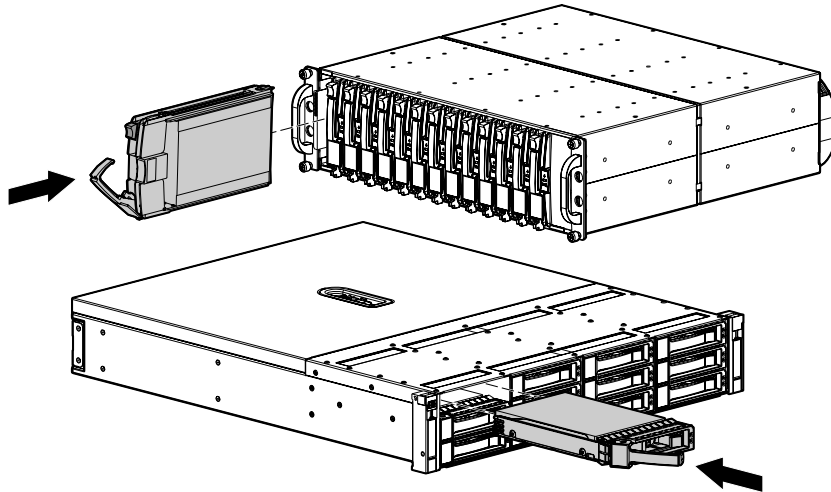


- b. Tighten the thumbscrew on the bracket.
- c. Repeat these steps for the other rail.

Step 5: Install the hard drives



After the storage enclosures are secured in the rack, install the hard drives into the drive bays. For a list of supported hard drives, see the Compatibility Matrix, located on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.



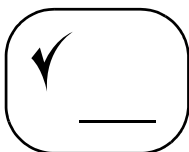
Caution: Follow industry-standard practices when handling hard drives. Internal storage media can be damaged when drives are shaken, dropped, or roughly placed on a work surface. When installing a hard drive, make sure it is fully seated in the drive bay. To remove a hard drive, press the release button and pull the drive only slightly out of the enclosure. Then, to allow time for the internal disk to stop rotating, wait approximately 10 seconds before completely removing the drive from the enclosure.

Note: HP recommends installing hard drives in bay-number sequence. Locate this information for your storage enclosure in the enclosure documentation.

For information about installing hard drives, refer to the instructions that came with the hard drive and the enclosure.

Go to **Table 14: “Hard Drive Information”** on page 108 to record information about your hard drives.

Step 6: Prepare your servers



In an existing SAN, the servers are already set up and configured, but if you are deploying your MSA into a new SAN, install and configure your servers at this time. HP recommends that you:

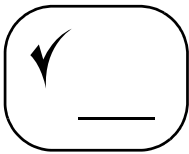
- Verify that the servers and operating systems you plan to use are supported for use with the MSA. For a list of servers and operating systems that are supported for use with the MSA, refer to the *Compatibility Matrix* and the *QuickSpecs*, located on the QuickSpecs and Technical documents pages of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.
- If more than one server will access the MSA, designate one of the servers as a management server. It is on the management server that you install management software (such as the ACU) and it is from this server that you perform your SAN management tasks. (Instructions for installing the ACU are included later in this guide.)
- Verify that all servers that will access the MSA are functioning properly before proceeding to the next step in this guide.
- Install the latest available operating system updates and patches. For a list of operating systems versions that are supported for use with the MSA refer to the *Compatibility Matrix*, located on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Note: In multi-path configurations, management software such as the ACU must be installed on each server with access to the MSA.

For information about installing and configuring your servers, refer to the instructions that came with your server and operating system.

Go to Table 13: “Server Information” on page 104 to record information about the servers that will connect to the MSA.

Step 7: Install the HBA in your servers



After you have confirmed that your servers are operating properly, install the HBA for the MSA in each server that will access the MSA.

Because the MSA can be deployed into a variety of operating system environments and configurations (including single-path and multi-path), specific HBAs are required for the different deployments.

To confirm that you purchased the correct HBA for your configuration, read the *Release Notes* and the *Compatibility Matrix*, located on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.



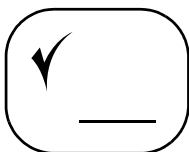
Caution: Be sure that power is removed from the server when installing the HBA, and do not apply power until instructed.

Powering on the server before instructed may cause an unsupported HBA driver to be installed automatically by the operating system.

For information about installing the HBA, refer to the instructions that came with the HBA or the server.

Go to **Table 13: “Server Information”** on page 104 to record information about the HBA in each server that will connect to the MSA. Some information may be printed on the HBA or on its shipping carton. If this information is not available now, you can obtain it later through the Command Line Interface or by viewing the monitor connected to the server during the server power-on self-test (POST).

Step 8: Prepare your switches



In an existing SAN, your switches are already set up and configured, but if you are deploying your MSA into a new SAN, you need to install and configure your Fibre Channel switches at this time.

Note: If you are connecting the Fibre Channel I/O module of the MSA directly to the HBA in the server, proceed to the next step. Direct connections are supported on Windows Server 2003 32-bit Enterprise Edition, Windows 2000, and HP-UX.

HP recommends that you:

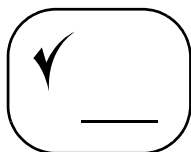
- Confirm that the switch you plan to use is approved for use with the MSA and that you upgrade the switch firmware to a supported level. For a list of supported switches, refer to the *Compatibility Matrix*, located on the Technical documents page of the MSA1500 web site:
<http://www.hp.com/go/msa1500cs>.
- For newly installed switches, change the IP address of the switch from the default value to a valid IP address.
- If desired, set up zoning on the switch to control access to the MSA. In an environment with multiple servers and storage systems, you must isolate each storage system and its LUNs to prevent unauthorized access. Use switch zoning, Selective Storage Presentation options in the ACU and ACU-CLI, Access Control Lists in the CLI, or a combination of strategies to control access to the storage.

Note: Although the MSA can support the use of some 1 Gbps (gigabit per second) devices, HP recommends connecting the MSA to 2 Gbps devices only. To obtain optimum performance, use faster devices.

Refer to the documentation included with the switch for installation and configuration instructions.

Go to **Table 12: “External Fibre Channel Interconnect Device (Switch) Information”** on page 103 to record information about the switches that will connect to the MSA.

Step 9: Connect the cables



At this point in the process of installing your MSA, you have either installed your new SAN or prepared your existing SAN for the MSA, your server is ready, your switch is ready, and the MSA is ready. Now is the time for:

- [Connecting the SCSI cables](#)
- [Connecting the Fibre Channel cables](#)
- [Connecting the power cords](#)

Each of these connection types is discussed in the following paragraphs.

Cabling best practices

- Use the shortest possible cable between devices. Shorter cables are easier to manage and route along the back of the rack. In addition, shorter cables reduce the possibility of signal degradation that may occur over longer distances.
- Gather the cables in the rear of the MSA to ensure that the cabling in the back of the rack system does not interfere with system operation or maintenance. Bind the cables loosely with cable ties and route the excess cables out of the way, along the side of the rack. When the cables are tied together and routed down the side of the rack, system components and indicators are easily visible and accessible.
- Attach a label near both ends of each cable to identify the device connected to that cable. Include the device, device name, port, or other information that you think will be helpful.
- Use colored markers to color-code both ends of each cable, to help you visually identify a particular cable without having to read or locate the label.
- In multi-path configurations, you may want to loosely bind the matching pair of cables connecting devices.

Connecting the SCSI cables

To connect the MSA to the storage enclosures, use standard VHDCI SCSI cables included in the shipping carton with each storage enclosure.

Recommended SCSI cable connections

HP recommends installing additional SCSI I/O modules and connecting storage enclosures in the same sequence as the pre-assigned box numbers, as illustrated in [Figure 2](#).

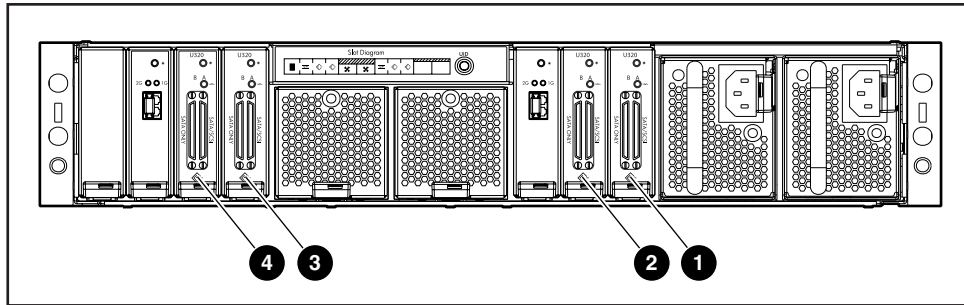


Figure 2: SCSI I/O modules, bus numbers, and box numbers

Item	Bus	Port	Assigned Box Numbers - SATA	Assigned Box Numbers - SCSI
1	0	A	1	1
		B	5	not used
2	1	A	2	2
		B	6	not used
3	2	A	3	3
		B	7	not used
4	3	A	4	4
		B	8	not used

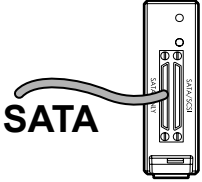
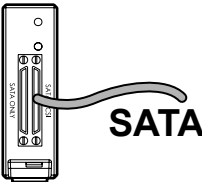
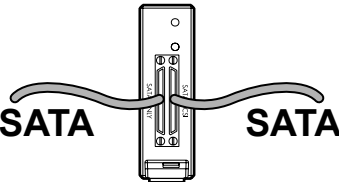
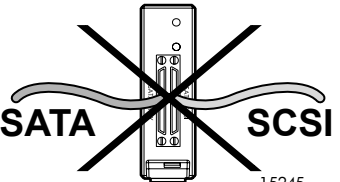
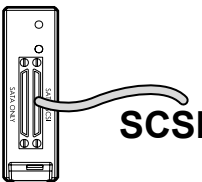
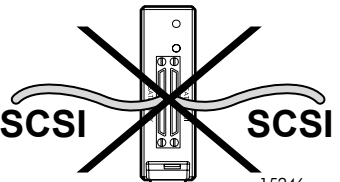
Go to [Table 14 “Hard Drive Information”](#) on page 108 to record information about each storage enclosure.

Supported and unsupported SCSI connections

Each MSA SCSI I/O module has two ports — depending on the type of storage enclosure you plan to connect, one or both of the ports may be supported.

See [Table 6](#) for examples of supported and unsupported connections and see [Figure 3](#) and [Figure 4](#) for illustrations of sample configurations.

Table 6: Supported / Unsupported SCSI cable connections

Supported	Unsupported
 <p>SATA</p> <p>15242</p>	
 <p>SATA</p> <p>15264</p>	
 <p>SATA</p> <p>SATA</p> <p>15243</p>	 <p>SATA</p> <p>SCSI</p> <p>15245</p>
 <p>SCSI</p> <p>15244</p>	 <p>SCSI</p> <p>SCSI</p> <p>15246</p>

Connecting the MSA to SATA storage enclosures

The following illustration shows the MSA1500 connected to two MSA20 SATA storage enclosures.

Note: Tighten the thumbscrews on the SCSI cables to ensure a secure connection.

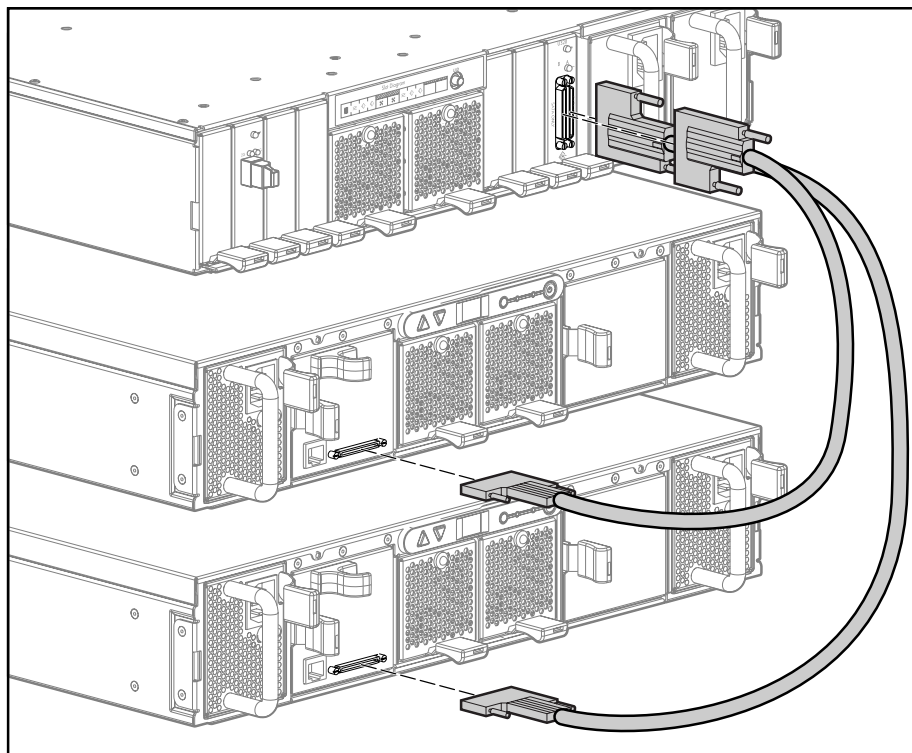


Figure 3: SCSI cable connections to two MSA20 SATA storage enclosures

Connecting the MSA to SCSI storage enclosures

The following illustration shows the MSA1500 connected to one dual-bus MSA30 SCSI storage enclosure.

Note: Tighten the thumbscrews on the SCSI cables to ensure a secure connection.

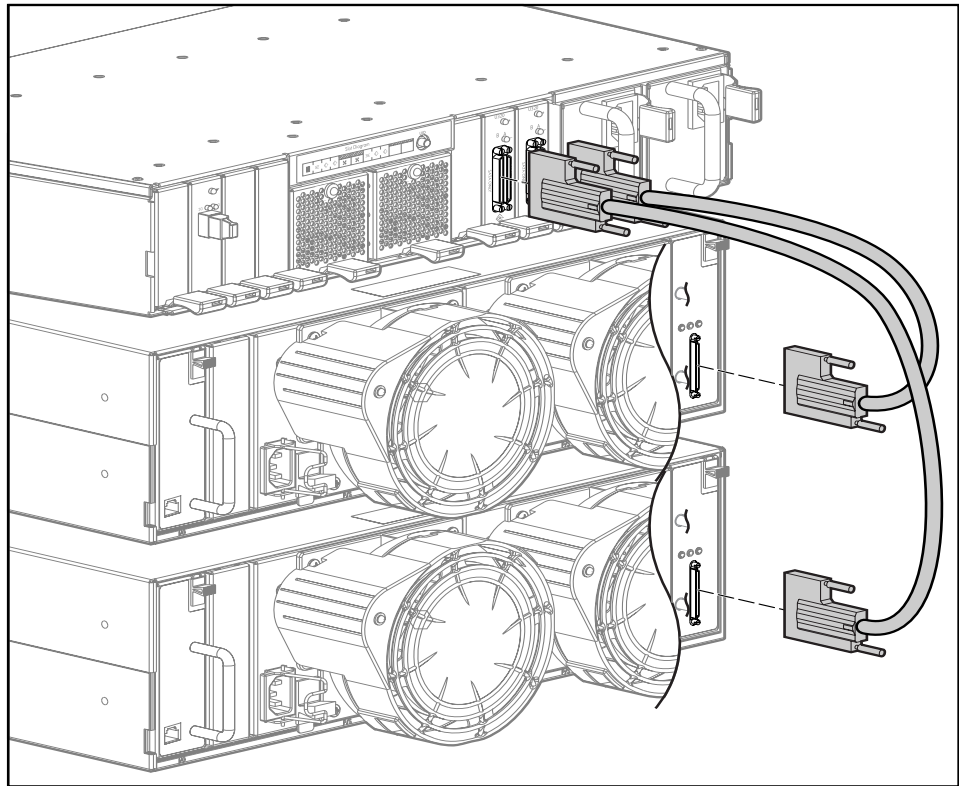


Figure 4: SCSI cable connections to one MSA30 SCSI storage enclosure

Connecting the Fibre Channel cables

Your MSA can be deployed into a variety of configurations, from relatively simple single-path configurations to more complex multi-path configurations. Because there are two switches, two HBAs, and two servers in multi-path configurations, all of which use Fibre Channel cables, cable connections must follow specific installation requirements.



Caution: Use appropriate precautions when handling Fibre Channel cables:

- Touching the end of a Fibre Channel cable will either damage the cable or cause performance problems, including intermittent difficulties accessing the storage.
 - Whenever a Fibre Channel cable is not connected, replace the protective covers on the ends of the cable.
 - Make certain that the Fibre Channel cables are installed and supported so that no excess weight is placed on the connectors. This prevents damage to the connector and cable. Excess cable should be loosely coiled and tied out of the way, being careful not to coil the cable in a tight loop with a bend radius of less than 3 inches (7.62 cm).
-

To connect the MSA to the SAN, use standard Fibre Channel cables.

Note: See the illustrations on the following pages for sample cabling configurations for a single-path and a multi-path installation.

Connecting Fibre Channel cables in a single-path configuration

Figure 5 shows the Fibre Channel cable connections of an MSA1500 being accessed by two servers in a single-path configuration.

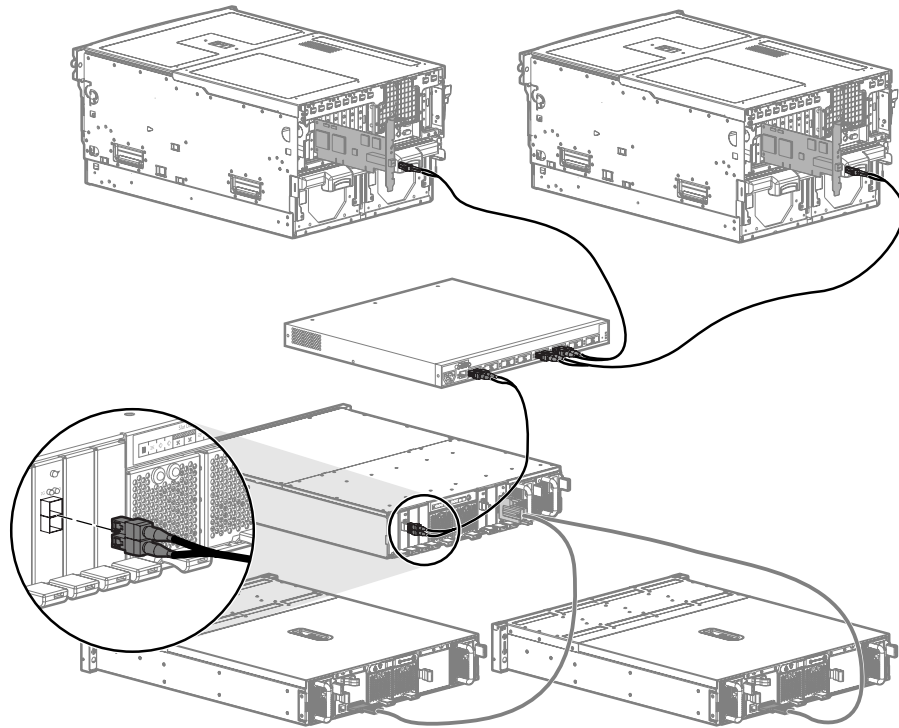


Figure 5: Sample Fibre Channel cable connections, single-path configuration

Connecting Fibre Channel cables in a multi-path configuration

Figure 6 shows the Fibre Channel cable connections of an MSA1500 being accessed by two servers, but in a multi-path configuration.

Note: Multi-path configurations must include:

- Two MSA controllers
 - Two MSA Fibre Channel I/O modules
 - Two Fibre Channel switches
 - Two servers, each with two HBAs
-

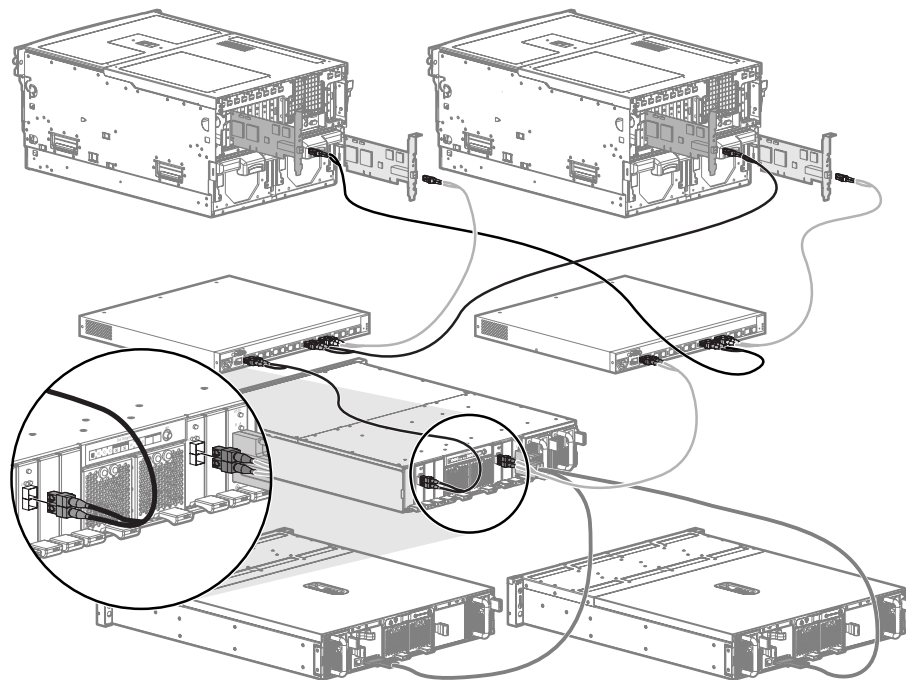


Figure 6: Sample Fibre Channel cable connections, multi-path configuration

Connecting the power cords

To protect your system from power-failure-related down time, each MSA ships standard with a redundant power supply. Depending how you connect the power supplies to your power source, you can eliminate down time caused by power-related failures.

When connecting the power cords, use the power cords shipped with the MSA. After power is supplied to the MSA, the power supply automatically senses the input voltage and the LED behind the power switch illuminates as solid amber.

Table 7: Levels of Protection Against Power Failures

Connection Method	Level of Protection
MSA power supplies connected to: <ul style="list-style-type: none"> ■ one power source 	<ul style="list-style-type: none"> ■ Protects you from down time when one of the MSA power supplies fails. The remaining power supply/fan module can operate the MSA until you install a replacement module.
MSA power supplies connected to: <ul style="list-style-type: none"> ■ two separate power sources 	<ul style="list-style-type: none"> ■ Protects you from down time when one of the MSA power supplies fails. ■ Protects you from data loss when <i>one</i> of your power sources fails, due to a pulled cable, tripped breaker. The remaining power source can power the MSA until the failed power source is restored or relocated. Depending on the cause and duration of the power outage, you can use this time to properly shut down your storage sub-system.
MSA power supplies connected to: <ul style="list-style-type: none"> ■ two UPS ■ two separate power sources 	<ul style="list-style-type: none"> ■ Protects you from down time when one of the MSA power supplies fails. ■ Protects you from data loss when <i>one or both</i> of your power sources fails, due to a pulled cable, tripped breaker or local power outage. The remaining power source or the UPS will power the MSA until power is restored to the source. Depending on the cause and duration of the power outage, you can use this time to properly shut down your storage sub-system.



WARNING: To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- To remove power to the equipment, unplug the power cord from the power supply.
- Route the power cord so that it is not likely to be walked on or pinched by items placed against it. Pay particular attention to the plug, electrical outlet, and the point where the cord is attached to the MSA.

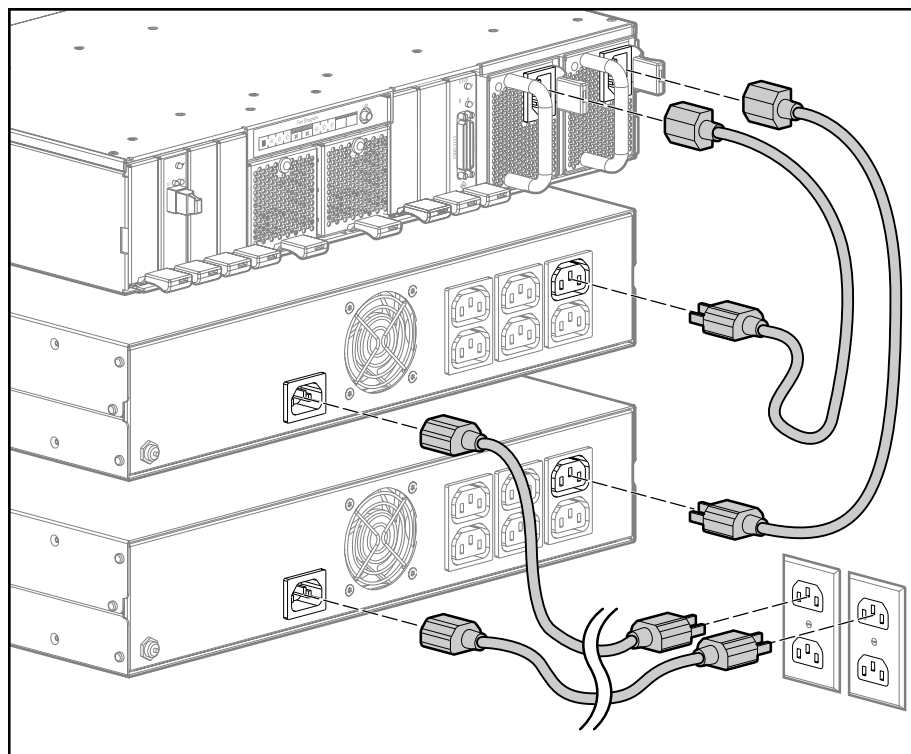
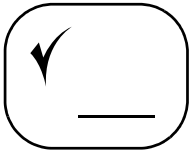


Figure 7: Connecting the power cords, using two UPS

Step 10: Power on the devices



After the MSA and its storage enclosures are installed and connected to the SAN, power up all of the devices in the SAN and verify that they are operating properly.

1. Apply power to each UPS.
2. Apply power to each external Fibre Channel switch.
3. Apply power to each attached storage enclosure.
4. Power on the MSA by pressing the power/standby button on the front panel.

The LED on the power/standby button changes from amber to solid green, indicating that the MSA has been powered on.

5. Wait (up to four minutes) for the MSA to complete its startup routine.

Note: In dual-controller configurations, when the MSA is power cycled, firmware on the two controllers is compared. If the versions are mismatched, the system prompts to clone the firmware on the controller with the latest version (higher number) over to the controller with the older version (lower number) firmware. The following message is displayed on the LCD panel of the controller with the older (lower number) firmware:

```
07 CLONE FIRMWARE? `<`= NO, `>`= YES
```

Press the > button on the LCD panel to clone the firmware. If < is selected, the standby controller is disabled and the system operates in a single-path mode until the firmware on the two controllers does match. If neither button is pushed within 30 seconds, cloning automatically proceeds.

In dual-controller configurations, the firmware version on the controllers must match.

6. Press the ^ and v LCD panel message buttons on the front of each MSA controller to review the startup messages and look for the following message:

```
Startup Complete
```

Note: Proceed to the next step only after the `Startup Complete` message is displayed. If you power up the server before the MSA has completed its power-on sequence, your server may not see the MSA properly.

7. Apply power to the servers in the SAN with access to the MSA, start the operating system, and log on as user with administrative control.



Caution: When you power on the server, the monitor may display a “New Hardware Found” message and prompt to install an HBA driver. Cancel out of this window to prevent the installation of an unsupported HBA driver.

8. Verify that each component in the SAN is operating properly.

Verify the operating status of the MSA

To verify the operating status of the MSA:

- [View the LEDs on the MSA](#)
- [Read the messages on the controller display panel](#)

View the LEDs on the MSA

Each module of the MSA is equipped with LEDs. To verify that your MSA is operating properly, look for the following LED patterns:

Table 8: MSA1500 Startup Status Lights

LED	Condition
Power switch	Amber = standby power Solid green = power on
Power supply module	Solid green
Fan module	Solid green
Fibre Channel I/O module (top LED)	Solid green
SCSI I/O module (top LED)	Solid green

If the above LED patterns are not illuminated:

- Check your cable connections between the device and the MSA.
- Check the availability of your power source.
- Review the setup instructions in the previous sections of this guide.
- Remove and reinsert the module.
- Refer to the *HP StorageWorks MSA1500 Maintenance and Service Guide*, available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Read the messages on the controller display panel

Each controller contains an integrated LCD panel. This panel displays informational and error messages, shows the current status of the MSA, and provides an interface for user input. To verify that your MSA is operating properly, use the arrow buttons on the LCD panel of the controller and look for the following messages:

Table 9: MSA1500 Startup Messages

Message	Meaning
Startup Complete	The array controller has completed its power on sequence and is operational.
Fibre Sub-System Link Failure	No active fiber connection to the MSA controller exists. This message is expected, because, although you have physically installed the HBA in the server, you have not yet installed the drivers for the HBA and the MSA. You may safely ignore this message.
Array controller Firmware ver <version>	The current version of the firmware running on the controller.

If the Startup Complete message is not displayed:

- Check the cable connections to the MSA
- Check the availability of your power source
- Review the setup instructions in the previous sections of this guide
- Refer to the *HP StorageWorks MSA1500 Maintenance and Service Guide*, available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Go to **Table 11: “MSA1500 Information”** on page 102 to record the controller firmware version.

Verify the operating status of the storage enclosures

To verify that your storage enclosures and hard drives are operating properly, view the enclosure and hard drive LEDs and compare them with the patterns described in the documentation for these devices.

If the LEDs indicate a fault, refer to the documentation that came with the enclosure for help.

Verify the operating status of the Fibre Channel switches

To verify that your switches are operating properly, view the switch LEDs and compare them with the patterns described in the documentation for these devices.

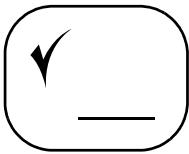
If the LEDs indicate a fault, refer to the documentation that came with the switch for help.

Verify the operating status of the servers

Although the MSA is not yet visible to the server, verify that the server is operating properly. A simple test is to verify that your operating system loaded and then open a software application or your browser.

If your server is not operating properly, refer to the documentation that came with the server for help.

Step 11: Configure your MSA



After the servers and switches are set up and the MSA is physically installed, connected, and powered on, you may customize the server and the MSA and configure the storage according to your plan.

Procedures vary for each operating system, but common steps include:

- Obtain desired controller firmware and Support Software CD versions
- Determine which storage configuration utility to use
- Configure the MSA

Obtain desired controller firmware and Support Software CD versions

As discussed in “[Determine which version MSA controller firmware to use](#)” on page 17, multiple versions of MSA controller firmware are available.

Use the following procedures to determine the pre-installed controller firmware version on the MSA and obtain a different version of firmware or support software CD from the Web.

1. Obtain the Support Software CD from the shipping carton of your MSA.
2. Read the CD label and record the version of the Support Software CD in [Table 11: “MSA1500 Information”](#) on page 102.
3. With the MSA powered on, press the up and down arrow buttons on the front of the controller until the following message is displayed:

```
Array controller Firmware ver <version>
```

(Where *<version>* represents the installed firmware version.)

4. Record the installed MSA controller firmware version in [Table 11: “MSA1500 Information”](#) on page 102.
5. Go to the **Software, Firmware & Drivers** page of the MSA1500 web site: <http://www.hp.com/go/MSA1500cs>.



Caution:

Do not go to the MSA1000 web site for information about the MSA1500.

6. Under the **Select operating system** banner, select the entry for your operating system.

7. Scroll through and read the display for the Web versions of the Support Software CD and MSA controller firmware, and then record the version numbers in [Table 11: “MSA1500 Information”](#) on page 102.
8. If desired, download the updated firmware or support software CD ISO image from the web.

Note: When instructed in later sections of this guide, install this new firmware on the MSA and use this new Support CD.

Determine which storage configuration utility to use

Depending on your operating system and your preference of user interfaces, use one of the following provided utilities to configure the MSA:

- Command Line Interface (CLI)
- Array Configuration Utility (ACU)
- Array Configuration Utility - Command Line Interface (ACU-CLI)

Note: See “[Plan your storage configuration](#)” on page 28 and “[Review MSA installation best practices](#)” on page 22 for help developing a configuration plan.

About the MSA Command Line Interface

The MSA Command Line Interface (CLI) is built into the controller firmware and can be used to configure, manage, and monitor all aspects of the MSA, including hard drive array configuration.

The CLI is accessed by connecting the serial port on a host computer or laptop to the customized RJ-45Z serial port on the front of the MSA. The specialized CLI Configuration cable (part number 259992-001) is included in the shipping carton with the MSA.

All supported operating systems can use the CLI.

For information about using the CLI, obtain and refer to the *MSA1000/MSA1500 Command Line Interface User Guide*. This guide is available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

About the Array Configuration Utility

The Array Configuration Utility (ACU) is a graphical user interface that can run locally through your browser or remotely through HP Insight Manager.

Note: The ACU is included on the Support Software CD inside the MSA1000/1500 Setup and Management kit. Instructions for installing the ACU on your server are included in the configuration chapters of this guide.

The ACU may be installed and run from the server or run from its CD. (Diskless servers and some operating systems must run the ACU from the CD.)

To determine if you can use the ACU to help manage an MSA in your environment, read the *Compatibility Matrix*, located on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

For information about using the ACU, obtain and refer to the *HP Array Configuration Utility User Guide*. This guide is available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

For more information about the ACU, refer to the ACU web site: <http://h18000.www1.hp.com/products/servers/proliantstorage/software-management/acumatrix/index.html>

Note: When creating arrays, the ACU provides suggested settings. Consider these defaults (especially the RAID level and rebuild priority) and make sure that they are acceptable according to your plans.

About the Array Configuration Utility - Command Line Interface

The Array Configuration Utility - Command Line Interface (ACU-CLI) is a command line user interface that can run locally through your browser or remotely through HP Insight Manager.

Note: The ACU-CLI is included on the Support Software CD inside the MSA1000/1500 Setup and Management kit. Instructions for installing the ACU-CLI on your server are included in the configuration chapters of this guide.

The ACU-CLI may be installed and run from the server or run from its CD. (Diskless servers and some operating systems must run the ACU from the CD.)

To determine if you can use the ACU-CLI to help manage an MSA in your environment, read the *Compatibility Matrix*, located on the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

For more information about the ACU-CLI, refer to the ACU web site: <http://h18000.www1.hp.com/products/servers/proliantstorage/software-management/acumatrix/index.html>

Configure the MSA

To finish installing and begin configuring your MSA, go to the chapter for your specific operating system:

- Chapter 2: [Configuration Procedures - Windows Environments](#), page 65
- Chapter 3: [Configuration Procedures - Linux Environments](#), page 71
- Chapter 4: [Configuration Procedures - HP-UX Environments](#), page 77
- Chapter 5: [Configuration Procedures - OpenVMS Environments](#), page 83
- Chapter 6: [Configuration Procedures - Tru64 UNIX Environments](#), page 89

Configuration Procedures - Windows Environments

2

Deploying the MSA in a Microsoft Windows environment involves:

1. Completing all [Prerequisites](#), page 65
2. [Installing MSA-specific components on the servers](#), page 66
3. [Updating MSA controller firmware \(if necessary\)](#), page 69
4. [Configuring the storage](#), page 70

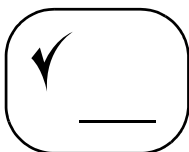
Each of these procedures is discussed in the following paragraphs.

Note: HP recommends installing your MSA in the sequence of steps listed here and in chapter 1 of this guide. Specific dependencies exist, and if you deviate from this sequence, you may have to uninstall and then reinstall your device.

Prerequisites

- Install and connect all equipment correctly, as detailed in [Installation Procedures - All Deployments](#), page 15.
- Verify that the operating system version installed on the server is supported for use with the MSA. For a current listing of supported operating system versions, see the QuickSpecs, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.
- If using the ACU, install Microsoft Internet Explorer, version 5.5 or greater.
- Obtain documentation for the storage configuration tool you plan to use. Documentation for the ACU and the CLI are available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Installing MSA-specific components on the servers



Because these installation processes involve updating the server configuration, HP recommends performing these tasks during inactive periods.

MSA-specific components include:

- HBA drivers
- Windows Event Notification Service
- Array Configuration Utility (ACU)
- Array Configuration Utility-Command Line Interface (ACU-CLI)
(The ACU-CLI is not supported on IA64 platforms.)
- Array Diagnostic Utility (ADU)
- MPIO Full Featured Device Specific Manager (DSM)
- MPIO Multipath Manager

To install these components on the server, do the following:

1. With the HBAs installed in the server, power on the server and start your Windows operating system.

Note: If the **New Hardware Wizard** is displayed, click **Cancel** to prevent installation of an HBA driver that is unsupported for use with the MSA1500.

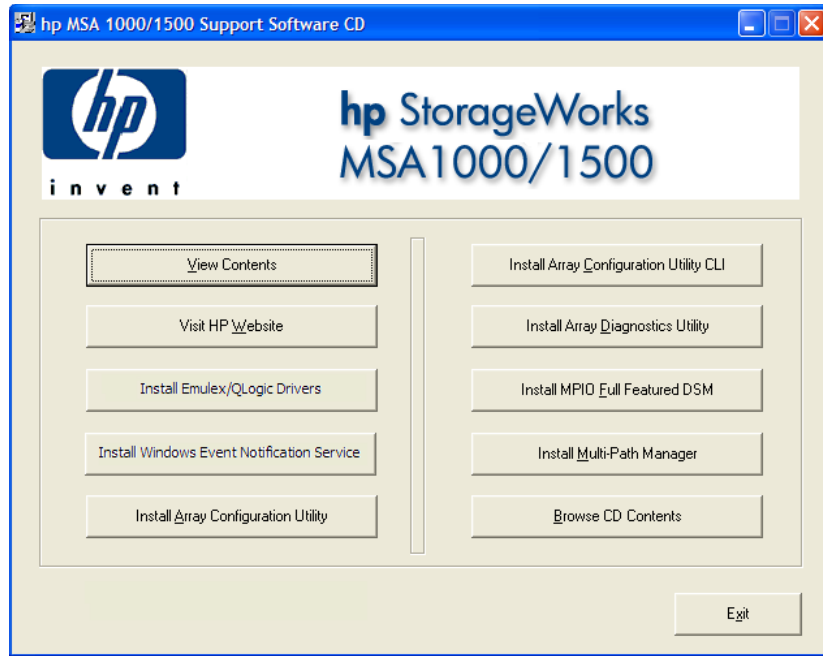
2. Insert the Support Software CD in the CD-ROM drive of the server and let it auto-start the installation program. If the CD does not start automatically, access the CD-ROM drive, browse the directory of the CD, and execute the *setup.exe* file on the CD.

Note: If you created a new Support Software CD from the Web, insert that CD in the CD-ROM drive of the server and do not use the shipping version of the CD. For more information, see:

- [Determine which version MSA controller firmware to use](#), page 17
 - [Obtain desired controller firmware and Support Software CD versions](#), page 59
-

The installation program scans the server to identify the HBAs and determine which driver to install. This scan may take a few moments.

3. When prompted, read and accept the license agreement.
The Support Software CD main menu is displayed.



4. In the CD Main Menu, do the following:
 - a. Click **View Contents** to review notes and information that supplement this document.



Caution: Use only the Support Software CD to install HBA drivers. Drivers for all supported HBAs are included on the CD and are the only versions approved for use with the MSA.

Important:

- Install the HBA driver before the Windows Event Notification Service.
- As a time-saving measure during the installation processes, *do not restart the server each time when prompted*. Instead, restart the server when instructed in this document.

- b. Install the following two components (*required for all configurations*):
 - HBA drivers
 - Windows Event Notification Service

Note: After installing Windows Event Notification Service, remove the Support Software CD from the CD-ROM drive and restart the server.

- c. Install the following optional components from the CD (*recommended*):
 - Array Configuration Utility (ACU)
 - Array Configuration Utility-Command Line Interface (ACU-CLI)
 - Array Diagnostic Utility (ADU)
- d. In multipathing environments, install the following components (*required in all dual-controller configurations*):
 - MPIO Full Featured DSM

Note: After installing the MPIO Full Featured DSM, remove the Support Software CD from the CD-ROM drive and restart the server.

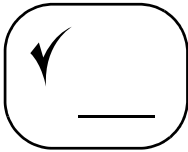
- MPIO Multipath Manager
5. After all desired components are installed on the server, remove the Support Software CD from the CD-ROM drive and restart the server.
 6. Repeat these installation procedures on each Windows server that will access the MSA.

Note: To initially start the ACU and enter basic settings, do the following:

- From the desktop, click **Start>Programs>HP System Tools>hp Array Configuration Utility>Set up hp Array Configuration Utility**.
- Click **Next** to set the execution mode (be sure to select Local Application), and then enter passwords, the device trust mode, and remote access settings.

For complete information about using the ACU to configure the storage, see ACU online help or the *HP Array Configuration Utility User Guide*.

Updating MSA controller firmware (if necessary)



If you need to update the firmware on your MSA controller to a version downloaded from the MSA1500 web site, do so at this time.

For information on determining whether you need to update MSA controller firmware, see the following sections of this guide:

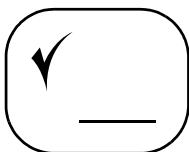
- [Determine which version MSA controller firmware to use](#), page 17
- [Obtain desired controller firmware and Support Software CD versions](#), page 59

For instructions on updating MSA controller firmware, see the *HP StorageWorks Modular Smart Array 1000/1500 firmware updating guide*, available on the Technical documents page of the MSA1500 web site:

<http://www.hp.com/go/msa1500cs>.

Note: After updating MSA controller firmware, be sure to check the status of the MSA for unexpected issues. Verify the status of the connections, defined profile types, redundancy settings, and storage configuration.

Configuring the storage



Thorough planning is critical to the successful and efficient deployment of any storage array system. As discussed in Chapter 1: [Installation Procedures - All Deployments](#), page 15, plans should include decisions about total system capacity, fault-tolerance levels (availability), and performance.

Although detailed in the ACU and the CLI user guides, basic configuration tasks include (in the following sequence):

- Creating the arrays (LUNs).
- Entering global controller settings, such as setting the read/write cache ratio, setting the rebuild/expand priority, and setting the redundancy level.
- Identifying the operating system type (also called Host Mode, Access Mode, Profile, or Connection Profile) of each HBA with access to the MSA. This ensures that the MSA will communicate properly with that host, be it Windows, Linux, HP-UX, OpenVMS, or Tru64.
- Verifying that each HBA with access to the MSA is visible to the MSA.
- Entering Selective Storage Presentation options (also called Access Control Lists) to isolate the storage from unauthorized access. These settings indicate, by HBA, which LUNs the HBA can access.

Important: In multi-path configurations:

- Verify that both HBAs in each server have been granted access to the storage.
 - In active/active configurations, manually assign a preferred path (controller ownership) for each LUN. By default, MSA firmware initially assigns ownership of all LUNs to the controller in slot one (front-right) of the MSA. Then, based on access patterns and I/O load, the firmware automatically re-assigns ownership of the LUN between the controllers to balance the load. If your environment controls load balancing from the host, you must manually assign the preferred path for each LUN.
 - HP recommends that Fibre Channel HBA load balancing from the host, selectable in Windows and Linux environments, be turned Off for the MSA, because it can reduce performance.
-

Perform these tasks using your chosen configuration utility. Refer to the appropriate user documentation for instructions.

Go to [Table 14: Hard Drive Information](#), page 108 and [Table 15: Array \(LUN\) Information](#), page 112 to record information about your storage.

Configuration Procedures - Linux Environments

3

Deploying the MSA in a Linux environment involves:

1. Completing all [Prerequisites](#), page 71
2. [Installing MSA-specific components on the servers](#), page 72
3. [Updating MSA controller firmware \(if necessary\)](#), page 75
4. [Configuring the storage](#), page 76

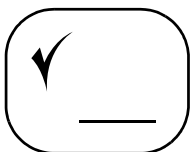
Each of these procedures is discussed in the following paragraphs.

Note: HP recommends installing your MSA in the sequence of steps listed here and in chapter 1 of this guide. Specific dependencies exist, and if you deviate from this sequence, you may have to uninstall and then reinstall your device.

Prerequisites

- Install and connect all equipment correctly, as detailed in “[Installation Procedures - All Deployments](#)” on page 15.
- Verify that the operating system version installed on the server is supported for use with the MSA. For a current listing of supported operating system versions, see the QuickSpecs, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.
- If using the ACU, install Netscape Navigator version 6.2 or later or Mozilla, version 1.0.2 or later with Personal Security Manager.
- Obtain documentation for the storage configuration tool you plan to use. Documentation for the ACU and the CLI is available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Installing MSA-specific components on the servers



Because these installation processes involve updating the server configuration, HP recommends performing these tasks during inactive periods.

MSA-specific components include:

- HBA drivers
- HP Server Management Homepage
- Array Configuration Utility (ACU)
- Array Configuration Utility - Command Line Interface (ACU-CLI)

Note: If LUNs on the MSA are already being presented to the server (when performing a server upgrade or move), disconnect the MSA from the SAN. If the MSA is unconfigured, the MSA can be connected to the SAN.

To install these components on the server, do the following:

1. With the HBAs installed in the server, power on the server and start up your Linux operating system.
2. From the console, log on as the root user.
3. Insert the Support Software CD in the CD-ROM drive of the server.

Note: If you created a new Support Software CD from the Web, insert that CD in the CD-ROM drive of the server. Do not use the shipping version of the CD. For more information, see:

- [“Determine which version MSA controller firmware to use”](#) on page 17
 - [“Obtain desired controller firmware and Support Software CD versions”](#) on page 59
-

4. Mount the CD-ROM drive and view the contents of the CD.
5. Locate and read the `readme.txt` file to review notes and information that supplement this guide.

6. To install the HBA drivers:



Caution: Use only the Support Software CD to install the HBA drivers. Drivers for all supported HBAs are included on the CD and are the only versions approved for use with the MSA.

- a. Navigate to the `/RDP/Linux/hp-qla2x00` directory on the CD.
- b. Install the HBA driver on the new kernel by entering:

```
./INSTALL -f
```
- c. Restart the server.
- d. If not already connected, connect the MSA to the SAN.

Note: To build an HBA driver from source code or manually patch the Linux kernel, refer to the README file in the `/opt/hp/src/hp_qla2x00src` directory on the server.

7. To install the HP Server Management Homepage:

Note: The Server Management Homepage must be installed prior to the ACU.

- a. Navigate to the `/SMH/Linux` directory on the CD.
- b. List the contents of the directory and identify the installation rpm file for your environment.
- c. Copy the file to a directory on the server.
- d. Change to the server directory of the file and un-tar the installation file by entering:

```
tar -zxvf <SMH_tar_filename>
```

where `<SMH_tar_filename>` is the name of the Server Management Homepage zip file.
- e. Install the Server Management Homepage by entering:

```
rpm -i <SMH_rpm_filename>
```

`(<SMH_rpm_filename>` is the name of the Server Management Homepage rpm)

8. To install the Array Configuration Utility (ACU):

Note:

- You must remove earlier versions of the ACU before installing later versions.
 - You must install the HP Server Management Homepage before installing the ACU.
 - For information about using the ACU or the ACU-CLI, see ACU online help or the *HP Array Configuration Utility User Guide*.
-

- a. Navigate to the `/ACU/Linux/x86` directory on the CD.
- b. List the contents of the directory and identify the ACU installation rpm file for your environment.
- c. Install the ACU by entering:

```
rpm -ivh <ACU_rpm_filename>  
(<ACU_rpm_filename> is the name of the ACU rpm)
```

Note: Warning messages regarding driver version dependencies may be displayed. These messages do not affect the MSA and may safely be ignored.

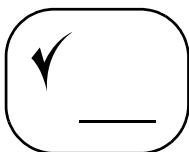
- d. Start the ACU by entering one of the following commands:
 - To enable remote access, enter: `/usr/sbin/cpqcacuxe -R`
 - To disable remote access, enter: `/usr/sbin/cpqcacuxe -d`
9. To install the Array Configuration Utility - Command Line Interface:
- a. Navigate to the `/HPACUCLI/Linux` directory on the CD.
 - b. List the contents of the directory and identify the directory for your operating system version.
 - c. Change to the CD directory of the ACU-CLI for your operating system version and list the contents of the directory.
 - d. Install the ACU-CLI by entering:

```
rpm -ivh <HPACUCLI_rpm_filename>  
(<HPACUCLI_rpm_filename> is the name of the ACU-CLI rpm)
```

10. Remove the Support Software CD and restart the server.

11. Repeat these procedures for each Linux server that will access the MSA.

Updating MSA controller firmware (if necessary)



If you need to update the firmware on your MSA controller to a version downloaded from the MSA1500 web site, do so at this time.

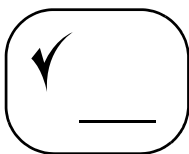
For information on determining whether you need to update MSA controller firmware, see:

- “[Determine which version MSA controller firmware to use](#)” on page 17
- “[Obtain desired controller firmware and Support Software CD versions](#)” on page 59

For instructions on updating MSA controller firmware, see the *HP StorageWorks Modular Smart Array 1000/1500 firmware updating guide*, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Note: After updating MSA controller firmware, be sure to check the status of the MSA for unexpected issues. Verify the status of the connections, defined profile types, redundancy settings, and storage configuration.

Configuring the storage



Thorough planning is critical to the successful and efficient deployment of any storage array system. As discussed in Chapter 1: “[Installation Procedures - All Deployments](#)” on page 15, plans should include decisions about total system capacity, fault-tolerance, performance, and availability.

Although detailed in the ACU and the CLI user guides, basic configuration tasks include (in the following sequence):

- Creating the arrays (LUNs).
- Entering controller settings, such as setting the read/write cache ratio, setting the rebuild/expand priority, and setting the redundancy level.
- Identifying the operating system type (also called Host Mode, Access Mode, Profile, or Connection Profile) of each HBA with access to the MSA. This ensures that the MSA will communicate properly with that host, be it Windows, Linux, HP-UX, OpenVMS, or Tru64.
- Verifying that each HBA with access to the MSA is visible to the MSA.
- Entering Selective Storage Presentation options (also called Access Control Lists) to isolate the storage from unauthorized access. These settings indicate, by HBA, which LUNs the HBA can access.

Important: In multi-path configurations:

- Verify that both HBAs in each server have been granted access to the storage.
 - In active/active configurations, manually assign a preferred path (controller ownership) for each LUN. By default, MSA firmware initially assigns ownership of all LUNs to the controller in slot one (front-right) of the MSA. Then, based on access patterns and I/O load, the firmware automatically re-assigns ownership of the LUN between the controllers to balance the load. If your environment controls load balancing from the host, you must manually assign the preferred path for each LUN.
 - HP recommends that Fibre Channel HBA load balancing from the host, selectable in Windows and Linux environments, be turned Off for the MSA, because it can reduce performance.
-

Perform these tasks using your chosen configuration utility. Refer to the appropriate user documentation for instructions.

Go to [Table 14: “Hard Drive Information”](#) on page 108 and [Table 15: “Array \(LUN\) Information”](#) on page 112 to record information about your storage.

Configuration Procedures - HP-UX Environments

4

Deploying the MSA in an HP-UX environment involves:

1. Completing all [Prerequisites](#), page 77
2. Reading the [Additional HP-UX support notes](#), page 78
3. [Installing the ACU-CLI on the servers \(optional\)](#), page 80
4. [Updating MSA controller firmware \(if necessary\)](#), page 81
5. [Configuring the storage](#), page 82

Each of these procedures is discussed in the following paragraphs.

Note: HP recommends installing your MSA in the sequence of steps listed here and in chapter 1 of this guide. Specific dependencies exist, and if you deviate from this sequence, you may have to uninstall and then reinstall your device.

Prerequisites

- Install and connect all equipment correctly, as detailed in “[Installation Procedures - All Deployments](#)” on page 15.
- Verify that the operating system version installed on the server is supported for use with the MSA. For a current listing of supported operating system versions, see the QuickSpecs, available on the web: <http://www.hp.com/go/msa1500cs>.
- Obtain documentation for the storage configuration tool you plan to use. Documentation for the ACU and the CLI are available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Additional HP-UX support notes

- Supported HP-UX operating system versions:
 - HP-UX 11i v1(PA)
 - HP-UX 11i v2(PA/IA)
- Supported controller configurations:
 - Single controller (active/passive firmware only)
 - Dual controllers (active/active firmware only)
- Supported Fibre Channel connections:
 - Fabric connection to an external switch
 - Direct connection to the HBA in the server (Limitations may exist. See the MSA1500 Compatibility Matrix documents for details.)
- Supported storage configuration tools:
 - MSA Command Line Interface (CLI): Accessed via a direct serial cable connection to the MSA controller.
 - Array Configuration Utility-Command Line Interface (ACU-CLI): Accessed from an HP-UX server with a Fibre Channel connection to the MSA.
 - Array Configuration Utility (ACU): Accessed via a Windows or Linux ProLiant server in the SAN, with a Fibre Channel connection to the MSA.
- Supported hardware monitoring service:

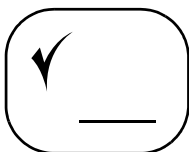
The Event Monitoring Service (EMS) is native to the HP-UX operating system as part of the online diagnostics tools. For full information about available support tools, see the EMS Hardware Monitors User's Guide and other documents located on the HP diagnostics web site:
<http://docs.hp.com/hpux/diag/index.html>.

 - In single-controller active/passive configurations, no action is needed; EMS with active/passive support should already be installed.
 - In dual-controller active/active configurations, make sure the recent patch that includes support for monitoring active/active MSA is installed on the server.

HP-UX version	Required update for active/active
11.11 systems	HWE0509 Online Diagnostics Support Tools Bundle, Sept. 2005 (or later)
11.23 systems	HWE0603 Online Diagnostics Support Tools Bundle, June 2006 (or later)
<p>These bundles are available on the HP Software Depot home web site: http://h20293.www2.hp.com. Click Enhancement releases and patch bundles, navigate to Diagnostic and Support Tools for the HP 9000, Integrity Servers, and Intel Itanium 2 Workstations, and then click Receive for Free. Then, follow the onscreen instructions to obtain the bundle.</p>	

- Direct connect configuration notes:
 - For direct connect configurations you must enable FC-AL hard addressing on the MSA controller. See the ACU or CLI online help or user documentation for instructions.
- LUN configuration notes:
 - In direct connect environments or in any environment when using the ACU-CLI, a minimum of one storage LUN on the MSA must be configured and set to the HP-UX host mode before connecting the MSA to the HP-UX server.

Installing the ACU-CLI on the servers (optional)



To use the ACU-CLI to configure MSA storage, perform the following steps to install it on the servers:

Note:

- You must remove earlier versions of the ACU before installing later versions.
- You must install the HP Server Management Homepage before installing the ACU.
- For information about using the ACU, see ACU-CLI online help, the HP-UX ACU-CLI readme file, or the *HP Array Configuration Utility User Guide*.

-
1. Insert the Support Software CD in the CD-ROM drive of the server.

Note: If you created a new Support Software CD from the Web, insert that CD in the CD-ROM drive of the server and do not use the shipping version of the CD. For more information, see:

- [“Determine which version MSA controller firmware to use”](#) on page 17
- [“Obtain desired controller firmware and Support Software CD versions”](#) on page 59

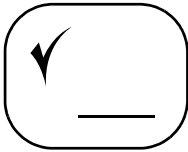
-
2. From the console, mount the CD-ROM drive and navigate to the `/HPUXACUCLI/HP-UX` directory for your environment.
 3. List the contents of the directory and identify the ACU-CLI depot file for your environment.
 4. Copy the ACU-CLI depot file and its corresponding readme file to a temporary directory on the server. For example:

```
# cp /HPACUCLI/HP-UX/IA64/HPACUCLI_IA_v7.47-1.depot .tmp
```
 5. Install the ACU-CLI application using the `swinstall` command. For example:

```
# swinstall -s /tmp/HPACUCLI_IA_v7.47-1.depot
```
 6. Remove the Support Software CD from the CD-ROM drive.

Note: To start the ACU-CLI, do the following from the console: Navigate to the `/opt/compaq/hpacucli/bld` directory, and then enter `# ./hpacucli`.

Updating MSA controller firmware (if necessary)



If you need to update the firmware on your MSA controller to a version downloaded from the MSA1500 web site, do so at this time.

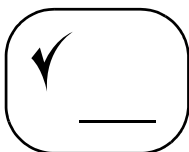
For information on determining whether you need to update MSA controller firmware, see:

- “[Determine which version MSA controller firmware to use](#)” on page 17
- “[Obtain desired controller firmware and Support Software CD versions](#)” on page 59

For instructions on updating MSA controller firmware, see the *HP StorageWorks Modular Smart Array 1000/1500 firmware updating guide*, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Note: After updating MSA controller firmware, be sure to check the status of the MSA for unexpected issues. Verify the status of the connections, defined profile types, redundancy settings, and storage configuration.

Configuring the storage



Thorough planning is critical to the successful and efficient deployment of any storage array system. As discussed in Chapter 1: “[Installation Procedures - All Deployments](#)” on page 15, plans should include decisions about total system capacity, fault-tolerance levels (availability), and performance.

Although detailed in the ACU and the CLI user guides, basic configuration tasks include (in the following sequence):

- Creating the arrays (LUNs).
- Entering controller settings, such as setting the read/write cache ratio, setting the rebuild/expand priority, and setting the redundancy level.
- Identifying the operating system type (also called Host Mode, Access Mode, Profile, or Connection Profile) of each HBA with access to the MSA. This ensures that the MSA will communicate properly with that host, be it Windows, Linux, HP-UX, OpenVMS, or Tru64.
- Verifying that each HBA with access to the MSA is visible to the MSA.
- Entering Selective Storage Presentation options (also called Access Control Lists) to isolate the storage from unauthorized access. These settings indicate, by HBA, which LUNs the HBA can access.

Important: In multi-path configurations:

- Verify that both HBAs in each server have been granted access to the storage.
 - In active/active configurations, manually assign a preferred path (controller ownership) for each LUN. By default, MSA firmware initially assigns ownership of all LUNs to the controller in slot one (front-right) of the MSA. Then, based on access patterns and I/O load, the firmware automatically re-assigns ownership of the LUN between the controllers to balance the load. If your environment controls load balancing from the host, you must manually assign the preferred path for each LUN.
-

Perform these tasks using your chosen configuration utility. Refer to the appropriate user documentation for instructions.

Go to [Table 14: “Hard Drive Information”](#) on page 108 and [Table 15: “Array \(LUN\) Information”](#) on page 112 to record information about your storage.

Configuration Procedures - OpenVMS Environments

5

Deploying the MSA in an OpenVMS environment involves:

1. Completing all [Prerequisites](#), page 83
2. [Obtaining World Wide Port Names](#), page 84
3. [Installing the current Fibre_SCSI patch on the servers](#), page 85
4. [Updating MSA controller firmware \(if necessary\)](#), page 86
5. [Configuring the storage](#), page 87
6. [Assigning ID Numbers to the Controllers and LUNs](#), page 88

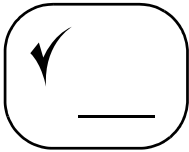
Each of these procedures is discussed in the following paragraphs.

Note: HP recommends installing your MSA in the sequence of steps listed here and in chapter 1 of this guide. Specific dependencies exist, and if you deviate from this sequence, you may have to uninstall and then reinstall your device.

Prerequisites

- Install and connect all equipment correctly, as detailed in “[Installation Procedures - All Deployments](#)” on page 15.
- Verify that the operating system version installed on the server is supported for use with the MSA. For a current listing of supported operating system versions, see the QuickSpecs, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.
- Obtain documentation for the storage configuration tool you plan to use. Documentation for the ACU and the CLI are available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Obtaining World Wide Port Names



When setting connections to the MSA, you must supply the WWPNs of the Fibre Channel adapters on the OpenVMS system.

To obtain the WWPNs:

1. From OpenVMS, use the following DCL command:

```
$ show device fg/full
```

The following information is displayed:

```
Device FGA0: device type KGPSA Fibre Channel, is online,  
shareable, error logging is enabled.
```

```
Error count0Operations completed0  
Owner Process"Owner UIC[SYSTEM]  
Owner process ID00000000Dev ProtS:RWPL,O:RWPL,G,W  
Reference count0Default buffer size0  
Current preferred CPU Id0Fastpath1  
FC Port Name1000-0000-C922-4659FC Node Name2000-0000-C922-4659
```

```
Device FGB0: device type KGPSA Fibre Channel, is online,  
shareable, error logging is enabled.
```

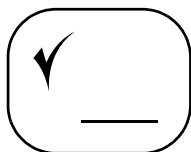
```
Error count0Operations completed0  
Owner Process"Owner UIC[SYSTEM]  
Owner process ID00000000Dev ProtS:RWPL,O:RWPL,G,W  
Reference count0Default buffer size0  
Current preferred CPU Id0Fastpath1  
FC Port Name1000-0000-C921-5B6EFC Node Name 2000-0000-C921-5B6E
```

2. Record the WWPNs (FC Port Name in the previous example).

WWPN: _____

WWPN _____

Installing the current Fibre_SCSI patch on the servers



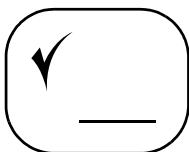
1. Download the current patch from the HP OpenVMS Systems web site:
http://h71000.www7.hp.com/serv_support.html.
 - a. Navigate to the **HP Proactive service tools** banner.
 - b. Select one of the following options:
 - **Register to access the HP Patch Database**
 - **FTP site for OpenVMS patches**
 - c. Follow the onscreen instructions to navigate to and download the patch.

Table 10: OpenVMS Fibre_SCSI patches (as of April 2006)

OpenVMS version	Fibre_SCSI patch
OpenVMS 7.3-2	VMS732_FIBRE_SCSI-V0700
OpenVMS 8.2 (Alpha)	VMS82A_FIBRE_SCSI-V0100
OpenVMS 8.2 (Itanium)	VMS82I_FIBRE_SCSI-V0100
OpenVMS 8.2-1 (Itanium)	VMS821I_FIBRE_SCSI-V0100

2. For existing OpenVMS installations:
 - a. Assign a unique identifier to the MSA controller. For instructions, see the MSA1000/1500 CLI User Guide.
 - b. On each OpenVMS server, install the Fibre_SCSI patch on all system disks. For instructions, see the documentation that came with the kit.
 - c. Restart the servers.
3. If you do not have an existing OpenVMS installation:
 - a. Create at least one LUN on the MSA. For instructions, see the MSA1000/1500 CLI User Guide.
 - b. Assign a unique identifier to the MSA controller. For instructions, see the MSA1000/1500 CLI User Guide.
 - c. Install OpenVMS on the server. For instructions, see your version-specific OpenVMS Upgrade and Installation Manual.
 - d. Restart the OpenVMS server.
 - e. Install the Fibre_SCSI patch on all system disks. For instructions, see the documentation that came with the kit.
 - f. Restart the OpenVMS server.

Updating MSA controller firmware (if necessary)



If you need to update the firmware on your MSA controller to a version downloaded from the MSA1500 web site, do so at this time.

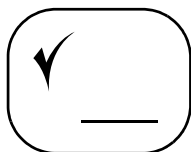
For information on determining whether you need to update MSA controller firmware, see:

- “[Determine which version MSA controller firmware to use](#)” on page 17
- “[Obtain desired controller firmware and Support Software CD versions](#)” on page 59

For instructions on updating MSA controller firmware, see the *HP StorageWorks Modular Smart Array 1000/1500 firmware updating guide*, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Note: After updating MSA controller firmware, be sure to check the status of the MSA for unexpected issues. Verify the status of the connections, defined profile types, redundancy settings, and storage configuration.

Configuring the storage



Thorough planning is critical to the successful and efficient deployment of any storage array system. As discussed in Chapter 1: “[Installation Procedures - All Deployments](#)” on page 15, plans should include decisions about total system capacity, fault-tolerance levels (availability), and performance.

Although detailed in the ACU and the CLI user guides, basic configuration tasks include (in the following sequence):

- Creating the arrays (LUNs).
- Entering controller settings, such as setting the read/write cache ratio, setting the rebuild/expand priority, and setting the redundancy level.
- Identifying the operating system type (also called Host Mode, Access Mode, Profile, or Connection Profile) of each HBA with access to the MSA. This ensures that the MSA will communicate properly with that host, be it Windows, Linux, HP-UX, OpenVMS, or Tru64.
- Verifying that each HBA with access to the MSA is visible to the MSA.
- Entering Selective Storage Presentation options (also called Access Control Lists) to isolate the storage from unauthorized access. These settings indicate, by HBA, which LUNs the HBA can access.

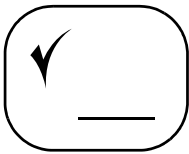
Note: In multi-path configurations:

- Verify that both HBAs in each server have been granted access to the storage.
- In active/active configurations, manually assign a preferred path (controller ownership) for each LUN. By default, MSA firmware initially assigns ownership of all LUNs to the controller in slot one (front-right) of the MSA. Then, based on access patterns and I/O load, the firmware automatically re-assigns ownership of the LUN between the controllers to balance the load. If your environment controls load balancing from the host, you must manually assign the preferred path for each LUN.

Perform these tasks using your chosen configuration utility. Refer to the appropriate user documentation for procedural instructions.

Go to [Table 14: “Hard Drive Information”](#) on page 108 and [Table 15: “Array \(LUN\) Information”](#) on page 112 to record information about your storage.

Assigning ID Numbers to the Controllers and LUNs



When configuring your MSA, you must assign a unique ID number to each MSA controller *and* to each MSA storage LUN.

See the *HP StorageWorks 1000/1500 Command Line Interface reference guide* for specific instructions.

Configuration Procedures - Tru64 UNIX Environments



Deploying the MSA in a Tru64 UNIX environment involves:

1. Completing all [Prerequisites](#), page 89
2. [Updating MSA controller firmware \(if necessary\)](#), page 90
3. [Configuring the storage](#), page 91

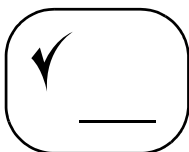
Each of these procedures is discussed in the following paragraphs.

Note: HP recommends installing your MSA in the sequence of steps listed here and in chapter 1 of this guide. Specific dependencies exist, and if you deviate from this sequence, you may have to uninstall and then reinstall your device.

Prerequisites

- Install and connect all equipment correctly, as detailed in “[Installation Procedures - All Deployments](#)” on page 15.
- Verify that the operating system version installed on the server is supported for use with the MSA. For a current listing of supported operating system versions, see the QuickSpecs, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.
- An AlphaServer with a minimum of factory installed Tru64 UNIX software that supports the MSA, configured in a SAN switch zone with the MSA.
- Obtain documentation for the storage configuration tool you plan to use. Documentation for the ACU and the CLI are available on the Documentation CD and the Technical documents page of the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Updating MSA controller firmware (if necessary)



If you need to update the firmware on your MSA controller to a version downloaded from the MSA1500 web site, do so at this time.

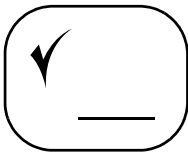
For information on determining whether you need to update MSA controller firmware, see:

- “[Determine which version MSA controller firmware to use](#)” on page 17
- “[Obtain desired controller firmware and Support Software CD versions](#)” on page 59

For instructions on updating MSA controller firmware, see the *HP StorageWorks Modular Smart Array 1000/1500 firmware updating guide*, available on the MSA1500 web site: <http://www.hp.com/go/msa1500cs>.

Note: After updating MSA controller firmware, be sure to check the status of the MSA for unexpected issues. Verify the status of the connections, defined profile types, redundancy settings, and storage configuration.

Configuring the storage



Thorough planning is critical to the successful and efficient deployment of any storage array system. As discussed in Chapter 1: “[Installation Procedures - All Deployments](#)” on page 15, plans should include decisions about total system capacity, fault-tolerance levels (availability), and performance.

Although detailed in the ACU and the CLI user guides, basic configuration tasks include (in the following sequence):

- Creating the arrays (LUNs).
- Entering controller settings, such as setting the read/write cache ratio, setting the rebuild/expand priority, and setting the redundancy level.
- Identifying the operating system type (also called Host Mode, Access Mode, Profile, or Connection Profile) of each HBA with access to the MSA. This ensures that the MSA will communicate properly with that host, be it Windows, Linux, HP-UX, OpenVMS, or Tru64.
- Verifying that each HBA with access to the MSA is indeed visible to the MSA.
- Entering Selective Storage Presentation options (also called Access Control Lists) to isolate the storage from unauthorized access. These settings indicate, by HBA, which LUNs the HBA can access.

Important: In multi-path configurations:

- Verify that both HBAs in each server have been granted access to the storage.
- In active/active configurations, manually assign a preferred path (controller ownership) for each LUN. By default, MSA firmware initially assigns ownership of all LUNs to the controller in slot one (front-right) of the MSA. Then, based on access patterns and I/O load, the firmware automatically re-assigns ownership of the LUN between the controllers to balance the load. If your environment controls load balancing from the host, you must manually assign the preferred path for each LUN.

Perform these tasks using your chosen configuration utility. Refer to the appropriate user documentation for procedural instructions.

Go to [Table 14: “Hard Drive Information”](#) on page 108 and [Table 15: “Array \(LUN\) Information”](#) on page 112 to record information about your storage.

Regulatory Notices



Regulatory Compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your device is assigned an HP Series number. The Series number can be found on the product label, along with the required approval markings and information. The product label is located on the right side of the chassis. When requesting certification information for this product, always refer to this Series number. This Series number should not be confused with the marketing name or model number for your storage system.

Federal Communications Commission notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the user must correct the interference at personal expense.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to comply with FCC Rules and Regulations.

Canadian notice (Avis Canadien)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (in brackets are the equivalent international standards):

- EN55022 (CISPR 22) - Electromagnetic Interference
- EN50082-1 (IEC801-2, IEC801-3, IEC801-4) - Electromagnetic Immunity
- EN60950 (IEC950) - Product Safety

Japanese notice

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Japanese power cord notice

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

BSMI notice

警告使用者：

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Laser compliance

The SFP Module contains a laser diode of either gallium aluminum arsenide (GaALAs) emitting in the wavelength range of 770-860 nm, or indium gallium arsenide phosphide (InGaAsP) emitting in the wavelength range of 1270-1355 nm. All HP systems equipped with a laser device comply with safety standards, including International Electrotechnical Commission (IEC) 825. With specific regard to the laser, the equipment complies with laser product performance standards set by government agencies as a Class 1 laser product. The product does not emit hazardous laser radiation.



WARNING: Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:

- Do not try to open the unit enclosure. There are no user-serviceable components inside.
 - Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
 - Allow only HP Authorized Service technicians to repair the unit.
-

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States. This device is classified as a Class 1 laser product as defined by IEC 825.



This indicates that the product is classified as a CLASS 1 LASER PRODUCT.

Battery replacement notice

Your MSA1500 is provided with a Lithium Manganese Dioxide, a Nickel-Metal Hydride, or a Vanadium Pentoxide, batteries. There is a danger of explosion and risk of personal injury if the array is incorrectly replaced or mistreated. Replace only with the HP spare designated for this product. For more information about battery replacement or proper disposal, contact your HP Authorized Reseller or your Authorized Service Provider.



WARNING: Your Accelerator Array contains Lithium Manganese Dioxide, Nickel-Metal Hydride, or Vanadium Pentoxide batteries. There is risk of fire and burns if the battery pack is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
 - Do not expose to temperatures higher than 60° C (140° F).
 - Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
 - Replace only with HP spare designated for this product.
-



Caution: Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. In order to forward them to recycling or proper disposal, please use the public collection system or return them to HP, your authorized HP Partners, or their agents.

Disposal of waste equipment by users in private households in the European Union



This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at this time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

Electrostatic Discharge



B

To prevent damage to the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

Prevention methods

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

Grounding methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ± 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the equipment suggested for proper grounding, either have an HP Authorized Reseller install the part or discharge any potential static by touching a piece of sheet metal immediately before touching the component or the MSA1500.

Note: For more information on static electricity, or assistance with product installation, contact your HP Authorized Reseller.

Worksheets



Use these worksheets to record information about your MSA.

Note: Although these worksheets are not prerequisites for installing your MSA, some of the information is required for multi-pathing, future configuration changes, and troubleshooting purposes.

The following worksheets are included in this section:

- [MSA1500 Information](#), page 102
- [External Fibre Channel Interconnect Device \(Switch\) Information](#), page 103
- [Server Information](#), page 104
- [Hard Drive Information](#), page 108
- [Array \(LUN\) Information](#), page 112

Table 11: MSA1500 Information

Component	Setting
<p>Configuration Type (check one)</p>	<p><input type="checkbox"/> Single-path, non-clustered <input type="checkbox"/> Single-path, clustered-servers <input type="checkbox"/> Multi-path, non-clustered <input type="checkbox"/> Multi-path, multiple clustered-servers</p>
<p>MSA1500</p> <p>Serial number (on the product label) Controller firmware: Version shipped on the controller Version available on the Web Support Software CD: Version shipped with the MSA1500 Version available on the Web MSA1500 WWNN MSA1500 WWPN</p> <p>Fibre Channel interconnect device (switch)</p> <p>Additional SCSI I/O module, in bus 1 slot Additional SCSI I/O module, in bus 2 slot Additional SCSI I/O module, in bus 3 slot</p> <p><i>Additional items for multi-path configurations:</i> Additional Controller Additional Fibre Channel I/O Module Additional switch</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>(See Table 12 External Fibre Channel Interconnect Device (Switch) Information)</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Yes <input type="checkbox"/> Yes</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> Yes <input type="checkbox"/> Yes</p>

Table 12: External Fibre Channel Interconnect Device (Switch) Information

Component	Setting
<p>Primary Switch</p> <p>Make and model Switch firmware version Switch IP Address Switch WWNN Switch WWPN</p> <p><i>Additional Device for Multi-Path Configurations:</i></p> <p>Make and model Switch firmware version Switch IP Address Switch WWNN Switch WWPN</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <u>(must be the same as the companion device)</u> <u>(must be the same as the companion device)</u> <hr/> <hr/> <hr/>
<p>Any Other Interconnect Device</p> <p>Make and model Switch firmware version Switch IP Address Switch WWNN Switch WWPN</p>	<hr/> <hr/> <hr/> <hr/> <hr/>
<p>Any Other Interconnect Device</p> <p>Make and model Switch firmware version Switch IP Address Switch WWNN Switch WWPN</p>	<hr/> <hr/> <hr/> <hr/> <hr/>

Table 13: Server Information

Component	Setting
Primary Server	
Make and model	_____
Operating system and version / kernel	_____
Service pack / Errata	_____
Server name	_____
HBA model	_____
HBA server slot location	_____
HBA firmware version	_____
HBA driver version	_____
HBA boot BIOS firmware	_____
HBA WWNN	_____
HBA WWPN (also called Adapter ID)	_____
<i>Additional Items for Multi-Path Configurations:</i>	
Multi-pathing software and version	_____
Additional HBA model	_____
Additional HBA server slot location	_____
Additional HBA WWNN	_____
Additional HBA WWPN	_____
<i>Additional Items for Clustered Configurations:</i>	
Clustering software and version	_____
Cluster cabling	_____
<p>Note: Worksheets for four (4) servers are provided in this table.</p> <ul style="list-style-type: none"> ■ Complete one worksheet for each server connected to your MSA1500. ■ If necessary, create additional copies of this worksheet. 	

Table 13: Server Information

Component	Setting
Additional Server	
Make and model	_____
Operating system and version / kernel	_____
Service pack / Errata	_____
Server name	_____
HBA model	_____
HBA server slot location	_____
HBA firmware version	_____
HBA driver version	_____
HBA boot BIOS firmware	_____
HBA WWNN	_____
HBA WWPN (also called Adapter ID):	_____
<i>Additional Items for Multi-Path Configurations:</i>	
Multi-pathing software and version	_____
Additional HBA model	<u>(must be the same as the companion device)</u>
Additional HBA server slot location	_____
Additional HBA WWNN	_____
Additional HBA WWPN	_____
<i>Additional Items for Clustered Configurations:</i>	
Clustering software and version	_____
Cluster cabling	_____

Table 13: Server Information

Component	Setting
Additional Server	
Make and model	_____
Operating system and version / kernel	_____
Service pack / Errata	_____
Server name	_____
HBA model	_____
HBA server slot location	_____
HBA firmware version	_____
HBA driver version	_____
HBA boot BIOS firmware	_____
HBA WWNN	_____
HBA WWPN (also called Adapter ID)	_____
<i>Additional Items for Multi-Path Configurations:</i>	
Multi-pathing software and version	_____
Additional HBA model	<u>(must be the same as the companion device)</u>
Additional HBA server slot location	_____
Additional HBA WWNN	_____
Additional HBA WWPN	_____
<i>Additional Items for Clustered Configurations:</i>	
Clustering software and version	_____
Cluster cabling	_____

Table 13: Server Information

Component	Setting
Additional Server	
Make and model	_____
Operating system and version / kernel	_____
Service pack / Errata	_____
Server name	_____
HBA model	_____
HBA server slot location	_____
HBA firmware version	_____
HBA driver version	_____
HBA boot BIOS firmware	_____
HBA WWNN	_____
HBA WWPN (also called Adapter ID)	_____
<i>Additional Items for Multi-Path Configurations:</i>	
Multi-pathing software and version	_____
Additional HBA model	<u>(must be the same as the companion device)</u>
Additional HBA server slot location	_____
Additional HBA WWNN	_____
Additional HBA WWPN	_____
<i>Additional Items for Clustered Configurations:</i>	
Clustering software and version	_____
Cluster cabling	_____

Table 14: Hard Drive Information

Box Number	Drive Bay	Transfer Rate	Drive Capacity	Spindle Speed	Array Letter (LUN #)
Box Number Assigned to this Enclosure _____	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				

Note: Recording information about the hard drives and their configuration is a two-step process:

- As you install the hard drives, record basic information about the drives in this table.
- As you configure the storage, enter the array letter (LUN #) of the drive in this table and record information about the arrays (LUNs) in [Table 15 "Array \(LUN\) Information"](#) on page 112.

Note: Worksheets for four (4) storage enclosures are included in this table.

- Complete one worksheet for each storage enclosure connected to your MSA1500.
- If necessary, create additional copies of this worksheet.

Table 14: Hard Drive Information

Box Number	Drive Bay	Transfer Rate	Drive Capacity	Spindle Speed	Array Letter (LUN #)
Box Number Assigned to this Enclosure _____	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				

Note: Box numbers are assigned to enclosures based on their connection to the MSA1500. See [Figure 2 “SCSI I/O modules, bus numbers, and box numbers”](#) on page 46 for the box number assignment pattern.

Table 14: Hard Drive Information

Box Number	Drive Bay	Transfer Rate	Drive Capacity	Spindle Speed	Array Letter (LUN #)
Box Number Assigned to this Enclosure _____	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				

Table 14: Hard Drive Information

Box Number	Drive Bay	Transfer Rate	Drive Capacity	Spindle Speed	Array Letter (LUN #)
Box Number Assigned to this Enclosure _____	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				

Table 15: Array (LUN) Information

Basic Settings			SSP (ACL) Settings		
Array Letter (LUN #)	Capacity	RAID Level	HBA WWPN or Name	Host Mode (Profile)	O/S Share Name

Table 15: Array (LUN) Information

Basic Settings			SSP (ACL) Settings			O/S Share Name
Array Letter (LUN #)	Capacity	RAID Level	HBA WWPN or Name	Host Mode (Profile)		

Table 15: Array (LUN) Information

Basic Settings			SSP (ACL) Settings			O/S Share Name
Array Letter (LUN #)	Capacity	RAID Level	HBA WWPN or Name	Host Mode (Profile)		

Index

A

- Array Configuration Utility (ACU)
 - best practices [23](#)
 - information about [62, 63](#)
 - installing
 - Linux environments [74, 80](#)
 - supported operating systems [62, 63](#)
- audience [8](#)
- authorized reseller, HP [14](#)

B

- battery replacement notice [96](#)
- best practices
 - cabling [45](#)
 - general [22](#)
 - racking [35](#)
 - SCSI cable connections [46](#)
- box number assignments [46](#)
- bus number assignments [46](#)

C

- cables
 - best practices [45](#)
 - cable management considerations [45](#)
 - connecting fibre cables, illustrated [51](#)
 - connecting power cords, illustrated [54](#)
 - connecting SCSI cables, illustrated [48](#)
 - fibre [50](#)
 - power [53](#)
 - recommended SCSI connections [46](#)
 - SCSI [46](#)
- cloning of firmware between controllers [55](#)

- Command Line Interface (CLI)
 - information about [61](#)
 - configuring the MSA1500
 - best practices [22](#)
 - operating-system-specific tasks [64](#)
 - steps to [59](#)
 - configuring the storage
 - available tools [61](#)
 - Linux environments [76](#)
 - planning of [28](#)
 - Windows environments [70, 82, 87, 91](#)
 - connecting the cables [50](#)
 - controller display
 - functionality [57](#)
 - controller display messages
 - box numbering [46](#)
 - controller, redundancy requirements [34](#)
 - conventions
 - equipment symbols [11](#)
 - text symbols [10](#)
 - converting rack rails for roundhole racks [37](#)

D

- documentation
 - MSA1500-related [9, 25, 26, 27](#)

E

- electrostatic discharge [99](#)
- enclosures
 - bus and box numbers [46](#)
 - installing [35](#)
- environment, requirements [32](#)

equipment symbols [11](#)

F

FCC notice [93](#)

fibre cables, connecting [50](#)

firmware

cloning in dual-controller configurations [55](#)

G

getting help [14](#)

grounding methods [100](#)

H

hard drives

approved models [41](#)

installing [41](#)

recommendations [30](#)

using spares [31](#)

HBA driver

best practices [22](#)

installing in Linux environments [66, 72](#)

installing in Windows environments [66](#)

help, obtaining [13](#)

High Availability web site [20](#)

Host Bus Adapter (HBA)

approved models [43](#)

installing in the server [43](#)

HP

authorized reseller [14](#)

storage website [14](#)

technical support [14](#)

HP-UX environments

prerequisites for the MSA1000 [77](#)

specific installation procedures [77](#)

I

Infrastructure web site [20](#)

Insight Manager

web site [20](#)

installing

hard drives [41](#)

option kits [34](#)

rack rails [37](#)

installing the ACU

Linux environments [74, 80](#)

installing the HBA driver

Linux environments [66, 72](#)

Windows environments [66](#)

installing the MSA1500

best practices [22](#)

illustrated steps [16](#)

listed steps [15](#)

installing the MSA1500 cs

recommendations [15](#)

interconnect devices

approved models [44](#)

at MSA1500 startup [58](#)

preparing for use with the MSA1500 [44](#)

L

LCD display [57](#)

LCD messages

at MSA1500 startup [57](#)

LEDs

MSA1500 [56](#)

Linux environments

configuring the storage [76](#)

installing the ACU [74, 80](#)

installing the HBA driver [66, 72](#)

prerequisites for the MSA1500 [71](#)

LUNs

configuration planning [28](#)

sizing considerations [31](#)

M

management server

best practices [23](#)

definition of [23](#)

management software, best practices [23](#)

messages, LCD

at MSA1500 startup [57](#)

O

- obtaining world wide port names
 - OpenVMS environments [84](#)
- OpenVMS environments
 - obtaining world wide port names [84](#)
 - prerequisites for the MSA1000 [83](#)
- operating systems
 - approved versions [42](#)
 - special configuration tasks [64](#)
 - upgrading [42](#)
- option kits
 - installing [34](#)
 - list of [34](#)
 - SCSI I/O module
 - recommendations [34](#)

P

- physical requirements [32](#)
- planning
 - completing the worksheets [19](#)
 - going to the Internet [20](#)
 - storage configuration [28](#)
 - using the Configuration poster [19](#)
- planning for your MSA1500 installation [17](#)
- power
 - applying to the MSA1500 [55](#)
 - connecting the power cord [53](#)
 - startup sequence [55](#)
- power cords
 - AC [53](#)
- power sources, recommendations [32](#)
- preparing for your installation [17](#)
- prerequisites [8](#)
 - HP-UX environments [77](#)
 - Linux environments [71](#)
 - OpenVMS environments [83](#)
 - Tru64 UNIX environments [65, 89](#)

R

- rack
 - approved models [35](#)

- best practices [35](#)
 - installing storage enclosures [35](#)
 - installing the MSA1500 in [35](#)
 - stability warning [12](#)
 - rack rails
 - converting for roundhole racks [37](#)
 - installing [37](#)
 - RAID levels [29](#)
 - recommendations
 - MSA1500 best practices [22](#)
 - power sources [53](#)
 - redundant
 - controller note [34](#)
 - fibre cables [50](#)
 - power cables [53](#)
 - redundant configurations
 - notes about [55](#)
 - regulatory compliance
 - country notices [94](#)
 - identification numbers [93](#)
-
- S**
 - SAN Infrastructure web site [20](#)
 - SCSI cables, connecting [34, 46](#)
 - SCSI connections, supported and unsupported [47](#)
 - SCSI I/O module, installing [34](#)
 - Secure Path
 - website [20](#)
 - securing the system to the rack [39](#)
 - server
 - at MSA1500 startup [58](#)
 - designating a management server [42](#)
 - preparing for use with the MSA1500 [42](#)
 - setup
 - illustrated steps [16](#)
 - listed steps [15](#)
 - recommendations [15](#)
 - shipping bracket [40](#)
 - sliding the system into the rack [39](#)
 - spare drives [31](#)
 - specifications, environmental requirements [33](#)

- start up, of the MSA1500 [57](#)
- startup sequence [55](#)
- status lights
 - MSA1500 [56](#)
- Step 1: Review and confirm your plans [17](#)
- Step 10: Power on the devices [55](#)
- Step 11: Configure your MSA [59](#)
- Step 2: Prepare your site [32](#)
- Step 3: Install MSA1500 option kits [34](#)
- Step 4: Rack the MSA1500 and the storage enclosures [35](#)
- Step 5: Install the hard drives [41](#)
- Step 6: Prepare your servers [42](#)
- Step 7: Install the HBA in your servers [43](#)
- Step 8: Prepare your switches [44](#)
- Step 9: Connect the cables [45](#)
- storage configuration
 - available tools [61](#)
 - in Linux environments [76](#)
 - in Windows environments [70, 82, 87, 91](#)
 - planning of [28](#)
 - recommendations [24](#)
- striping methods [29](#)
- support software CD
 - using in Linux environments [72](#)
- switches
 - approved models [44](#)
 - preparing for use with the MSA1500 [44](#)
- switches and hubs, verifying the status of [58](#)
- symbols

- in text [10](#)
- on equipment [11](#)

T

- technical support, HP [14](#)
- text symbols [10](#)
- Tru64 UNIX environments
 - prerequisites for the MSA1000 [65, 89](#)

V

- ventilation requirements [32](#)
- verifying the status
 - of servers [58](#)
 - of switches and hubs [58](#)
 - of the MSA1500 [57](#)

W

- warnings
 - power related [54](#)
 - rack stability [12](#)
 - symbols on equipment [11](#)
- websites
 - HP storage [14](#)
 - MSA1500 and SAN [20](#)
- weight considerations [32](#)
- Windows environments
 - configuring the storage [70, 82, 87, 91](#)
 - installing the HBA driver [66](#)
 - specific installation procedures [65](#)