

Maintenance and
Service Guide

hp StorageWorks Modular Smart Array 1500 cs

First Edition (April 2004)

Part Number: 356606-001

This guide provides procedures and diagnostics needed for the maintenance and troubleshooting of the Modular Smart Array 1500 Controller Shelf (MSA1500 cs).



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About This Guide

This maintenance and service guide provides information to help you:

- Service the MSA1500 cs
- Troubleshoot the MSA1500 cs
- Reference the MSA1500 cs



WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs can create conditions that are hazardous.



WARNING: Only authorized technicians trained by HP should attempt to repair this equipment. All troubleshooting and repair procedures are detailed to allow only subassembly/module-level repair. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.



WARNING: To reduce the risk of personal injury from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create conditions that are hazardous.



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

- Disconnect power from the system by unplugging all power cords from the power supplies.
 - 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.
-



Caution: To properly ventilate the system, you must provide at least 7.6 cm (3.0 in.) of clearance at the front and back of the server.



Caution: The computer is designed to be electrically grounded (earthed). To ensure proper operation, plug the AC power cord into a properly grounded AC outlet only.

Note: Any indications of component replacement or printed wiring board modifications may void any warranty.

“About This Guide” topics include:

- [Overview](#), page 9
- [Conventions](#), page 10
- [Rack stability](#), page 12
- [Getting help](#), page 12

Overview

This section covers the following topics:

- [Intended audience](#)
- [Prerequisites](#)
- [Related documentation](#)

Intended audience

This book is intended for use by system administrators and technicians who are experienced with the following:

- SAN management
- Network administration
- Network installation

Prerequisites

Before you service the MSA1500 cs, make sure you consider the items below.

- Knowledge of operation system
- Knowledge of related hardware/software
- Previous version of the product/firmware

Related documentation

In addition to this guide, HP provides corresponding information:

- *HP StorageWorks MSA1500 cs Configuration Overview*
This poster illustrates common MSA1500 cs deployments and includes a checklist and worksheet for you complete, to help ensure that you have all of the items needed for your MSA1500 cs installation.
The poster is a companion piece to this Installation Guide.
- *HP StorageWorks Modular Smart Array 1500 cs Installation Guide*
This guide contains basic information about installing the MSA1500 cs.
- *Command Line Interface Reference Guide*
This guide contains information about using the CLI.
- *HP StorageWorks Modular Smart Array 1000 Controller Reference Guide*
This guide defines MSA1000 Controller display messages and discusses other controller reference information.
- *HP Array Configuration Utility User Guide*
This guide contains information about using the ACU.
Access the ACU web site to obtain the latest version of the guide at <http://h18000.www1.hp.com/products/servers/proliantstorage/software-management/acumatrix/index.html>

These documents, and others, such as white papers and release notes, are available on the **Technical Documents** page of the MSA1500 cs web site at:
<http://www.hp.com/go/msa1500cs>.

Conventions

Conventions consist of the following:

- [Document conventions](#)
- [Text symbols](#)
- [Equipment symbols](#)

Document conventions

This document follows the conventions in [Table 1](#).

Table 1: Document Conventions

Convention	Element
Blue text: Figure 1	Cross-reference links
Bold	Menu items, buttons, and key, tab, and box names
<i>Italics</i>	Text emphasis and document titles in body text
Monospace font	User input, commands, code, file and directory names, and system responses (output and messages)
<i>Monospace, italic font</i>	Command-line and code variables
Blue underlined sans serif font text (http://www.hp.com)	Web site addresses

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.

Tip: Text in a tip provides additional help to readers by providing nonessential or optional techniques, procedures, or shortcuts.

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.



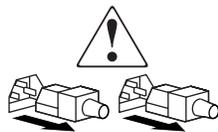
Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

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

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. To provide timely service you may be directed by HP to run these utilities to gather required entitlement information.

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
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

HP storage web site

The HP web site has the latest information on this product, as well as the latest drivers. Access storage at: <http://www.hp.com/country/us/eng/prodserv/storage.html>. From this web site, select the appropriate product or solution.

HP authorized reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518
- In Canada, call 1-800-263-5868
- Elsewhere, see the HP web site for locations and telephone numbers: <http://www.hp.com>.

Illustrated Parts Catalog



This chapter provides the illustrated parts breakdown and a spare parts list for the HP StorageWorks Modular Smart Array 1500 cs (MSA1500 cs). See [Table 2](#) for information on referenced parts.

MSA1500 cs mechanical parts and system components exploded view

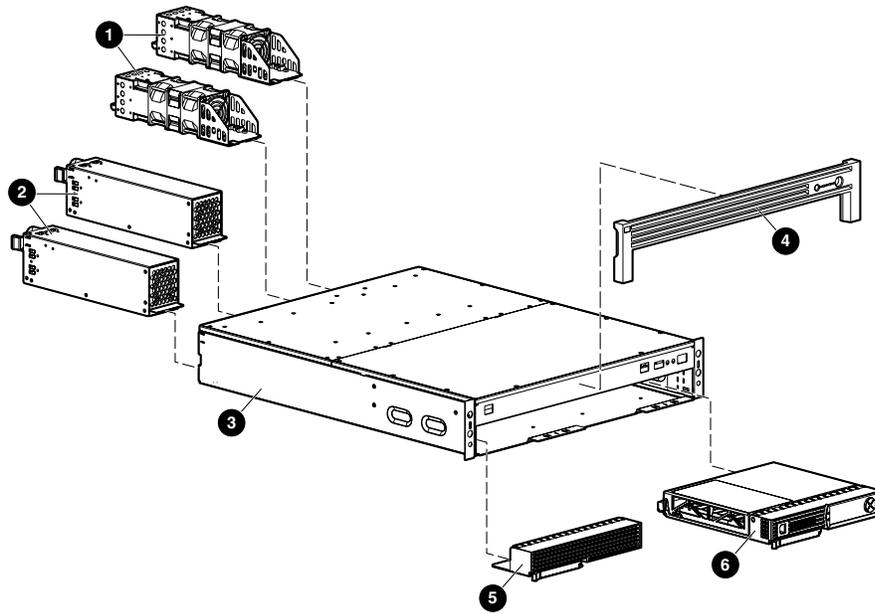


Figure 1: MSA1500 cs mechanical parts and system components exploded view

Note: The MSA1500 cs can support up to 96 SATA drives with the addition of 8 SATA expansion enclosures, or 56 SCSI drives with the addition of 4 SCSI expansion enclosures. The MSA1500 cs contains no internal drives.

Table 2: MSA1500 cs Mechanical Parts and System Components Spare Parts List

Item	Description	Spare Part Number	Hot-pluggable
	Chassis		
③	Chassis, 2U	70-41211-S1	N
④	Bezel	70-41220-S1	n/a
⑤	Controller blank	229208-001	n/a
	System Components		
	AC power cord (2) (not shown)	187335-001	N
	Power cords: (not shown) SPT-2 IEC-C13 IEC-C14 SPT-2 IEC-C13 IEC-C14	202974-001 202973-001	n/a
	Boards		
⑥	MSA1000 Controller	229203-001	Y
	Miscellaneous		
①	Fan module	349798-001	Y
②	Power supply	349800-001	Y
	Optical cables: (not shown) 1-Gb to 2-Gb connection 2-Gb to 2-Gb connection	263894-(001-007) 263895-(001-007)	n/a
	Cache module with battery (Bd, Dimm, Sdram, 128 mb, with battery) (not shown)	171387-001	N
	SFP transceiver (Transceiver, 650mm, Fc, 2 gb, Htplg) (not shown)	229204-001	Y

Removal and Replacement Procedures

2

This chapter provides subassembly/module-level removal and replacement procedures for the MSA1500 cs. After completing all necessary removal and replacement procedures, run the Diagnostics software described in [Chapter 3, Diagnostics](#) to verify that all components operate properly.



WARNING: To reduce the risk of personal injury or damage to the equipment, observe all warnings and cautions throughout this chapter.



WARNING: To reduce the risk of personal injury or damage to the equipment, the installation of options other than hotplug power devices should be performed only by individuals who are qualified in servicing computer equipment and trained to deal with products capable of producing hazardous energy levels.

To service the MSA1500 cs, the following tools are recommended:

- 4-mm flat-blade screwdriver (for SCSI cables)
- #2 phillips screwdriver (for 2U chassis)

Preparation procedures

System power to the MSA1500 cs does not shut off completely with the power switch. The two positions of the front panel power switch should be considered as ON and STANDBY, rather than ON and OFF. The STANDBY position removes power from most of the electronics and the drives, but portions of the power supply and some internal circuitry remain active. To remove all power from the system, you must disconnect the power cord from the storage system. In systems with multiple power supplies, you must disconnect all the power cords to remove power completely from the system.



WARNING: To reduce the risk of electric shock or damage to the equipment, disconnect power from the storage system by unplugging all power cords from either the electrical outlet or the MSA1500 cs.

Note: Before removing any serviceable part, determine whether the part is hot-pluggable or non-hot-pluggable. Hot-pluggable devices in the MSA1500 cs include the fan modules, power supplies, I/O modules and the MSA1000 controllers.

Hot-pluggable parts

If the part is hot-pluggable, a power shutdown of the device is not required for replacement of the part. Hot-pluggable devices in the MSA1500 cs include the power supplies, fan modules, SCSI I/O modules, Fibre Channel I/O modules, and MSA1000 Controllers.



WARNING: Before replacing a hot-pluggable component ensure that steps have been taken to prevent loss of data.

Non-hot-pluggable parts

If the part is non-hot-pluggable, the MSA1500 cs must be powered down. Non-hot-pluggable parts include the 2U chassis, and the power switch.



WARNING: To reduce the risk of personal injury or damage to the equipment, the installation of options other than hot-plug power devices should be performed only by individuals who are qualified in servicing computer equipment and trained to deal with products capable of producing hazardous energy levels.

Powering down the MSA1500 cs

Before beginning any of the removal and replacement procedures for non-hot-pluggable devices, do the following:

1. Hold down the Power On/Standby switch for five seconds.

Note: powering down the unit places the device in standby mode that disables the main power supply output and provides only auxiliary power (+5V) to the device.

2. Verify that the Power On/Standby switch power LED indicator is Green/Off and that the fans are off.
3. Disconnect all power cords from the AC outlets, and then from the device.



WARNING: To reduce the risk of injury from electric shock, remove all power cords to completely disconnect power from the system.

4. Disconnect all external peripheral devices from the MSA1500 cs.



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 warnings



WARNING: To reduce the risk of personal injury or damage to the equipment:

- Observe local occupational safety requirements and guidelines for heavy equipment handling.
- Obtain adequate assistance to lift and stabilize the product during installation or removal.
- Remove all pluggable power supplies and modules to reduce the weight of the product.
- Always load the heaviest item first, and load the rack from the bottom up. This makes the rack “bottom-heavy” and helps prevent the rack from becoming unstable.
- Extend the leveling jacks to the floor.
- Rest the full weight of the rack on the leveling jacks.
- Attach the stabilizing feet to the rack if it is a single-rack installation.
- The racks are coupled in multiple-rack installations.
- Fully extend the bottom stabilizers on the equipment. Be sure that the equipment is properly supported/braced when installing options and boards.
- Be careful when sliding the unit into the rack. The slide rails could pinch your fingertips.
- Ensure that the rack is adequately stabilized before extending a component outside the rack. Extend only one component at a time. A rack may become unstable if more than one component is extended for any reason.
- Do not attempt to move a fully loaded equipment rack. Remove equipment from the rack before moving the rack.
- At least two people are needed to safely unload the rack from the pallet. An empty 42U rack weighs 115 kg (253 lb), is over 2.1 meters (7 ft) tall, and may become unstable when being moved on its casters. Do not stand in front of the rack as it rolls down the ramp from the pallet; handle it from the sides. Stabilize the device by keeping the unit on the rails.



WARNING: Because the rack allows stacking of computer components on a vertical rather than horizontal plane, ensure that precautions have been taken to provide for rack stability and safety. It is important to follow these precautions providing for rack stability and safety, and to protect both personnel and property. Heed all cautions and warnings throughout the installation instructions provided with the device.

Device warnings and precautions



WARNING: The installation of internal options and service of this product should be performed by individuals who are knowledgeable about the procedures, precautions, and hazards associated with equipment containing hazardous energy levels.



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

- Allow the product to cool before removing covers and touching internal components.
- 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.
- Disconnect power from the device by unplugging the power cord from either the electrical outlet or the device.
- Do not use conductive tools that could bridge live parts.
- Remove all watches, rings, or loose jewelry when working in hot-plug areas of an energized device.

-Or-

- The device should be installed in a controlled access location where only qualified personnel have access to the device.
 - Power down the equipment and disconnect power to all AC power cords before removing any access covers for non-hot-pluggable areas.
 - Do not replace non-hot-pluggable components while power is applied to the product. First, shut down the product and disconnect all AC power cords.
 - Do not exceed the level of repair specified in the procedures in the product documentation. All troubleshooting and repair procedures are detailed to allow only subassembly or module-level repair. Because of the complexity of the individual boards and subassemblies, do not attempt to make repairs at the component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard.
 - Verify that the AC power supply branch circuit that provides power to the rack is not overloaded. Not overloading AC power to the rack power supply circuit reduces the risk of personal injury, fire, or damage to the equipment. The total rack load should not exceed 80 percent of the branch circuit rating. Consult the electrical authority having jurisdiction over your facility wiring and installation requirements.
-



Caution: Protect the installed solution from power fluctuations and temporary interruptions with a regulating Uninterruptible Power Supply (UPS). This device protects the hardware from damage caused by power surges and voltage spikes, and keeps the system in operation during a power failure.

Connecting the power

It is strongly recommended to use the power cord that is shipped with your MSA1500 cs. If using a different power cord your power cord should be approved for use in your country. The power cord must be rated for the product and for the voltage and current marked on the electrical ratings label of the product. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 1.02 mm² or 18 AWG. If you are using 18 AWG, your maximum length may be up to 3.65 meters.

A power cord should be routed so that it is not likely to be walked on or pinched by items placed upon it or against it. Particular attention should be paid to the plug, electrical outlet, and the point where the cord exits from the product.

After all hardware components are installed and the unit is in place, the power can be connected.

1. Plug the AC power cord into the MSA1500 cs. The power supply automatically senses the input voltage. It is not necessary to select the correct main voltage.



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

- Do not disable the power cord's 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.
 - Disconnect power from the storage system by unplugging all power cords from the storage system.
-

2. Plug the AC power cord into a nearby, grounded outlet.
3. Plug the second AC power cord into the redundant power supply.
4. Plug the second AC power cord into a grounded outlet nearby.

Applying power

Before applying power to the MSA1500 cs all components of the storage system must be installed and connected to the supported interconnect options

The MSA1500 cs components must be powered up in the following order:

1. **Storage Enclosures**—Power on all storage expansion enclosures.
2. **MSA1500 cs**—Power the MSA1500 cs on with the power switch located in the far-right lower area of the front panel. After powering on, wait until the message “MSA1000 Startup Complete” appears on your display. This process may take up to two minutes.
3. **Server(s)**—Ensure that the servers that are attached to the MSA1500 cs are powered on.

MSA1000 Controller

Verifying component failure

Before replacing the controller, cache module, or batteries, use the following methods to verify the component failure.

Note: Record any failure indicators for reference purposes.

- Check the controller idle heartbeat LED ❶. If the LED is not blinking, it indicates a failure.
- Check the controller fault LED ❷. If the LED is on, it indicates a failure.

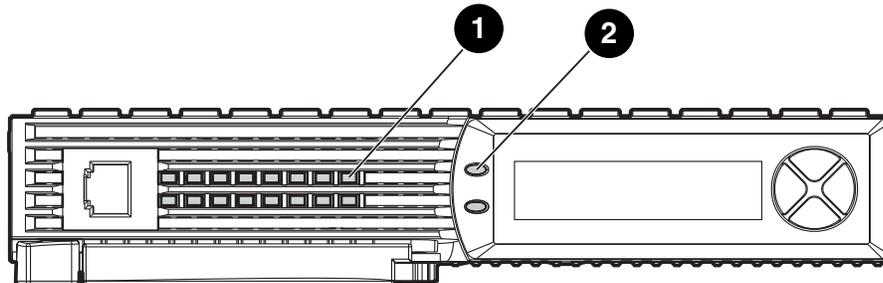


Figure 2: Controller indicators

- Check the LCD for one of the error messages listed in [Table 3](#).

Table 3: Controller Error Messages

No.	Message
03	CRITICAL LOCK-UP DETECTED. CODE=<n>h
50	REDUNDANCY FAILED OUT OF MEMORY
51	REDUNDANCY FAILED I/O REQUEST ERROR
52	REDUNDANCY FAILED PCI BUS ERROR
53	REDUNDANCY FAILED NO SECOND CONTROLLER

Table 3: Controller Error Messages

No.	Message
54	REDUNDANCY FAILED CACHE DIMMS MISMATCH
60	NO CACHE MODULE FOUND
66	CACHE HARDWARE FAILED AND DISABLED
73	CACHE HARDWARE BATTERIES MISSING
204	ARRAY CONTROLLER DISABLED
305	ROM CLONING FAILED
308	FIRMWARE FLASH FAILED
501	PCI SUBSYSTEM HARDWARE FAILURE
502	PCI BRIDGE ASIC SELF TEST FAILURE
513	UNCORRECTED ECC MEMORY ERROR SEEN
515	FIBRE DEVICE HARDWARE FAILURE
516	FIBRE SUBSYSTEM LINK FAILURE

- Remove the controller, wait 10 seconds, and then reinsert it, ensuring that it is fully seated in the chassis. If this does not resolve the issue, continue with the replacement procedures.



Caution: Before replacing any component including those that are hot-pluggable, ensure that steps have been taken to minimize downtime and prevent loss of data.

Replacing the MSA1000 Controller

The following steps detail how to replace a failed MSA1000 Controller.

Note: Before replacing your controller, follow these guidelines: If your system is equipped with a single controller, and this controller fails, it is recommended that the old cache module be migrated to a new controller. This is done to complete the disk writes that may have been trapped in the controller's cache. If an expand process is occurring, a dual controller system will transition into a non-redundant state. If a controller failure occurs during an expand process, it is required that the old cache module be migrated to the replacement controller to complete the expand process. If this is not done, the array contents will be invalid.

Note: The MSA1000 Controller is hot-pluggable and the unit does not need to be powered down in order to replace them.

1. Complete the preparation procedures. See the “[Preparation procedures](#)” on page 20 of this chapter.
2. Press the controller thumb latch and pull the latch handle toward you ❶.
3. Remove the MSA1000 Controller by pulling it straight out of the chassis ❷.

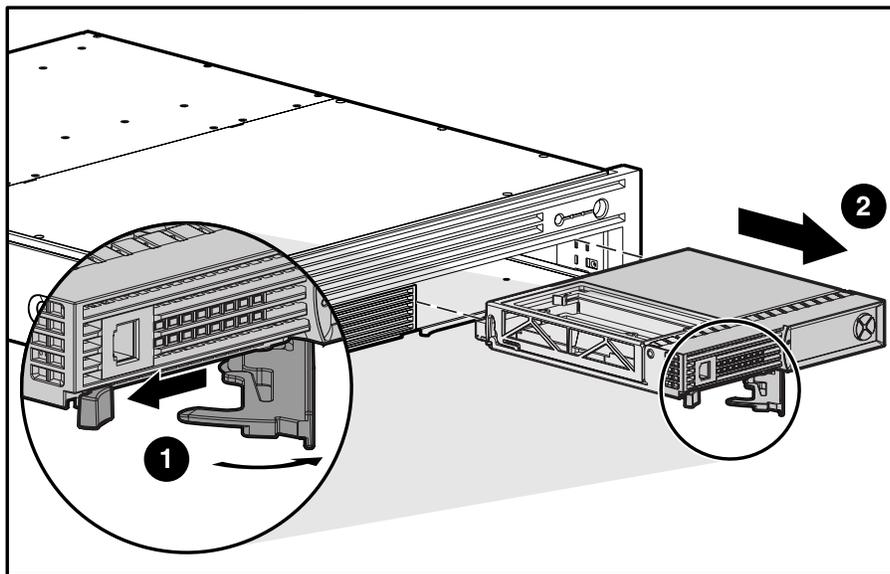


Figure 3: Removing the MSA1000 Controller

4. Insert the replacement controller into the chassis.
5. Push the controller in as far as it will go ❶ and press the latch inward until it is flush against the front panel ❷.

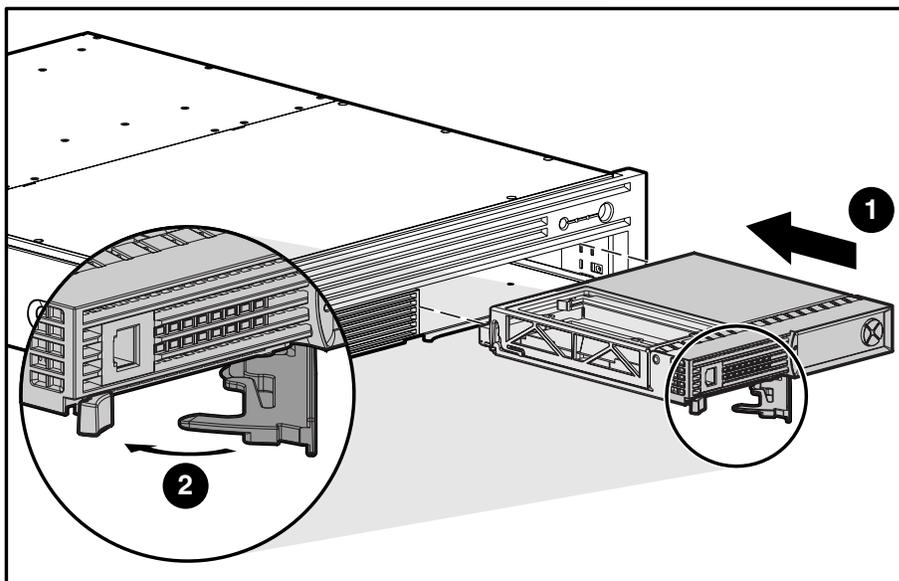


Figure 4: Installing the replacement controller

Replacing the MSA1000 Controller cache



Caution: It is important to follow these instructions when replacing components in the MSA1000. If the procedure is done improperly, it is possible to lose data or damage equipment. Refer to the “[Preparation Procedures](#)” section of this chapter for important information on using the proper procedures.

Note: If your system is equipped with a single controller, and you must replace the controller cache, you must power down the system first. If your system is equipped with two controllers, and you want to replace a failed cache module with another of the same size, you can replace the module while the system is running. If your system is equipped with two controllers, and you are replacing the cache module with a module of a different size, you must power down the system first, and then change the cache module on both controllers at the same time.



Caution: Before replacing any component including those that are hot-pluggable, ensure that steps have been taken to minimize downtime and prevent loss of data.

1. Complete the preparation procedures. See the “[Preparation procedures](#)” on page 20 of this chapter.
2. Press the thumb latch on the controller and pull the latch handle towards you **1**. See “[Removing the controller](#)” on page 29.
3. Remove the MSA1000 Controller by pulling it straight out of the chassis **2**.

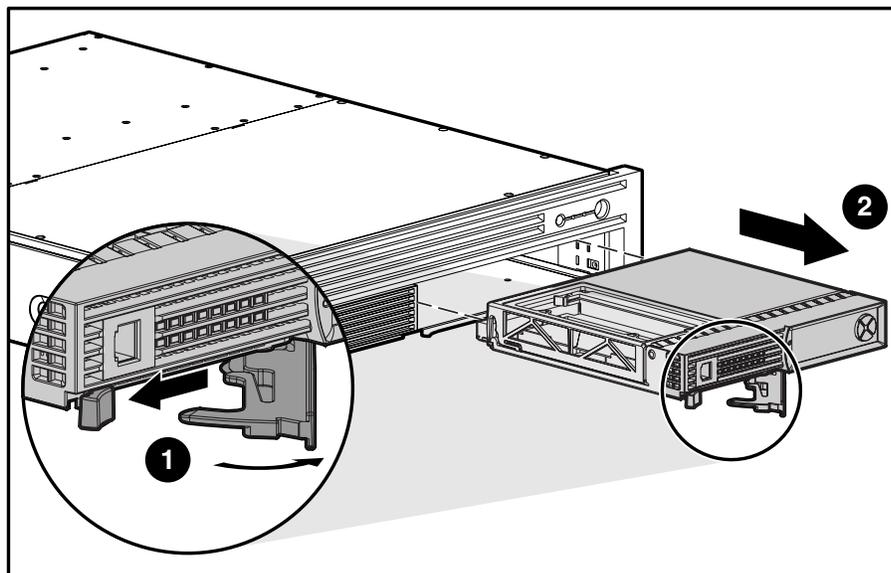


Figure 5: Removing the controller

4. As illustrated in [Figure 6](#), unlatch the controller cover clips **1** on the rear of the controller and then raise the cover **2**.

Note: The controller in [Figure 6](#) has been rotated so the side and rear of the controller are visible.

5. Simultaneously unlatch the clips that are holding the MSA1000 Controller cache in place **3**.
6. Carefully pull the cache away from the controller board **4**.

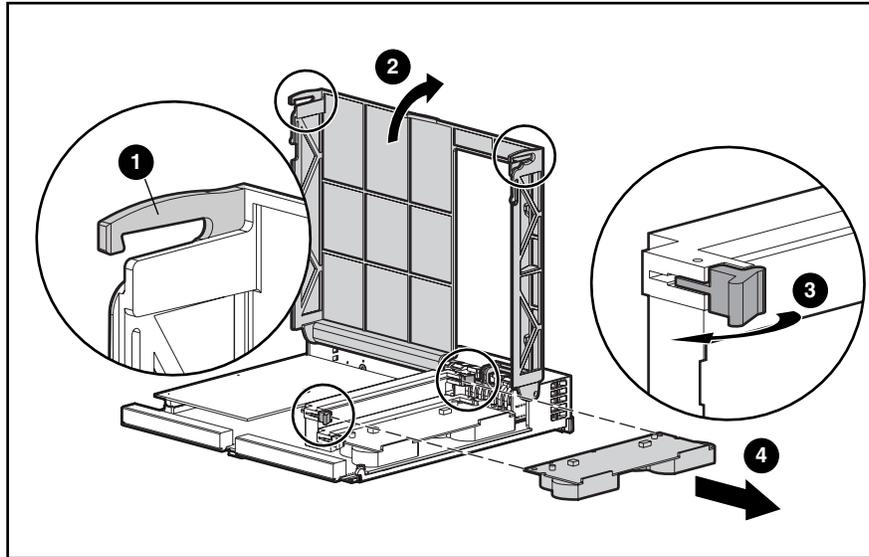


Figure 6: Removing the cache module

7. Install the new MSA1000 Controller cache by sliding the new MSA1000 Controller cache into the controller **1**. Be sure the side latches are fully engaged **2**. See [Figure 7](#).

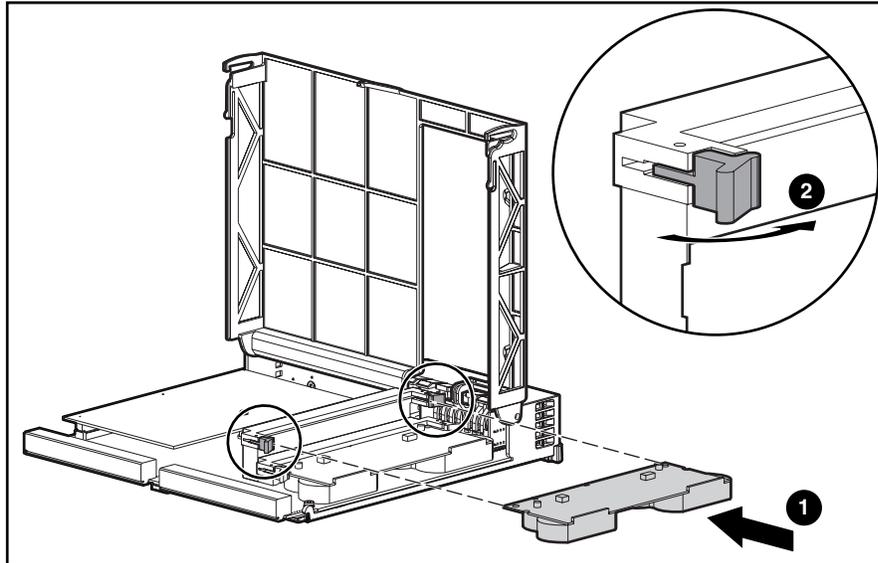


Figure 7: Installing the cache module

8. Push the controller in as far as it will go **1**; press the latch inward until it is flush against the front panel **2**. See [Figure 8](#).

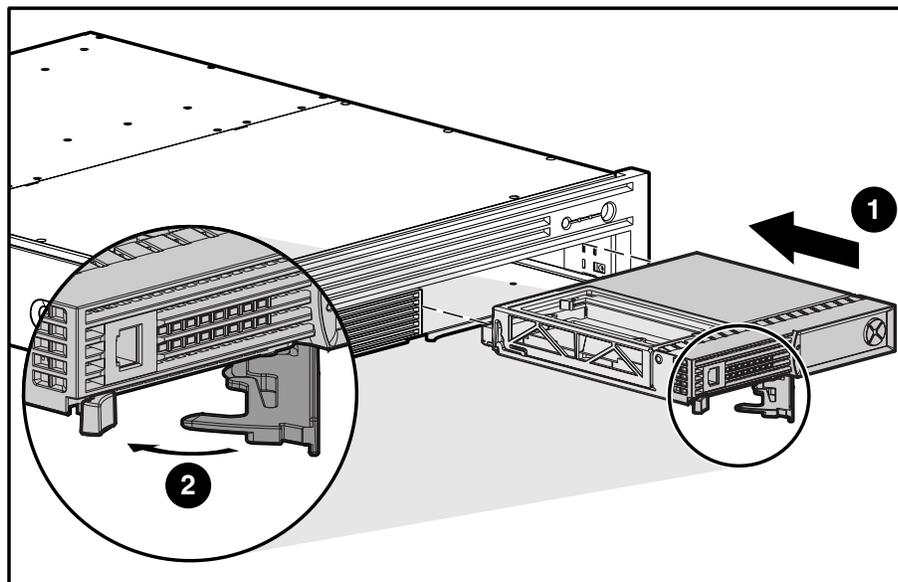


Figure 8: Installing the controller

Replacing the controller cache battery pack



WARNING: There is a risk of explosion, fire, or personal injury if the battery pack is replaced incorrectly or mistreated. To reduce the risk:

- Do not attempt to recharge the battery outside of the controller.
- Do not expose to water, or to temperatures higher than 60°C.
- Do not abuse, disassemble, crush, puncture, short external contacts, or dispose of in fire or water.
- Replace only with the spare designated for this product.
- Cache module battery disposal should comply with local regulations. Alternatively, return them by established parts return methods to Hewlett- Packard Corporation for disposal.



Caution: It is important to follow these instructions when replacing components in the MSA1000. If the procedure is done improperly, it is possible to lose data or damage equipment. Refer to [“Preparation procedures”](#) of this chapter for important information on using the proper procedures.

To remove the old NiMH battery pack:

1. Remove the MSA1000 Controller cache, as instructed in the previous section, [“Replacing the MSA1000 Controller cache.”](#)
2. Push down on the bottom clip of the battery pack, attached near the lower corner of the cache module.

See [Figure 9](#).

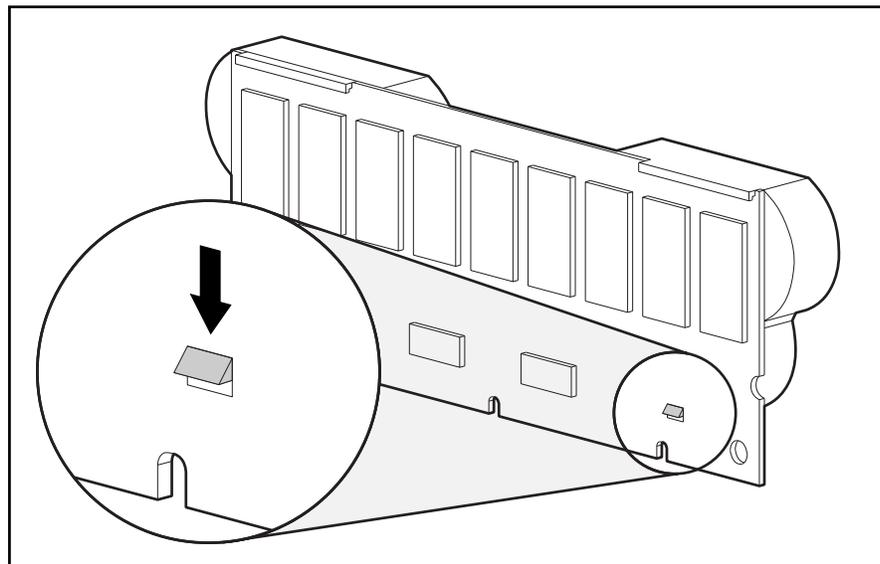


Figure 9: Bottom clip on battery pack

3. Swing the battery pack away from the cache module to about a 30-degree angle.

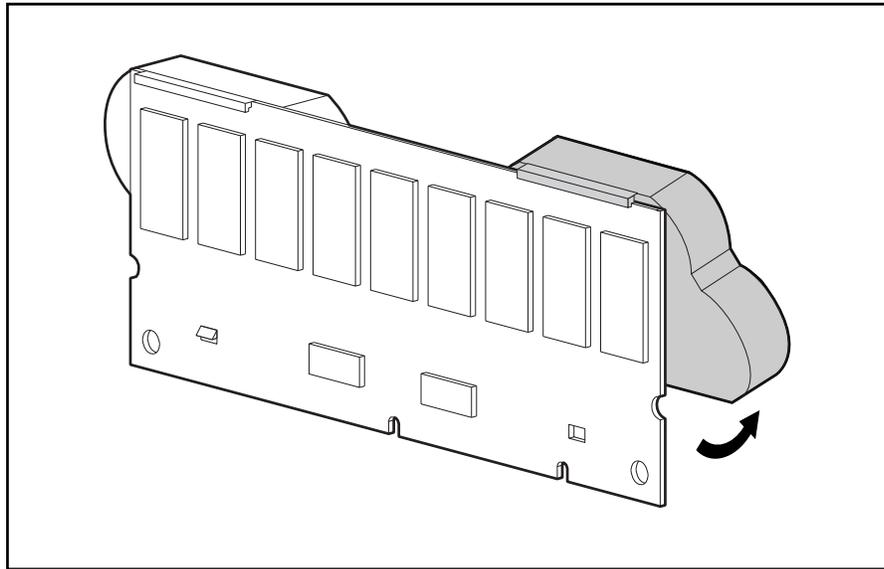


Figure 10: Angling the battery pack

4. Lift the pack upward to unhook the top of the battery pack.

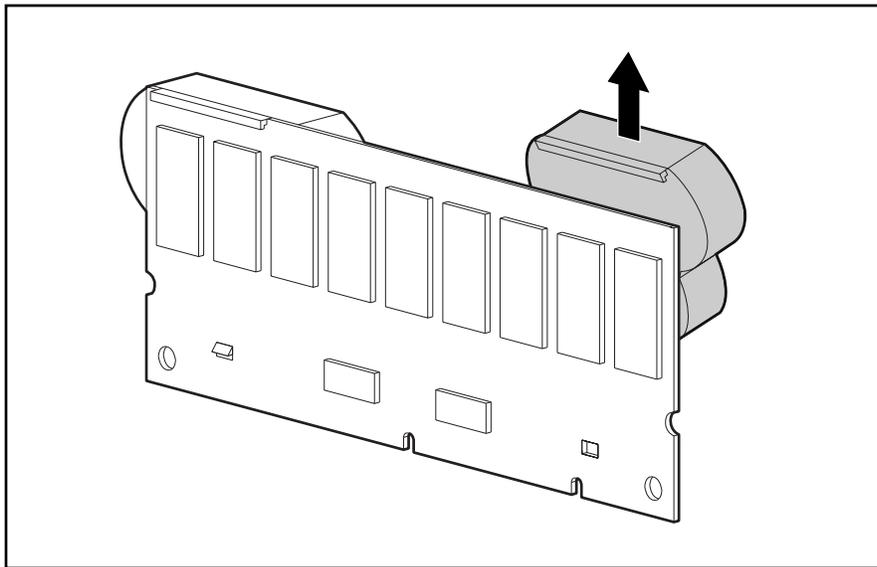


Figure 11: Removing the battery pack

5. Repeat for the second battery on this cache module.
Wait about 15 seconds after removing the old battery packs to allow the battery charge monitor to reset.

6. Install the new NiMH battery pack by hooking the top of the battery pack to the top of the cache module with the pack held at a 30-degree angle to the plane of the cache module board.

See [Figure 12](#) for an illustration.

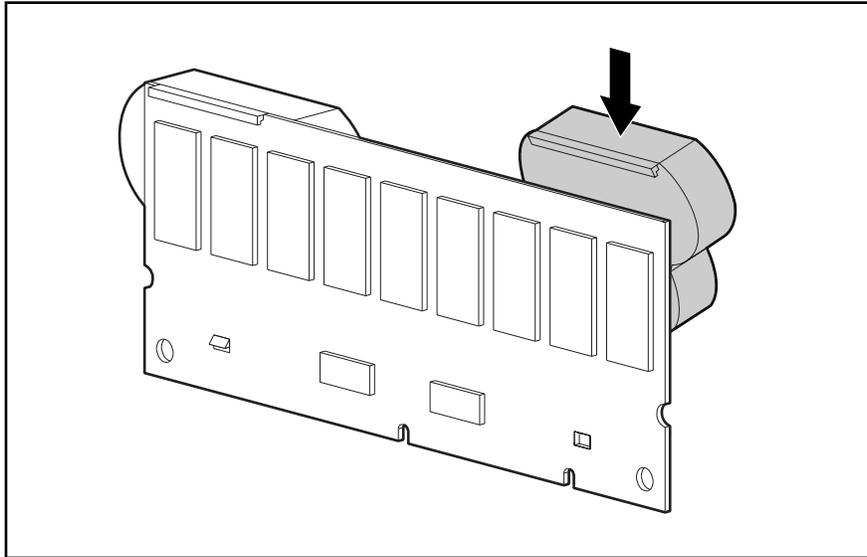


Figure 12: Installing the battery pack

7. After the pack is hooked in position, swing the pack downward making sure the bottom clip and two pegs line up with the holes in the cache module.
8. Make sure that the top hook **1** and bottom clip **2** on the battery pack are securely attached to the cache module.

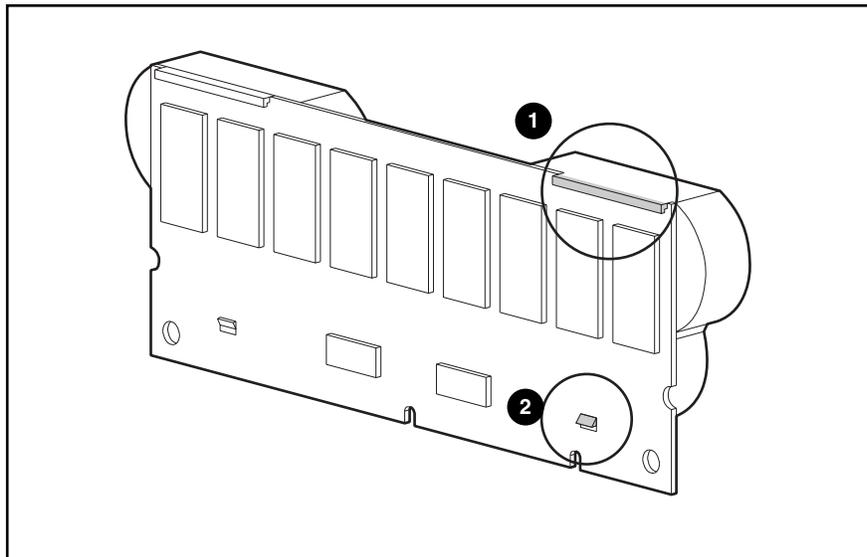


Figure 13: Securing the battery pack

9. Installation of the new battery is complete.

Hot-plug power supply

The power supplies for the MSA1500 cs are hot-pluggable and the unit does not need to be powered down to replace one.

Replacing a power supply

Verifying component failure

Before replacing the power supply use the following methods to verify the component failure.

- Check the controller LCD for the error message listed in [Table 4](#).

Table 4: Power Supply LCD Error Message

No.	Message
409	STORAGE BOX #<n> POWER SUPPLY FAILED

- The power supply indicator on the rear of the module is flashing amber.
- The system has power but the power supply indicator on the rear of the module is off.



Caution: Before replacing any component including those that are hot-pluggable, ensure that steps have been taken to minimize downtime and prevent loss of data. Removing a power supply significantly changes the airflow within the MSA1500 cs. To avoid possible overheating, always replace the power supply immediately. After removal of a power supply, the system will power down automatically if the internal temperature exceeds acceptable limits.

1. Complete the preparation procedures. See the “[Preparation procedures](#)” on page 20.
2. Disconnect the AC power cord from the failed power supply.

3. While pushing the power supply port-colored module latch ❶, pull the power supply out of the enclosure ❷.

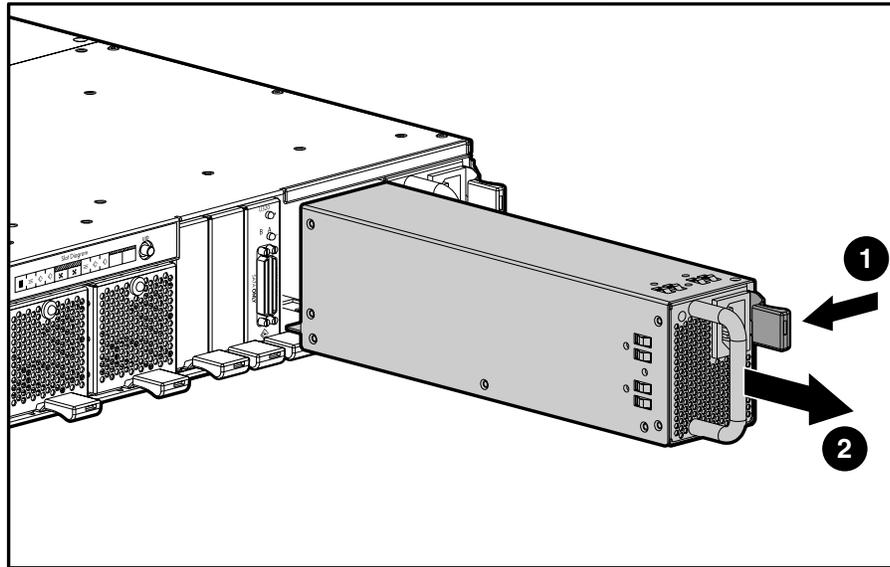


Figure 14: Removing the power supply

4. Install the replacement supply by lifting up on the power supply module latch and pushing in the base until the assembly is fully seated in the enclosure.

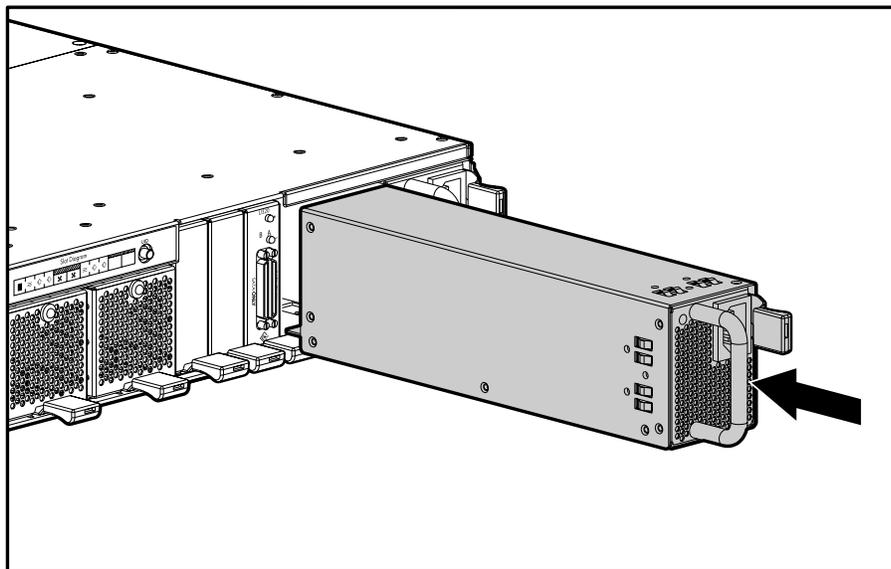


Figure 15: Installing the replacement power supply

Verifying the replacement

After replacing the failed power supply verify that:

- Check the controller LCD for the message listed in [Table 5](#).

Table 5: Power Supply LCD Verification Message

No.	Message
408	STORAGE BOX #<n> POWER SUPPLY OK

- The power supply indicator on the rear of the module is solid green.

Hot-plug fan module

The fan modules for the MSA1500 cs are hot-pluggable and the unit does not need to be powered down to replace one.

Replacing a fan module

Verifying component failure

Before replacing the fan module use the following methods to verify the component failure.

- Check the controller LCD for the error message listed in [Table 6](#).

Table 6: Fan Module LCD Error Message

No.	Message
401	STORAGE BOX #<n> FAN FAILED

- The system fault indicator on the enclosure is amber.
- The fan module indicator on the rear of the module is flashing amber.



Caution: Before replacing any component including those that are hot-pluggable, ensure that steps have been taken to minimize downtime and prevent loss of data. Removing a fan module significantly changes the cooling within the enclosure. To avoid possible overheating, always replace the fan module immediately. After removal of a fan module, the system will power down automatically if the internal temperature exceeds acceptable limits.

To replace the fan module:

1. Complete the preparation procedures. See the “[Preparation procedures](#)” on page 20.

2. Lift the port-colored fan module latch ❶ and pull the fan module out of the enclosure ❷.

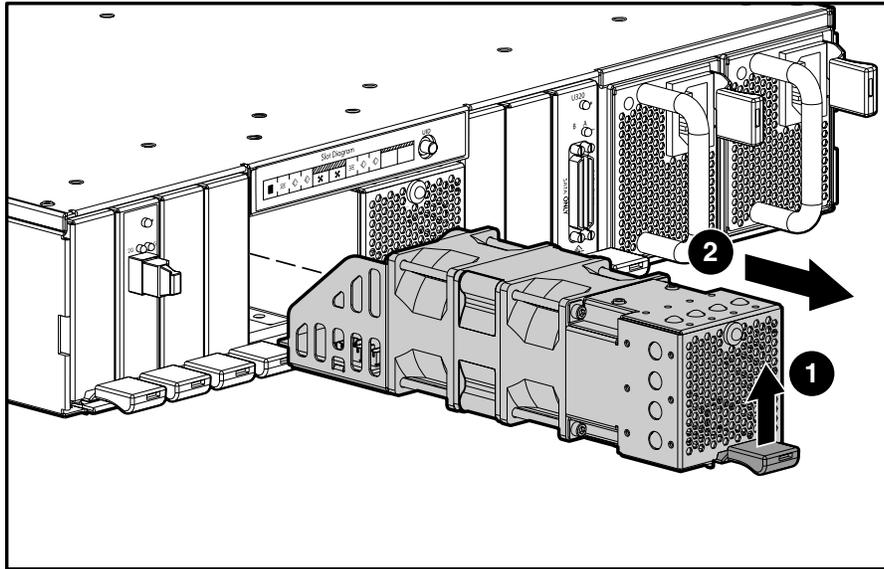


Figure 16: Removing the fan module

To install a fan module, slide it into the bay until it clicks into place.

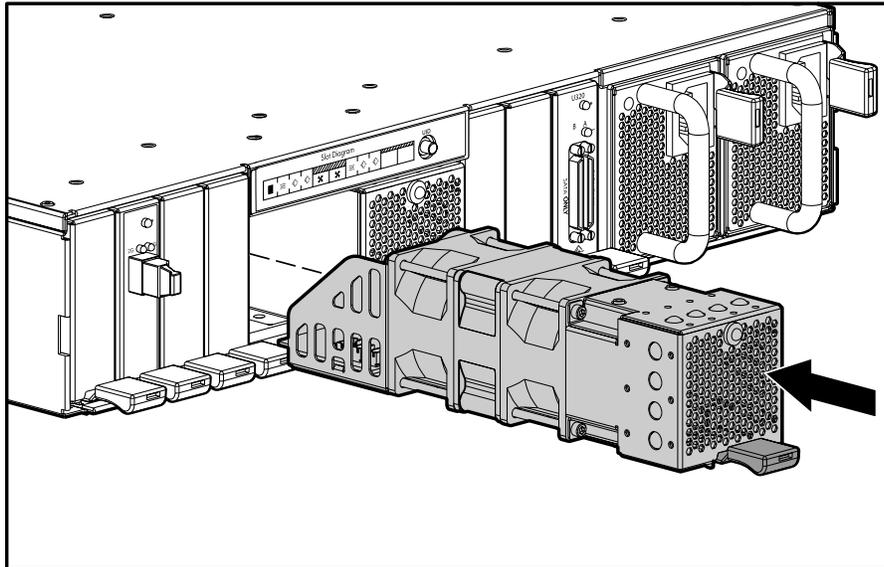


Figure 17: Installing the fan module

Verifying the Replacement

After replacing the failed fan module verify that:

- The controller LCD for the message listed in [Table 7](#).

Table 7: Fan Module LCD Verification Message

No.	Message
400	STORAGE BOX #<n> FAN OK

- The system fault indicator on the enclosure is off.
- The heartbeat LED is flashing green.
- The fan module indicator on the rear of the module is solid green.

SCSI I/O module

Replacing a SCSI I/O module

Verifying component failure

Before replacing the SCSI I/O module use the following methods to verify the component failure.

- Check the controller LCD for one of the error messages listed in [Table 8](#).

Table 8: SCSI I/O LCD Error Messages

No.	Message
23	SCSI SUBSYSTEM HARDWARE FAILURE
412	STORAGE BOX #<n> EMU NOT RESPONDING

- The status LED is not illuminated or is flashing amber.



Caution: Before replacing any component including those that are hot-pluggable, ensure that steps have been taken to minimize downtime and prevent loss of data. Removing a SCSI I/O module significantly changes the airflow within the enclosure. To avoid possible overheating, always replace the SCSI I/O module as soon as possible. After removal of a SCSI I/O module, the system will power down automatically if the internal temperature exceeds acceptable limits.

1. Complete the preparation procedures. See the “[Preparation procedures](#)” on page 20.

Note: Before removing the SCSI I/O module, label all cables. This ensures their reconnection in the correct configuration.

2. Disconnect all SCSI cables from the SCSI I/O module.

3. Lift the port-colored SCSI I/O module latch **1** and pull the SCSI I/O module out of the enclosure **2**.

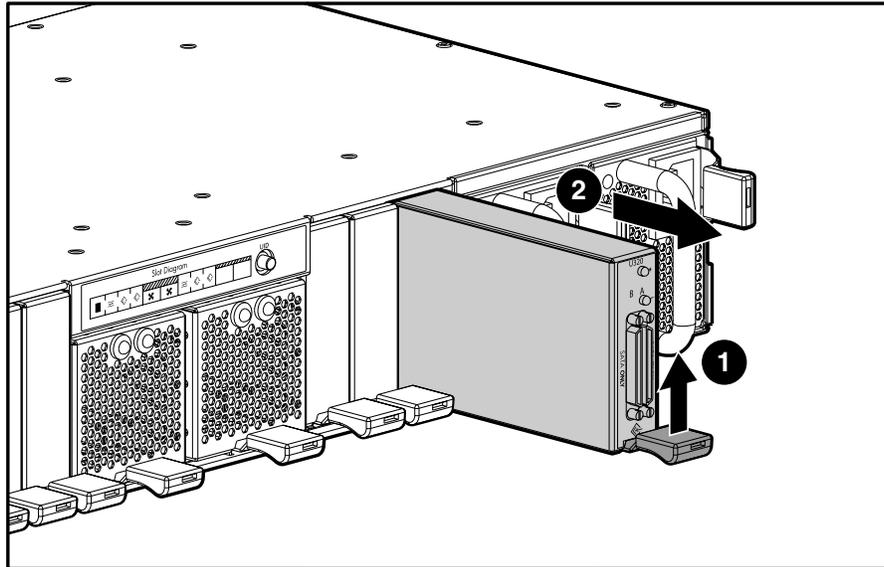


Figure 18: Removing the SCSI I/O module

4. Slide the SCSI I/O module into the bay until it clicks into place.

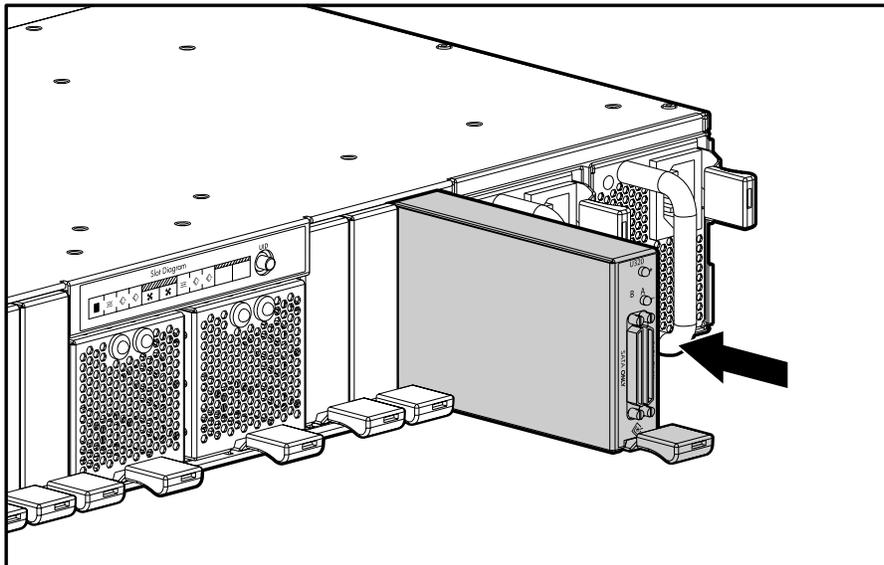


Figure 19: Installing the SCSI I/O module

5. Reconnect all SCSI cables.

Note: Make sure that all of the SCSI connectors are fastened tightly.

Verifying the replacement

After replacing the failed SCSI I/O module verify that:

- No error messages are displayed on the controller LCD.
- The status LED is solid green. Returning the failed component.

Fibre Channel I/O module

Replacing a Fibre Channel I/O module

Verifying component failure

Before replacing the Fibre Channel I/O module use the following methods to verify the component failure.

- Check the controller LCD for one of the error messages listed in [Table 9](#).

Table 9: Fibre Channel I/O Module LCD Error Messages

No.	Message
515	FIBRE DEVICE HARDWARE FAILURE
516	FIBRE SUBSYSTEM LINK FAILURE

- The status LED on the rear of the Fibre Channel I/O module is not illuminated or is flashing amber.
- The 1-GB LED is flashing amber.
- The 2-GB LED is flashing amber.



Caution: Before replacing any component including those that are hot-pluggable, ensure that steps have been taken to minimize downtime and prevent loss of data. Removing an Fibre Channel I/O module significantly changes the airflow within the enclosure. To avoid possible overheating, always replace the I/O module as soon as possible.

1. Complete the preparation procedures. See the “[Preparation procedures](#)” on page 20.



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).

2. Disconnect the fibre cable from the Fibre Channel I/O module.

3. Lift the port-colored Fibre Channel I/O module latch ❶ and pull the I/O module out of the enclosure ❷.

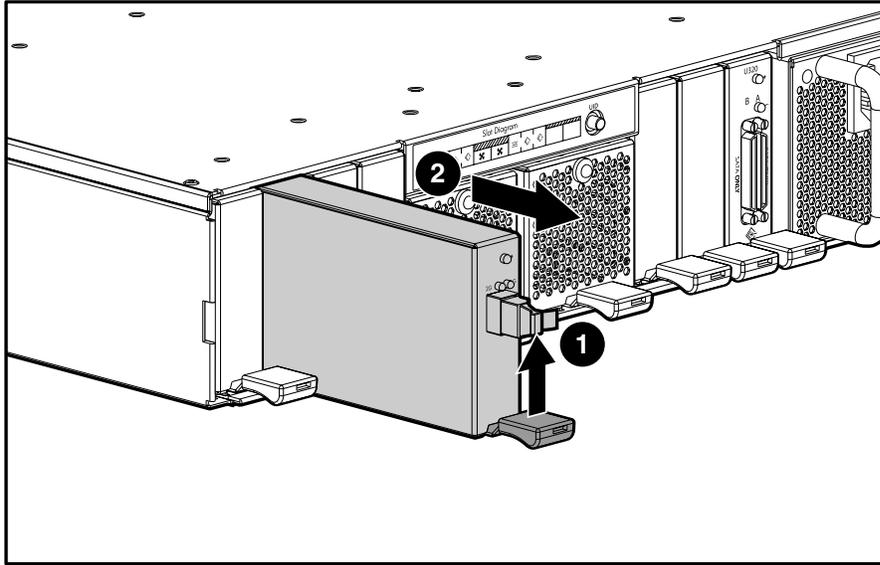


Figure 20: Removing the Fibre Channel I/O module

4. Slide it into the bay until the module clicks into place.

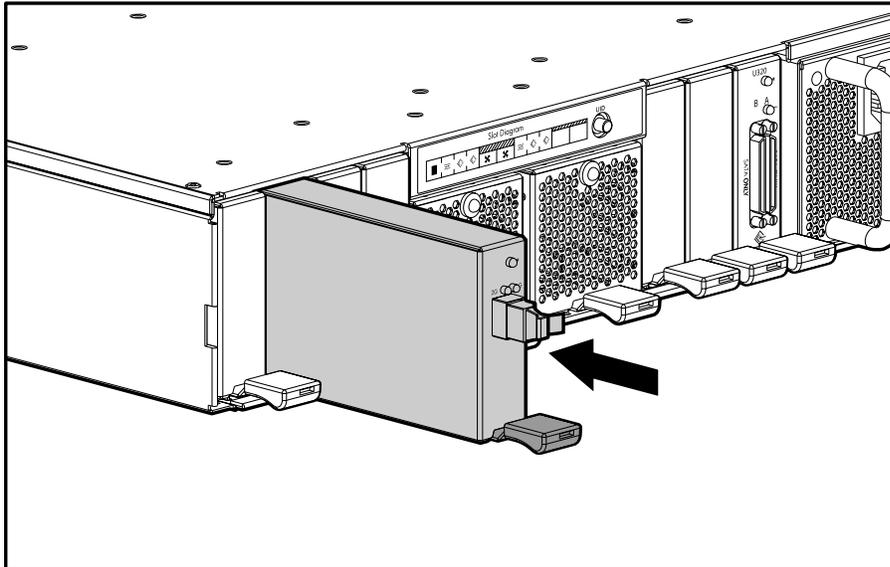


Figure 21: Installing the Fibre Channel I/O module

5. Move the SFP transceiver to the new Fibre Channel I/O module

Note: For instructions on replacing the SFP transceiver see [“Replacing a SFP transceiver”](#) on page 43.

Verifying the replacement

After replacing the failed Fibre Channel I/O module verify that:

- No error messages are displayed on the LCD.
- The status LED is solid green.
- The 1-GB LED is solid green.
- The 1-GB LED is solid green.

2-Gb Small Form Factor Pluggable (SFP) transceiver

Replacing a SFP transceiver

If a transceiver fails, follow this procedure to replace the failed transceiver. It is not necessary to power down the system.



Caution: Before replacing a hot-pluggable component ensure that steps have been taken to prevent loss of data.

Laser precautions



WARNING: To reduce the risk of injury from laser radiation or damage to the equipment, observe the following precautions:

- Do not open any panels, operate controls, make adjustments, or perform procedures to a laser device other than those specified herein.
 - Do not stare into the laser beam when panels are open.
-

1. Press the release clip on the bottom of the cable connector to remove the Fibre Channel I/O cable from the back of the failed transceiver.

- 2. Pull the release tab on the transceiver and pull the transceiver straight out of the device.

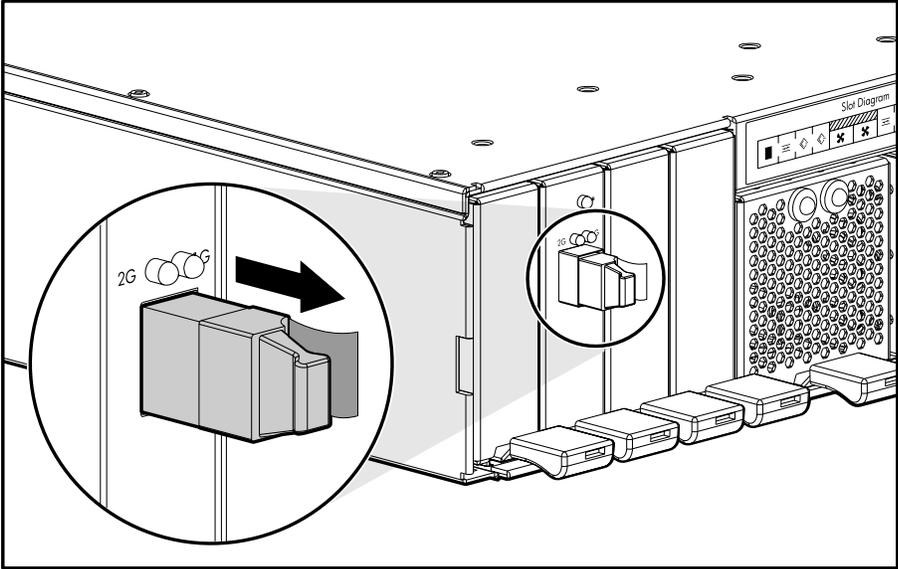


Figure 22: Removing the failed SFP

3. With the plastic tab facing to the right, insert the replacement transceiver straight into the device.

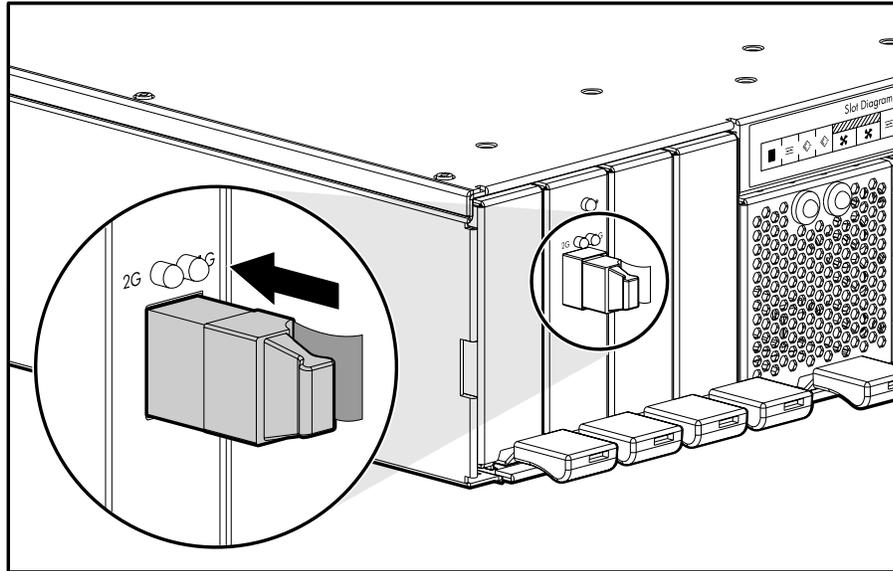


Figure 23: Installing a new SFP

4. Remove the dust cover from the SFP.

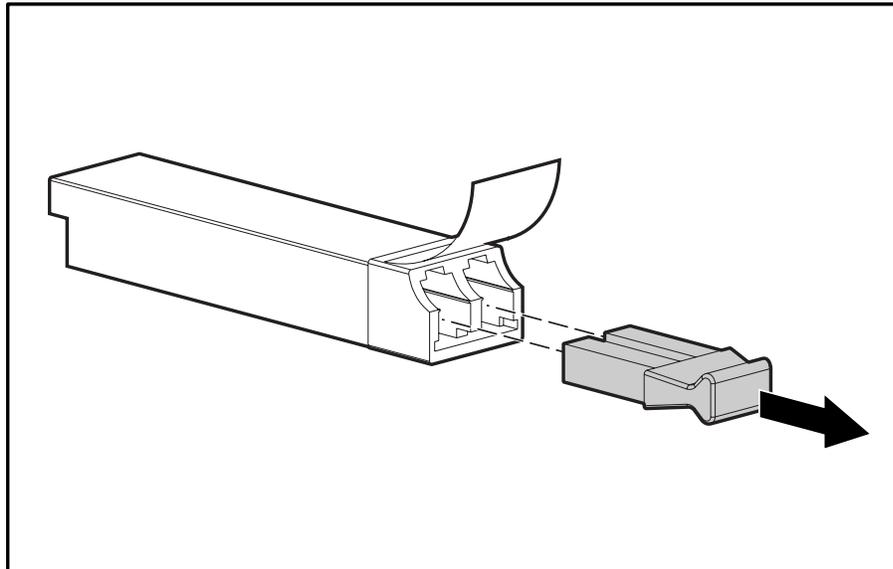


Figure 24: Removing the dust cover from the SFP

5. Insert the Fibre Channel I/O cable with the clip side to the left into the transceiver. The cable should snap into place.



Caution: To reduce the risk of damage to the equipment, do not use excessive force when inserting the transceiver.

Replacing the power switch assembly

The power switch assembly not hot-pluggable and the MSA1500 cs must be powered down and disconnected before the component can be replaced. For instruction on powering down the MSA1500 cs, refer to “[Powering down the MSA1500 cs](#)” on page 21.

To replace the power switch assembly:

1. Power down the MSA1500 cs.

Note: Before disconnecting any cables, label them so that they can be reconnected to the same connectors when the power switch assembly replacement is complete.

2. Disconnect the power cables from the MSA1500 cs.
3. Disconnect the fibre cable from the MSA1500 cs.
4. Disconnect the SCSI cables from the MSA1500 cs.
5. Remove the MSA1500CS from the rack.
6. Remove the bezel ❶ as shown in [Figure 25](#).
7. Remove the eight screws securing the top cover to the chassis ❷.



Caution: Before opening the MSA1500 cs, review the electrostatic discharge information contained in [Appendix B, Electrostatic Discharge](#).

8. Lift the front of the top cover and remove it from the chassis ❸, as shown in [Figure 25](#).

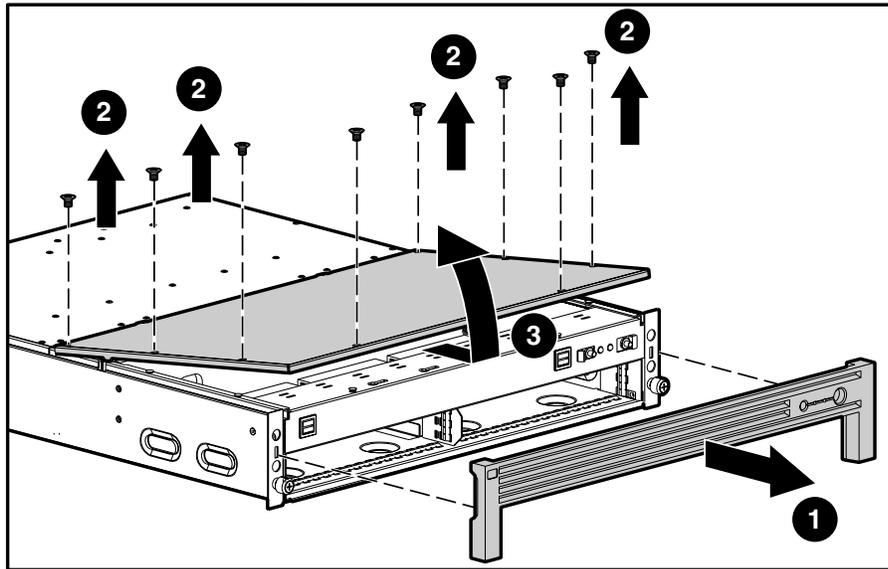


Figure 25: Removing the top cover

9. Unplug the power switch cable from the midplane, as shown in [Figure 26](#).

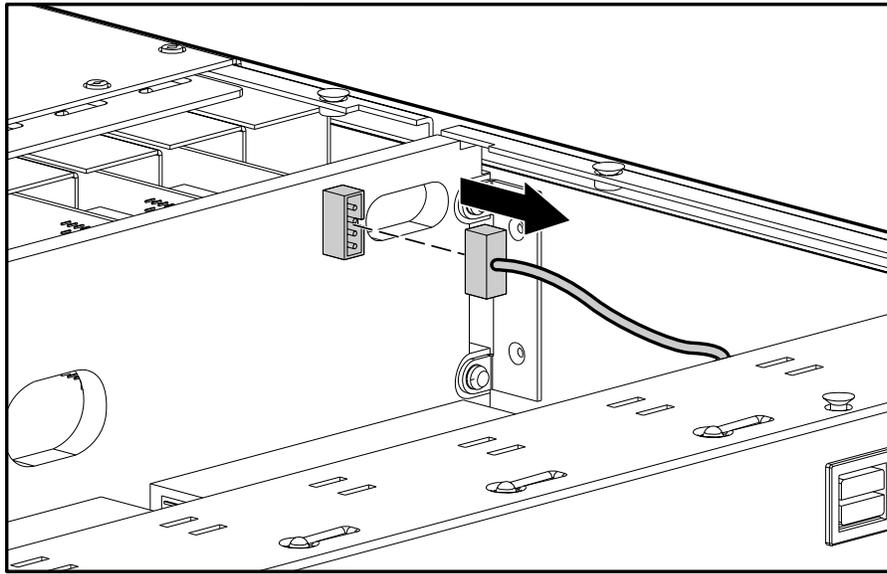


Figure 26: Unplugging the power switch cable

10. Press the release tab on the left side of the power switch assembly ❶ and then push the power switch assembly back to remove it ❷, as shown in [Figure 27](#).

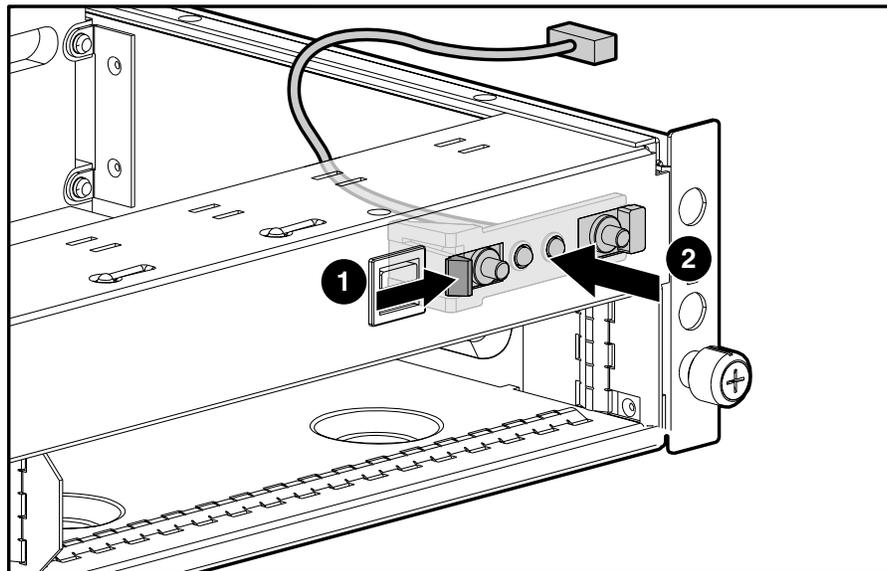


Figure 27: Removing the power switch assembly

11. Insert the new power switch assembly into the front panel and push into its seated position, as shown in [Figure 28](#).

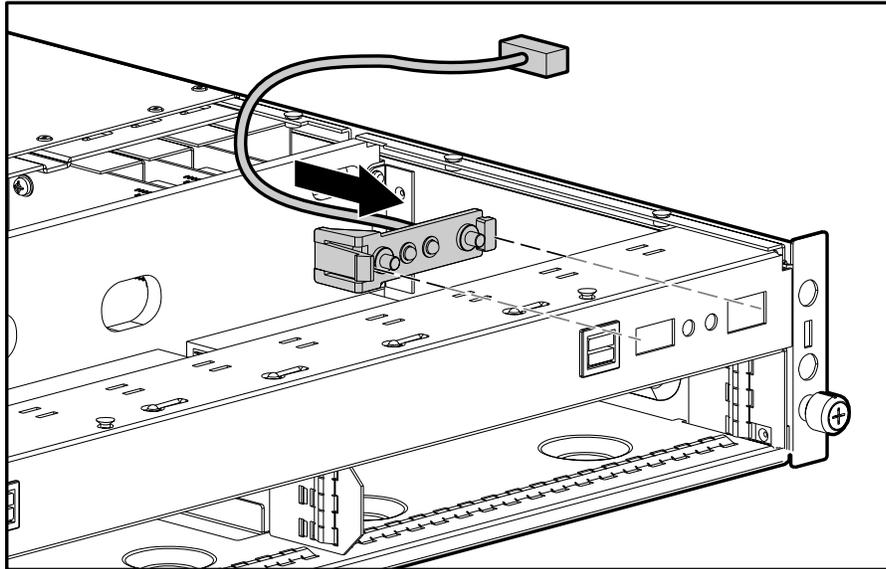


Figure 28: Reseating the power switch assembly

12. Connect the end of the power switch cable to the midplane as shown in [Figure 29](#).

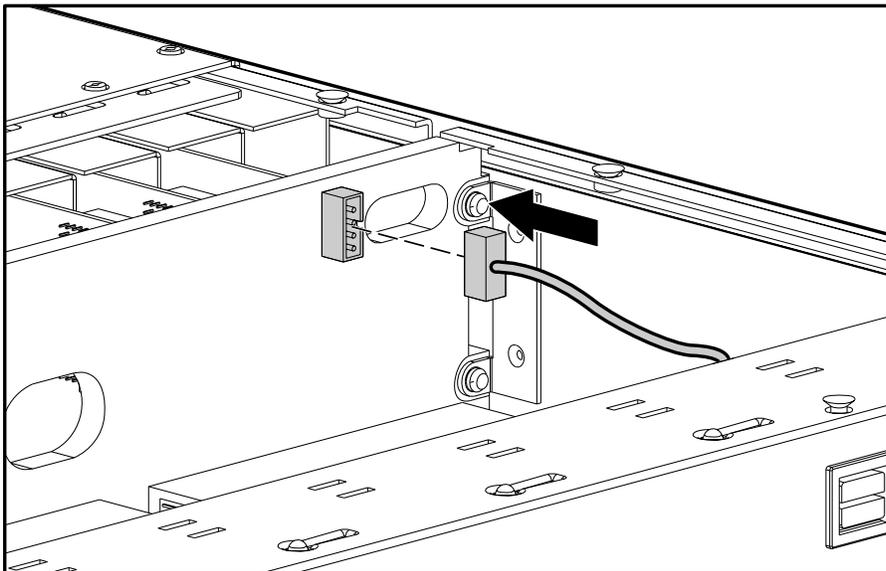


Figure 29: Connecting the power switch cable

13. Replace the top cover and fasten using the screws that were removed in [step 7](#).
14. Replace the bezel.
15. Reinstall the MSA1500 cs in the rack.
16. Reconnect the SCSI, fiber, and power cables.
17. Power on the MSA1500 cs.

Verifying the replacement

After replacing the failed power switch assembly verify that the power LED is illuminated.

Replacing a MSA1500 cs 2U chassis

In the event of a chassis failure, a new chassis must be ordered. All original component parts of the MSA1500 cs can be reinstalled to their respective locations in the new chassis. The MSA1500 cs must be powered down and disconnected before the chassis can be replaced. For instruction on powering down the MSA1500 cs, refer to [“Powering down the MSA1500 cs”](#) on page 21.

Note: Before disconnecting any cables and components, label them so that they can be reinstalled in the same position when the chassis replacement is complete.

The parts that will be removed and then reinstalled include:

- MSA1000 Controllers
For instructions on reinstalling the MSA1000 Controller, refer to [“Replacing the MSA1000 Controller”](#) on page 27.
- Hot-pluggable power supplies
For instructions on reinstalling the power supplies, refer to [“Replacing a power supply”](#) on page 35.
- Fan modules
For instructions on reinstalling the fan modules, refer to [“Replacing a fan module”](#) on page 37.
- SCSI I/O modules
For instructions on reinstalling the SCSI I/O modules, refer to [“Replacing a SCSI I/O module”](#) on page 39.
- Fibre Channel I/O modules
For instructions on reinstalling the Fibre Channel I/O modules, refer to [“Replacing a Fibre Channel I/O module”](#) on page 41.
- Slot and controller blanks

When finished, write the serial number, shown on the original chassis, on the label of the replacement chassis, located in the area shown in [Figure 30](#).

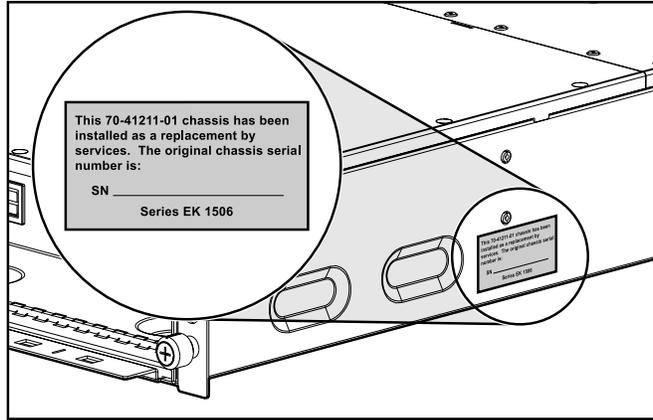


Figure 30: Replacement chassis serial number label location

Fibre Channel I/O cables

Multi-Mode Fibre Channel I/O cable

Multi-mode Fibre Channel I/O cables are capable of supporting distances of 2 m to 500 m (6.56168 ft to 1640.42 ft) at 1-Gb and 300 m at 2-Gb. These cables are for use with Short-wave transceivers only. To ease the installation of the HP StorageWorks MSA1500 cs, multi-mode Fibre Channel I/O cable option kits are available from HP. Each kit contains a multi-mode Fibre Channel I/O cable with a connector attached to each end.

The available 1-Gb to 2-Gb connection cable options are:

- 2-meter multi-mode Fibre Channel I/O cable option kit (part number 221691-B21)
- 5-meter multi-mode Fibre Channel I/O cable option kit (part number 221691-B22)
- 15-meter multi-mode Fibre Channel I/O cable option kit (part number 221691-B23)

Available 2-Gb to 2-Gb connection cable options are:

- 2-meter multi-mode Fibre Channel I/O cable option kit (part number 221692-B21)
- 5-meter multi-mode Fibre Channel I/O cable option kit (part number 221692-B22)
- 15-meter multi-mode Fibre Channel I/O cable option kit (part number 221692-B23)

To customize your system with multi-mode Fibre Channel I/O cable at distances greater than 15 meters, contact an independent Fibre Channel I/O cable supplier.

If you use an existing 62.5-micron cable, you must obtain a 62.5-micron jumper from an independent source. A 50-micron cable cannot be spliced with a 62.5-micron cable.

Diagnostics



3

Overview

This chapter describes software and firmware diagnostic tools available for the HP StorageWorks MSA1500 cs.

MSA1000 Controller indicators

During normal runtime, the MSA1000 Controller has 16 indicators that indicate activity or malfunction of the controller. They are labeled 1-16, as shown in the following figure. The table that follows describes the purpose and function of each indicator.

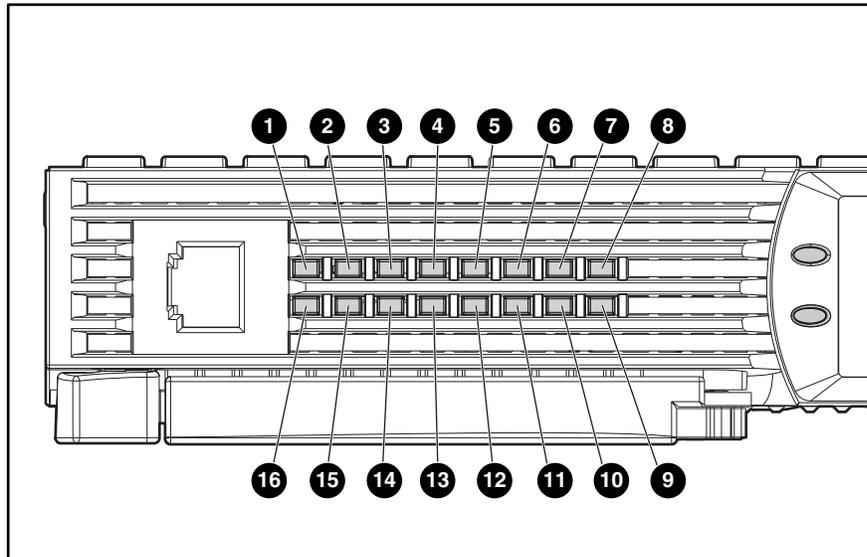


Figure 31: MSA1000 Controller indicators

Table 10: MSA1000 Controller Indicator Descriptions

Indicator	Function	Description
①	Drive failure	ON = A configured hard drive has failed in the array
②	Cache activity	ON = Cache active OFF = No cache activity Blinking = Cache transfer pending
③	SCSI Bus 1 active	ON = Indicates requests are outstanding on the second SCSI bus
④	SCSI Bus 0 active	ON = Indicates requests are outstanding on the first SCSI bus
⑤	Logical I/O active	ON = Currently processing logical requests from the Host Adapter
⑥	Direct Memory Access (DMA) active	ON = DMA transfers are active
⑦	Active/Standby	ON=Controller is active OFF=Controller is in standby
⑧	Idle heartbeat	Indicates the array controller is idle and functioning
⑨-⑪	Busy status	ON = Indicates this array controller is idle OFF = Indicates this array controller is operating at full capacity
⑫-⑯	Fibre Channel IDs	

MSA1000 Controller display

Each array controller in a MSA1500 cs contains an integrated Liquid Crystal Display (LCD). This module is used for displaying informational and error messages, showing the status of the module, and for providing user input when required. Traditional Power-On Self-Test (POST) messages issued by PCI-based array controllers have been combined with runtime event notification messages to create a new set of controller display messages.

The display module consists of the following components:

- A two line, twenty column display text display window
- Four navigation buttons arranged in a circular “pie” shape
- Two status indicator lights

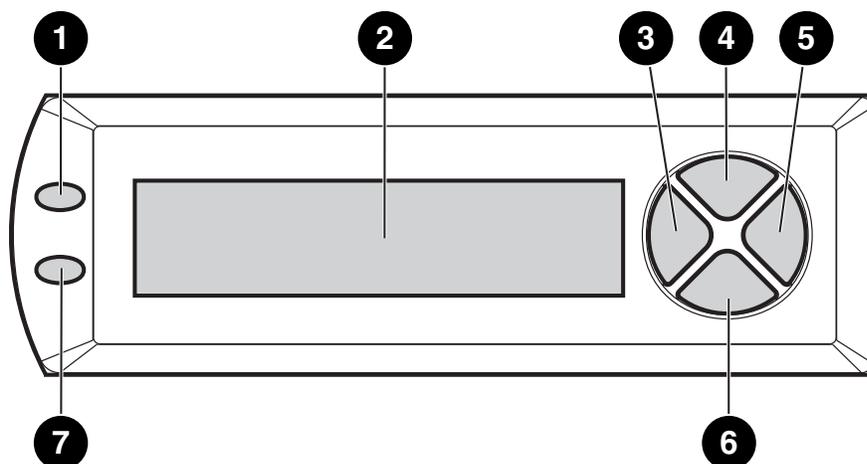


Figure 32: Controller display

Controller Display	Description
①	Fault indicator (amber) (indicates a component failure or external enclosure failure)
②	Display
③	Left navigation button
④	Up navigation button
⑤	Right navigation button
⑥	Down navigation button
⑦	Redundancy Link indicator (green)

Controller display messages

The display module is capable of holding up to 100 messages. After this maximum size is reached, older messages are removed to make room for newer ones. Messages can be of three types: error, informational, and user input.

The display message may specify a box number. The following box numbers are defined.

- Box 1 is the MSA1500 cs chassis.
- Box 2 is the storage enclosure attached to SCSI port A of the MSA1500 cs.
- Box 3 is the storage enclosure attached to SCSI port B of the MSA1500 cs.

Error messages

Error messages indicate that a problem has occurred and may require user action to correct it. A complete list of possible messages and their meanings is contained in this chapter.

An amber indicator to the left of the LCD display is turned on when an error message is currently displayed. This indicator is turned on if an error message was sent to the display module but has not been viewed because non-error type messages were sent to the display module afterwards. By scrolling backward and viewing all error messages, the indicator will reset and light when currently on an error message.

Informational messages

Informational messages indicate non-critical changes in the system that are provided as feedback to the user. A complete list of possible messages and their meanings is contained in this chapter.

The amber indicator to the left of the LCD display is off whenever an informational message is currently being viewed unless an unviewed error message was previously sent to the display module. By scrolling backward and viewing all error messages, the indicator will return to only lighting up when currently on an error message.

User input messages

User input messages indicate that the system has encountered a situation that allows user input. The user can select from a number of choices. If the user does not select one of the choices in a set amount of time, the system will select the default setting. These user input messages will only occur during system power on and not during run time. A complete list of possible messages and their meanings is contained in this chapter.

The amber indicator to the left of the display text display window will blink on and off when a user input message is currently being viewed and is available for input. If the user has not provided input within the time-out period, the message will remain but the indicator will stop blinking.

Scrolling

Older messages can be viewed by scrolling backward using the *up* navigation button (with the up arrow on it). Messages that are more recent can be viewed by scrolling forward using the *down* navigation button (with the down arrow on it). The last message can be viewed by pressing the *left* navigation button. When a new message is sent to the LCD, the display shows that message and ignores any previous scrolling position. This new message is now the most recent message available.

Deleting messages

The currently displayed message can be deleted from the display module by pressing the *left* navigation button and the *right* navigation button at the same time.

Redundancy link light

There is a green indicator to the left of the LCD display that is lit when two array controllers are inserted into the MSA1500 cs with controller redundancy enabled. The indicator is not lit if only one array controller is inserted or if the array controllers are not redundant due to some type of failure.

Note: You must have redundant cables connected to enable redundancy.

LCD Message Descriptions

The following table contains the defined messages and their components.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
00 ARRAY CONTROLLER FIRMWARE VER <version>	Informational	Displays the current version of the firmware running on the array controller.	
01 MSA1000 STARTUP COMPLETE	Informational	The array controller has completed its power on sequence and is now operational.	
02 ENABLE VOLUME <n>? \<'=NO, '>'=YES	User Input	An issue has been found with a configured volume that may result in data loss. The exact nature of the issue will be detailed in a previous display message.	Selecting the <i>no</i> option will result in the volume being disabled so the user can attempt to fix the issue. Selecting the <i>yes</i> option will result in the volume being enabled regardless of the issue.
03 CRITICAL LOCK-UP DETECTED. CODE=<n>h	Error	A critical error has been detected by the array controller firmware. In order to prevent any possible data loss, the firmware has entered a lock-up state. The code contains engineering specific information about the lock-up condition. HP support should be contacted.	Remove the failing array controller, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. Should the issue persist contact HP support.
04 ENABLE VOLUMES ? '<'=NO, '>'=YES	User Input	An issue has been found with all of the configured volumes that may result in data loss. The exact nature of the issue will be detailed in a previous display message.	An issue has been found with all of the configured volumes that may result in data loss. The exact nature of the issue will be detailed in a previous display message.
05 SYSTEM NAME: <name>	Informational	Displays the user assigned name for the MSA1500 cs system. This name can be assigned using the Array Configuration Utility (ACU).	
06 RESTARTING SYSTEM	Informational	Indicates that the system has been reset and is being restarted.	
20 INITIALIZING SCSI SUBSYSTEM	Informational	The SCSI subsystem is being initialized as part of the power on sequence.	
21 SCANNING FOR SCSI DEVICES	Informational	The firmware is searching for SCSI devices attached to the system as part of the power on sequence.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
22 INITIALIZING SCSI DEVICES	Informational	The firmware is initializing all SCSI devices attached to the system as part of the power on sequence.	
23 SCSI SUBSYSTEM HARDWARE FAILURE	Error	The SCSI subsystem on MSA1000 has experienced a hardware failure and is not operating correctly. The array controller has halted itself and cannot continue.	Contact HP support.
24 BAD SCSI BUS MODE NON-LVD DEVICE FOUND	Error	The MSA1000 does not support SCSI Single Ended (SE) devices, it only supports SCSI Low Voltage Differential (LVD) devices.	The MSA1500 cs should be powered off and then all SCSI devices attached to it should be examined. Any SE devices found should be removed and replaced with LVD devices.
30 I2C READ FAILURE <I2C device name>	Error	The MSA1500 cs has a number of internal devices that are accessed via an I2C hardware bus. One of these devices failed when attempting to read from it. Certain I2C devices are considered critical and will result in a failure of the array controller while others may result in some loss of functionality (such as lost display messages).	Should the issue persist contact HP support.
31 I2C WRITE FAILURE <I2C device name>	Error	The MSA1500 cs has a number of internal devices that are accessed via an I2C hardware bus. One of these devices failed when attempting to write to it. Certain I2C devices are considered critical and will result in a failure of the array controller while others may result in some loss of functionality (such as lost display messages).	Should the issue persist contact HP support.
32 CHASSIS NVRAM CONTENTS CORRUPTED	Error	The MSA1000 has non-volatile memory on it that contains required information which is needed to operate. This non-volatile memory appears to be corrupted and the information is not valid. The MSA1000 cannot continue to operate and will halt.	Contact HP support.
40 BEGIN REDUNDANCY SUPPORT	Informational	The array controllers are attempting to enter redundant mode.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
41 REDUNDANCY ACTIVE ACTIVE CONTROLLER	Informational	The array controllers are now in redundant mode and this array controller is active which means that it is allowed to access the configured volumes on the MSA1000.	
42 REDUNDANCY ACTIVE STANDBY CONTROLLER	Informational	The array controllers are now in redundant mode and this array controller is <i>standby</i> which means that it can be made <i>active</i> should the current <i>active</i> array controller fail, assuming you have all cables, and I/O modules installed.	
43 REDUNDANCY FAILED HARDWARE FAILURE	Error	While either attempting to enter redundant mode or already operating in redundant mode, one of the array controllers encountered a hardware failure on the communication channel between the two array controllers. Redundancy is disabled at this time.	<p>If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue then wait until down-time is available. Power off the MSA1500 cs, remove both array controllers and reinsert them insuring they are fully seated in the chassis.</p> <p>Should the issue persist contact HP support.</p>
44 REDUNDANCY FAILED MISMATCH HARDWARE	Error	Both array controllers must contain the same hardware for them to successfully enter redundant mode. The current array controllers do not contain the same hardware, possibly because one has an attached fibre daughter card and the other does not.	<p>If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, add or remove the fibre daughter card as needed, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue then wait until down-time is available. Power off the MSA1500 cs, remove both array controllers, add or remove fibre daughter cards as needed on both, and reinsert them insuring they are fully seated in the chassis.</p> <p>Should the issue persist contact HP support.</p>

Table 11: LCD Message Descriptions

Message	Type	Description	Action
45 REDUNDANCY FAILED MISMATCH FIRMWARE	Error	Both array controllers must be running the same version of firmware for them to successfully enter redundant mode. A process called firmware cloning that attempts to make them both the same firmware level has failed.	Manually update the firmware on the older array controller.
47 REDUNDANCY FAILED CACHE SIZE MISMATCH	Error	Both array controllers must have the same size of cache memory for them to successfully enter redundant mode.	If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, add or remove cache memory as needed, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. If this does not resolve the issue then wait until down-time is available. Power off the MSA1500 cs, remove both array controllers, add or remove cache memory as needed on both, and reinsert them insuring they are fully seated in the chassis. Should the issue persist contact HP support.
48 REDUNDANCY HALTED FIRMWARE CLONED	Informational	Both array controllers must be running the same version of firmware for them to successfully enter redundant mode. A process called firmware cloning has been successfully completed in order to make them both the same firmware level. The <i>standby</i> array controller will now be restarted automatically so they can attempt to achieve redundancy again.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
49 REDUNDANCY FAILED FIRMWARE LOCKUP	Error	While either attempting to enter redundant mode or already operating in redundant mode, one of the array controllers encountered a critical condition resulting in a firmware lockup. Redundancy is disabled at this time.	If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. If this does not resolve the issue then wait until down-time is available. Power off the MSA1500 cs, remove both array controllers, and reinsert them insuring they are fully seated in the chassis. Should the issue persist contact HP support.
50 REDUNDANCY FAILED OUT OF MEMORY	Error	While either attempting to enter redundant mode or already operating in redundant mode, one of the array controllers failed to allocate required memory. Redundancy is disabled at this time.	If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. If this does not resolve the issue then you wait until down-time is available. Power off the MSA1500 cs, remove both array controllers, and reinsert them insuring they are fully seated in the chassis. Should the issue persist contact HP support.
51 REDUNDANCY FAILED I/O REQUEST ERROR	Error	While either attempting to enter redundant mode or already operating in redundant mode, one of the array controllers encountered an error while sending I/O between the two array controllers over the communication channel between them. Redundancy is disabled at this time.	If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. If this does not resolve the issue then wait until down-time is available. Power off the MSA1500 cs, remove both array controllers, and reinsert them insuring they are fully seated in the chassis. Should the issue persist contact HP support.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
52 REDUNDANCY FAILED PCI BUS ERROR	Error	While either attempting to enter redundant mode or already operating in redundant mode, one of the array controllers encountered a PCI bus error on the communication channel used between the two array controllers. Redundancy is disabled at this time.	If the MSA1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. If this does not resolve the issue then wait until down-time is available. Power off the MSA1500 cs, remove both array controllers, and reinsert them insuring they are fully seated in the chassis. Should the issue persist contact HP support.
53 REDUNDANCY FAILED NO SECOND CONTROLLER	Error	While operating in redundant mode, one of the array controllers was removed. Redundancy is disabled at this time.	Reinsert the missing array controller insuring that it is fully seated in the chassis.
54 REDUNDANCY FAILED CACHE DIMMS MISMATCH	Error	The cache memory modules on two different controllers are not the same size. All cache memory modules must be the same size for redundancy to operate.	Remove the array controller that has been halted, replace the cache modules with the appropriately sized ones, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis.
60 NO CACHE MODULE FOUND	Error	The array controller requires at least one cache module in order to operate. Either there is not one present or it has failed.	Remove the failed array controller, either add a cache module or replace the failed one, wait 10 seconds, and then reinsert it insuring that it is fully seated in the chassis. Should the issue persist contact HP support.
61 DUAL CACHE MODULE SIZE MISMATCH	Error	The array controller has two cache modules attached but they are of different sizes. Both cache modules must be the same size.	Remove the failed array controller, replace one of the cache modules with a different one that is of the correct size, wait 10 seconds, and then reinsert it, insuring that it is fully seated in the chassis.
62 CACHE MODULE #<n> <n>MB	Informational	Displays the size of the cache module inserted into the respective cache module slot.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
63 VALID CACHE DATA FOUND AT POWER-UP	Informational	Valid host data was found in the battery backed cache memory at power up. This data has been flushed to the drives.	
64 CACHE DATA LOST BATTERY DEAD	Error	The battery on the cache memory was no longer charged. If there was data in the cache memory then it has been lost.	
65 CACHE HARDWARE ENABLED	Informational	The cache hardware had been temporarily disabled but is now enabled again. This may have been due to insufficient charge on the batteries that have now charged up to capacity.	
66 CACHE HARDWARE FAILED AND DISABLED	Error	The cache memory has experienced a hardware failure.	<p>If the failure has occurred on the <i>standby</i> array controller, then remove the <i>standby</i> array controller, replace the cache modules, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis.</p> <p>If the failure has occurred on the <i>active</i> array controller, then wait until downtime is available. Power off the MSA 1500 cs, remove the array controller, replace the cache modules, and reinsert the array controller insuring it is fully seated in the chassis. Should the issue persist contact HP support</p>
67 CACHE HARDWARE TEMPORARILY DISABLED	Informational	The cache memory hardware has temporarily been disabled typically because either the battery is not charged up or a capacity expansion operation is occurring. The cache will automatically be enabled once the condition has been corrected.	
68 OBSOLETE CACHE DATA DELETED	Informational	Old data that no longer belongs to any current configured volumes was found in the cache memory at power up. This data has been deleted. This typically happens if cache modules are moved between array controllers.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
69 CACHE BATTERIES LOW, RECHARGING	Informational	The batteries on the cache module are low and are being recharged.	
70 CACHE DISABLED NO CONFIGURATION	Informational	The cache has not been configured and therefore is disabled. The cache can be configured by using the Array Configuration Utility (ACU).	
71 SYSTEM HALTED FOR CACHE ERROR	Error	This message is generated if the user chooses to ignore a critical cache error condition. It is always preceded by message #72 (although message #72 is removed from the LCD display once it has accepted user input).	The <i>no</i> option will cause the array controller to halt itself, providing the user an opportunity to resolve the issue. Selecting the <i>yes</i> option will result in the cache data being erased. Operation of the array controller will continue normally.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
72 CACHE ERROR <n> IGNORE? <=NO >=YES	User Input	During power up, data was found in the cache that could not be flushed to the drives. The reason is either because the data does not belong to this array controller (the cache board was moved from a different array controller) or the cache data is partial (the rest of the data is in another cache board that was removed from the array controller). This error could occur if cache boards are moved improperly.	<p>The <i>no</i> option will cause the array controller to halt itself, providing the user an opportunity to resolve the issue. Selecting the <i>yes</i> option will result in the cache data being erased. Operation of the array controller will continue normally.</p> <p>Error 1.1 and 1.2: There is only one cache board in the array controller at present but it was previously configured with a second cache board that is now missing (dual cache module configuration).</p> <p>Error 2.1 and 2.2: A second cache board that contained valid data was removed from its original array controller and added to this array controller (dual cache module configuration).</p> <p>Error 2.3: A cache board that contained valid data was removed from its original array controller and added to this array controller (single cache module configuration). Return all cache boards to their original array controllers. Power up the systems without allowing any host I/O and wait for the cache data to be written to the drives. This will take a few minutes after the systems have finished the power on sequence. The systems can be powered off and cache boards moved to their new locations.</p>

Table 11: LCD Message Descriptions

Message	Type	Description	Action
73 CACHE HARDWARE BATTERIES MISSING	Error	The cache memory does not have its required batteries attached to it.	<p>If the failure has occurred on the <i>standby</i> array controller, then remove the <i>standby</i> array controller, replace the cache modules, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis.</p> <p>If the failure has occurred on the <i>active</i> array controller, then wait until down-time is available. Power off the MSA 1500 cs, remove the array controller, replace the cache modules, and reinsert the array controller insuring it is fully seated in the chassis.</p> <p>Should the issue persist contact HP support.</p>
80 REPLACEMENT DRIVE FOUND BOX #<n> BAY <n>	Informational	A SCSI drive that was previously missing or failed has now been replaced with a working SCSI drive.	
81 SMART DRIVE ALERT BOX #<n>, BAY <n>	Informational	A SCSI drive may be close to failing. This was determined either by the drive firmware itself using SMART technology or by the array controller using monitor and performance testing.	The drive should be replaced as soon as possible.
84 DRIVE FAILURE BOX #<n>, BAY <n> 84	Error	A SCSI drive in one of the storage enclosures attached to it has failed. If the drive was part of a configured volume, then the state of the volume will depend on the fault tolerance used.	The drive should be replaced as soon as possible.
85 BAD DRIVE FRMWARE BOX #<n>, BAY <n>	Error	A SCSI drive has been detected that has known, bad firmware on it. Continued usage of this drive could result in drive failure, decreased performance or data loss.	Either the drive firmware should be updated or the drive should be replaced as soon as possible.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
86 DRIVE POSITION CHANGE DETECTED	Informational	The SCSI drives that make up a configured volume have been physically moved within an attached storage enclosure. The array controller has updated its configuration information accordingly.	
87 DRIVE POSITION CHANGE INVALID	Informational	The SCSI drives that make up a configured volume have been physically moved in such a way that the array controller can no longer access the configured volume.	The MSA1500 cs should be powered off and the drives restored to their original positions.
100 VOLUME #<n> STATE OK	Informational	The configured volume has returned to its normal operating state. This typically occurs after a rebuild operation has completed.	
101 VOLUME #<n> STATE FAILED	Error	The configured volume has been failed because too many SCSI drives that it is composed of have failed exceeding the fault tolerance level. The data on the configured volume is no longer available.	
102 VOLUME #<n> STATE INTERIM RECOVERY	Informational	The array controller has failed one or more SCSI drives that the configured volume is composed of but no data loss has occurred because fault tolerance is allowing the data to be recovered.	The failed drives should be replaced as soon as possible following the guidelines in the <i>Recovering from Hard Drive Failure</i> (Appendix E) section in this guide.
103 VOLUME #<n> STATE REBUILDING	Informational	The configured volume is rebuilding data on a SCSI drive that replaced a previously failed drive.	
104 VOLUME #<n> STATE DISABLED	Error	The configured volume has been disabled because too many of the SCSI drives that it is composed of are missing.	Power off the MSA1500 cs and then all attached storage enclosures. Unplug and reinsert all SCSI drives insuring they are fully seated in their bays. Check the cables connecting the MSA1500 cs to any attached storage enclosures. Power on the attached storage enclosures and then the MSA1500 cs.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
105 VOLUME #<n> STATE EXPANSION ACTIVE	Informational	The configured volume is currently performing a volume expansion operation.	
106 VOLUME #<n> STATE WAITING TO REBUILD	Informational	The configured volume is waiting to start rebuilding data on a SCSI drive that replaces a previously failed drive. The rebuild may not have started yet because the array controller is already performing a rebuild on another configured volume.	
107 VOLUME #<n> STATE WAITING TO EXPAND	Informational	The configured volume is waiting to start a volume expansion operation. The expansion may have not started yet because another configured volume is undergoing expansion or a rebuild is occurring on the configured volume.	
108 VOLUME #<n> STATE MISSING DRIVES	Error	The configured volume is missing too many of the SCSI drives that it is composed of making it unusable. The volume will be disabled.	Power off the MSA1500 cs and then all attached storage enclosures. Unplug and reinsert all SCSI drives insuring they are fully seated in their bays. Check the cables connecting the MSA1500 cs to any attached storage enclosures. Power on the attached storage enclosures and then the MSA1500 cs.
109 VOLUME #<n> STATE WRONG DRIVE REPLACED	Error	The configured volume appears to have had known, good SCSI drives replaced instead of known, failed drives.	The MSA1500 cs should be powered off and the good drives should be restored while the failed drives should be replaced.
110 VOLUME #<n> EXPANSION DISABLED	Informational	The volume expansion operation on the configured volume has been disabled. This may be because a rebuild operation is ongoing, another expansion is already running, or the cache memory is disabled due to a low battery. The expansion will start once the condition has been cleared.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
111 VOLUME #<n> INITIALIZING PARITY	Informational	The array controller is calculating and storing parity information for the configured volume and therefore performance may be lower until it completes.	
112 VOLUME #<n> REBUILD FAILURE	Error	The rebuild operation on the configured volume has failed.	If the volume is still operating in regenerative mode, remove the new SCSI drive that was added as a replacement for the original failed drive and replace it with a different new drive.
113 VOLUME #<n> EXPANSION FAILURE	Error	The volume expansion operation on the configured volume has failed.	Run the Array Configuration Utility (ACU) and use it to determine the state of the volume. If the volume is still operational then it is possible to reattempt the operation.
114 VOLUME #<n> STATE DELETED	Informational	The configured volume has been deleted and is no longer available. Volumes are deleted by using the Array Configuration Utility (ACU).	
120 CONFIGURED VOLUMES <n>	Informational	The specified number of configured volumes were detected at power up.	
121 NO VOLUMES DETECTED	Informational	No configured volumes were detected at power up.	If there are supposed to be configured volumes, power off the MSA1500 cs and then all attached storage enclosures. Unplug and reinsert all SCSI drives insuring they are fully seated in their bays. Check the cables connecting the MSA1500 cs to any attached storage enclosures. Power on the attached storage enclosures and then the MSA1500 cs.
122 NEW VOLUME(S) DETECTED	Informational	Configured volumes from another array controller were migrated to this array controller. The configuration information has been updated.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
123 TOO MANY VOLUMES DETECTED	Error	The array controller only supports a maximum of 32 configured volumes. More volumes than that were detected at power up. This typically occurs when migrating a set of volumes from one array controller to a different array controller that already has configured volumes on it. The migrated volumes have not been added.	Remove the migrated drives and run the Array Configuration Utility (ACU). Delete any unneeded volumes until the number of existing volumes plus the number of migrated volumes is 32 or less. Add the migrated drives back.
125 ACCESS CONTROL CONFLICT DETECTED	Error	A set of volumes have been migrated from one array controller to a different array controller that already has configured volumes on it. The migrated volumes have access controls defined for them that conflicts with the existing configuration. The access controls has been modified so as to allow the migration to proceed.	Run the Array Configuration Utility (ACU) to check the new access controls and modify them if needed.
126 ACCESS CONTROL RESOURCES EXCEEDED	Error	A set of volumes have been migrated from one array controller to a different array controllers that already has configured volumes on it. The migrated volumes have access controls defined for them that conflicts with the existing configuration. The access controls has been modified so as to allow the migration to proceed.	Run the Array Configuration Utility (ACU) to check the new access controls and modify them if needed.
201 ARRAY CONTROLLER TEMPERATURE OK	Informational	The temperature sensor on the array controller indicates that the temperature which was previously exceeding the normal operating range is now back within the range.	
202 ARRAY CONTROLLER OVERHEATING	Error	The temperature sensor on the array controller indicates that the array controller is starting to exceed the normal operating range.	Check all MSA1500 cs fans and insure they are operating. Any failed fans should be replaced. If only one array controller is inserted, insure that there are cover plates installed in the empty array controller bay and the fibre bay of the MSA1500 cs chassis.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
203 ARRAY CONTROLLER OVERHEATED	Error	The temperature sensor on the array controller indicates that the array controller has exceeded the safe operating range.	The MSA1500 cs should be powered off as soon as possible to avoid hardware failure. Check all MSA1500 cs fans and insure they are operating. Any failed fans should be replaced. If only one array controller is inserted, insure that there are cover plates installed in the empty array controller bay and the fibre bay of the MSA1500 cs chassis.
204 ARRAY CONTROLLER DISABLED	Error	The array controller has been disabled due to a redundancy failure.	Remove the failed array controller, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis. Should the issue persist contact HP support.
205 ARRAY CONTROLLER RESTARTING	Informational	The array controller has completed firmware cloning and will be restarted automatically.	
300 RECOVERY ROM AUTOFLASH STARTED	Informational	Indicates that the array controller has detected that the firmware's backup recovery ROM image is invalid and is copying the current active firmware image into the backup recovery ROM.	
301 RECOVERY ROM AUTOFLASH DONE	Informational	Indicates that the array controller has successfully completed the process of copying the current active firmware image into the backup recovery ROM.	
302 RECOVERY ROM AUTOFLASH FAILED	Error	Indicates that the array controller failed to copy the current active firmware image into the backup recovery ROM. Recovery ROM support is disabled.	Remove the failing array controller, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis. The ROM autoflash process will be attempted again. Should the issue persist contact HP support.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
303 ROM CLONING STARTED	Informational	<p>Indicates that the two array controllers in a MSA1500 cs do not have the same version of firmware on them. Therefore, one array controller's version of the firmware will be copied on to the other array controller. Both controllers must be running the same version of firmware in order for controller redundancy to operate.</p> <p>If both array controllers are in the power up sequence, then the most recent version of firmware will be used.</p> <p>If one array controller has already completed the power up sequence and is now <i>active</i>, then its version of firmware will be used even if less recent.</p>	
304 ROM CLONING DONE	Informational	Indicates that the two array controllers in a MSA1500 cs have finished copying one array controller's version of firmware to the other array controller. Both controllers must be running the same version of firmware in order for controller redundancy to operate.	
305 ROM CLONING FAILED	Error	Indicates that the two array controllers in a MSA1500 cs failed to copy one array controller's version of firmware to the other array controller. Both controllers must be running the same version of firmware in order for controller redundancy to operate.	Remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis. The ROM cloning process will be attempted again. Should the issue persist contact HP support.
306 FIRMWARE FLASH STARTED	Informational	Indicates that the array controller in the MSA1500 cs has started the firmware flash process. Do not turn off power to the system until it has completed. This could take several minutes.	
307 FIRMWARE FLASH DONE	Informational	Indicates that the array controller in the MSA1500 cs has completed the firmware flash process. It is now safe to turn off power to the system.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
308 FIRMWARE FLASH FAILED	Error	Indicates that the array controller in the MSA1500 cs has failed the firmware flash process.	Attempt the flash process again. Should the issue persist, contact HP support.
312 FIRMWARE FLASH STARTED ON BOX ??	Informational	Indicates that the SATA storage enclosure assigned to the referenced box number has started the firmware flash process. Do not turn off the power to the system until it has completed. This could take five minutes.	
313 FIRMWARE FLASH DONE ON BOX ??	Informational	Indicates that the SATA storage enclosure assigned to the referenced box number has completed the firmware flash process. It is now safe to turn off power to the system.	
314 FIRMWARE FLASH FAILED ON BOX ??	Error	Indicates that the SATA storage enclosure assigned to the referenced box number has failed the firmware flash process.	Attempt the flash process again. Should the issue persist, contact HP support.
400 STORAGE BOX #<n> FAN OK	Informational	The specified storage enclosure indicates that one of its fans which previously had been failed or degraded is now operating normally.	
401 STORAGE BOX #<n> FAN FAILED	Error	The specified storage enclosure indicates that one of its fans has failed. The storage enclosure and any devices in it may now be susceptible to overheating if corrective action is not taken.	Check all fans and insure they are operating. Any failed fans should be replaced.
402 STORAGE BOX #<n> FAN DEGRADED	Error	The specified storage enclosure indicates that one of its fans is not operating at full efficiency. The fan may eventually fail.	Check all fans and insure they are operating. Any failed fans should be replaced.
403 STORAGE BOX #<n> FAN HOT INSERTED	Informational	The specified storage enclosure indicates that a fan has been added.	
404 STORAGE BOX #<n> FAN HOT REMOVED	Informational	The specified storage enclosure indicates that a fan has been removed.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
405 STORAGE BOX #<n> TEMPERATURE OK	Informational	The temperature sensor in the storage enclosure indicates that the temperature is now back in the normal operating range.	
406 STORAGE BOX #<n> OVERHEATING	Error	The temperature sensor in the storage enclosure indicates that the enclosure is starting to exceed the normal operating range.	Check all fans and insure they are operating. Any failed fans should be replaced. Insure that there are drive blank cartridges in any empty drive bays in the enclosure. If the enclosure is a MSA1500 cs and only one array controller is inserted, insure that there are cover plates installed in the empty array controller bay and the fibre bay in the chassis.
407 STORAGE BOX #<n> OVERHEATED	Error	The temperature sensor in the storage enclosure indicates that the enclosure has exceeded the safe operating range.	The MSA1500 cs should be powered off as soon as possible and immediately after that, the enclosure should be powered off, to avoid hardware failure. Check all fans and insure they are operating. Any failed fans should be replaced. Insure that there are drive blank cartridges in any empty drive bays in the enclosure. If the enclosure is a MSA1500 cs and only one array controller is inserted, insure that there are cover plates installed in the empty array controller bay and the fibre bay in the chassis.
408 STORAGE BOX #<n> POWER SUPPLY OK	Informational	The specified storage enclosure indicates that one of its power supplies which previously had been failed is now operating normally.	
409 STORAGE BOX #<n> POWER SUPPLY FAILED	Error	The specified storage enclosure indicates that one of its power supplies has failed.	Check all power supplies and insure they are operating. Any failed power supplies should be replaced.
410 STORAGE BOX #<n> POWER SUPPLY ADDED	Informational	The specified storage enclosure indicates that a power supply has been added.	

Table 11: LCD Message Descriptions

Message	Type	Description	Action
411 STORAGE BOX #<n> POWER SUPPLY REMOVED	Informational	The specified storage enclosure indicates that a power supply has been removed.	
412 STORAGE BOX #<n> EMU NOT RESPONDING	Error	The specified storage enclosure is not responding to commands.	Insure the storage box is powered on. Insure all cables are connected securely. Power of the MSA1500 cs and the storage box. Power on the storage box first and then the MSA1500 cs. Should the issue persist, contact HP support.
415 STORAGE BOX #2 OR #3 HOT ADDED	Informational	A HP StorageWorks SCSI expansion storage enclosure has been hot-added to the MSA1500 cs.	
500 INITIALIZING PCI SUBSYSTEM	Informational	The array controller's PCI subsystem is being initialized as part of the power up sequence.	
501 PCI SUBSYSTEM HARDWARE FAILURE	Error	The array controller's PCI subsystem has encountered a critical error during the power up sequence.	Remove the failed array controller, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis. Should the issue persist contact HP support.
502 PCI BRIDGE ASIC SELF TEST FAILURE	Error	The array controller's PCI bridge ASIC has encountered a critical error during the power up sequence.	Remove the failed array controller, wait 10 seconds, and then reinsert the array controller insuring that it is fully seated in the chassis. Should the issue persist contact HP support.
510 INITIALIZING FIBRE SUBSYSTEM	Informational	The array controller's fibre subsystem is being initialized as part of the power up sequence.	
513 UNCORRECTED ECC MEMORY ERROR SEEN	Error	The array controller has detected an uncorrectable error in the ECC memory on the memory cache board.	Remove the failed array controller and replace the memory cache board with a new one.

Table 11: LCD Message Descriptions

Message	Type	Description	Action
515 FIBRE DEVICE HARDWARE FAILURE	Error	The fibre device that is installed in the MSA1500 cs fibre bay was not recognized by the array controller.	Verify the fibre device is supported by the MSA1500 cs by checking the documentation that came with it. If it is supported then remove the fibre device, wait one minute and then reinsert it insuring it is fully seated in the chassis. Wait one minute and check the LCD to see if a new copy of this error message is created. The service indicator LED on the back of the switch should turn solid green if the device is operating normally. The service indicator LED will flash amber if it has failed again. Should the issue persist, contact HP support.
516 FIBRE SUBSYSTEM LINK FAILURE	Error	There is no active fibre connection to this MSA1000 array controller (Laser OFF). If the Fibre connection is a direct-connect from an HBA to the MSA1500 cs, this message is expected when the server is powered off or restarted.	Power on the server and load the HBA drivers. If the status does not change to OK, check cables, fibre bay board, SFP, and HBA.
517 FIBRE SUBSYSTEM LINK OK	Informational	There is an active fibre connection to this MSA1000 array controller (Laser On). This message is only displayed when preceded by message 516.	
518 PERSISTENT MEM ENABLED	Informational	Global variables such as system prompts and profile information remain persistent in cache over power cycles of the MSA1500 cs. This message is displayed each time the MSA1500 cs is powered up.	

Recovery ROM and ROM cloning

Recovery ROM

Each MSA1000 Controller contains ROM (Read-Only Memory), which holds the firmware that operates the controller. The Recovery ROM feature stores two complete firmware images in the ROM: one active image and one backup image. When the controller is powering up, it checks both firmware images to ensure they are valid. If either is not, the valid image will be copied on top of the invalid image to correct it. This is referred to as auto-flashing. All of this functionality is done automatically by the controller and does not require any user intervention.

ROM cloning

In order for a MSA1500 cs to operate in a redundant controller configuration, it must contain two controllers that are executing the same version of firmware. During power up (or if an optional controller is hot-plugged while the MSA1500 cs is already operating) the firmware versions on both controllers are compared. If they are not the same, then the ROM Cloning feature will attempt to copy one version of firmware onto the other controller. After the copy has been completed, the controller that was modified will be automatically reset. Once the reset controller has powered up the two controllers should then start redundant operation. All of this functionality is done automatically by the controllers and does not require any user intervention. On initial power up, the controller in the right slot is considered the primary controller and the version of firmware on that controller is cloned. If a failed controller is replaced, the controller still in operation is considered the primary controller and the version on that controller is cloned.

There is the possibility that a specific version of firmware may not be compatible with certain hardware revisions of a controller. In this scenario, the most recent firmware version that is compatible with both controllers will be copied to the controller with the incompatible firmware version. However, if the controller that is updated is already operating and processing I/O, then it will not be reset. The MSA1500 cs will not enter redundant operation and an appropriate message will be shown on the display. After the MSA1500 cs has been shutdown and powered back on, the controllers will then be able to enter redundant operation. On a subsequent power cycle, both controllers will enter redundant mode.

Connectors and Indicators

4

Overview

This chapter provides figures and tables showing front and rear views and the locations of connectors and indicators on various parts of the HP StorageWorks MSA1500 cs.

Front and rear views

This section contains figures and information about the front and rear views of the MSA1500 cs.

Front view

The front view is displayed in [Figure 33](#).

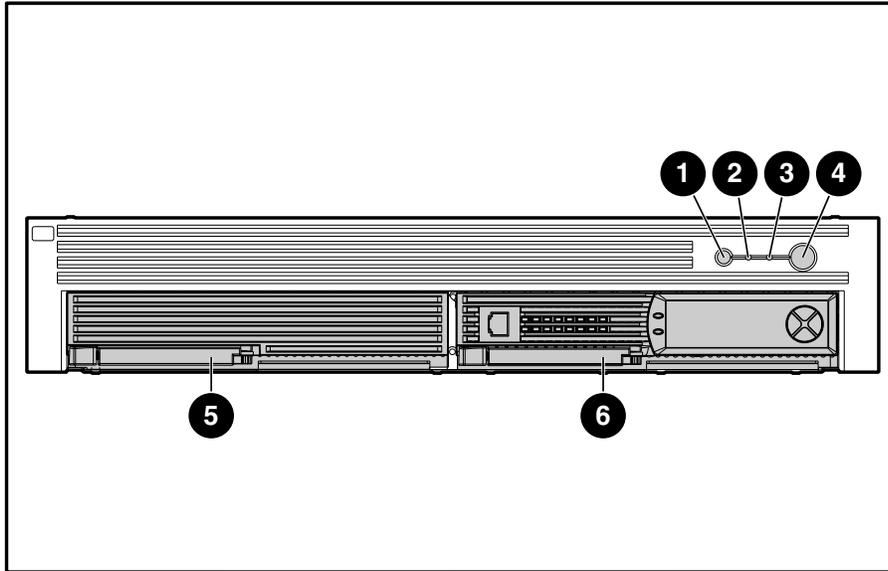


Figure 33: Front view

Table 12: MSA1500 cs Front View

Item	Description
①	Unit ID button (blue)
②	System fault indicator (amber)
③	Heartbeat LED (blinking green)
④	Power button (green or amber)
⑤	MSA1000 Controller
⑥	Controller blank

Rear view

The features and accessible components on the rear panel of the standard configuration are shown in [Figure 34](#).

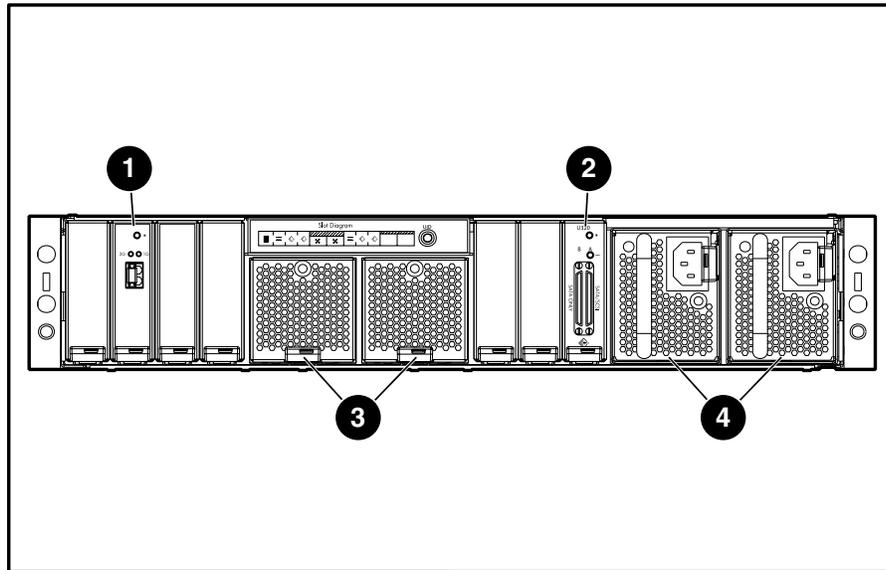


Figure 34: Rear view

Table 13: MSA1500 cs Rear View

Item	Description
❶	Fibre Channel I/O module
❷	SCSI I/O module
❸	Fan modules
❹	Power supplies

Slot diagram label

A slot diagram label is located on the rear of the MSA1500 cs. The label denotes the proper component for each slot. The label is shown in [Figure 35](#).

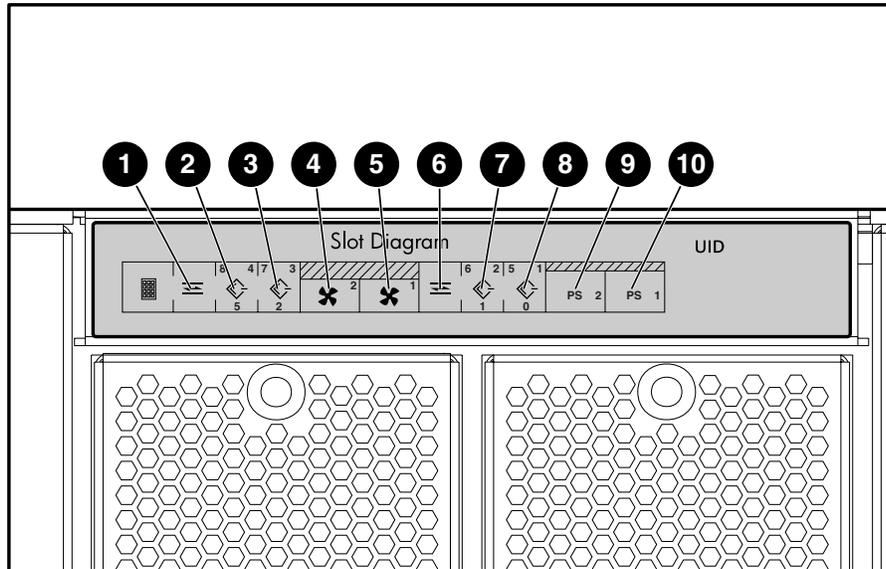


Figure 35: Slot diagram label

Table 14: Slot Diagram Label

Item	Description
①	Fibre Channel I/O module
②	SCSI I/O module (bus 3)
③	SCSI I/O module (bus 2)
④	Fan module
⑤	Fan module
⑥	Fibre Channel I/O module
⑦	SCSI I/O module (bus 1)
⑧	SCSI I/O module (bus 0)
⑨	Power supply
⑩	Power supply

Connectors

SCSI I/O module connectors

The connectors located on the rear of the SCSI I/O module are shown in figure [Figure 36](#).

Note: Two SATA storage enclosures can be connected to a single SCSI I/O module. Only one SCSI storage enclosure can be connected to SCSI I/O module. When connecting a SCSI storage enclosure, use SCSI port B.

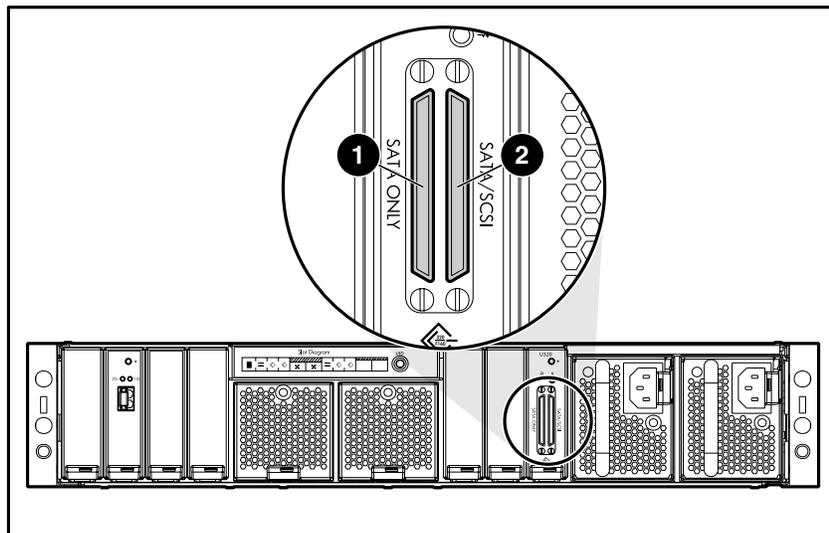


Figure 36: SCSI I/O module connectors

Table 15: SCSI I/O Module Connectors

Item	Description
❶	SCSI Port B
❷	SCSI Port A

Indicators

The MSA1500 cs is equipped with a series of indicators. The following sections list the indicators.

Interpreting component indicators

If the fault indicator on any of the MSA1500 cs components is amber, determine the reason for this alert by examining the component indicators to see if any indicates a fault.

Enclosure status indicators

The Enclosure Status indicators are found on the MSA1500 cs, as show in [Figure 37](#).

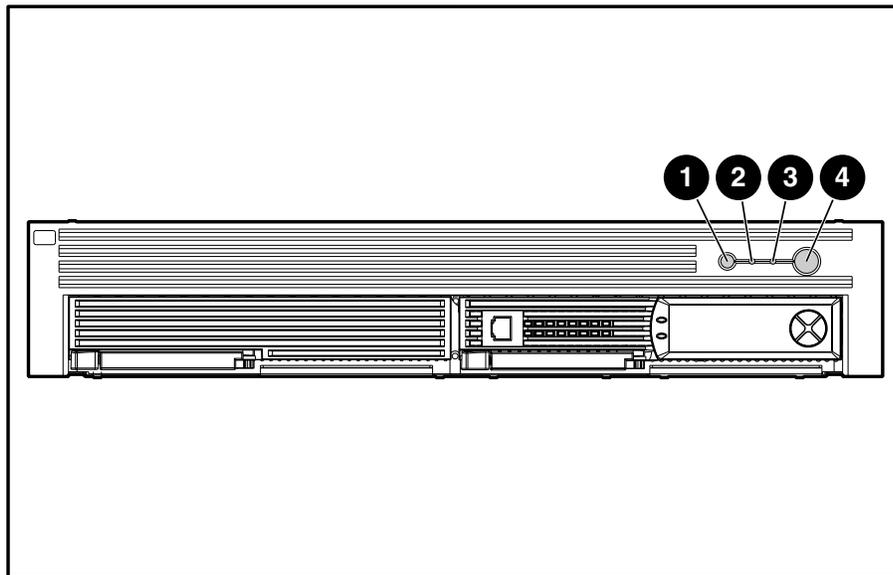


Figure 37: Enclosure status indicators

Table 16: Enclosure Status Indicators

Number	Indicator	Condition	Color	Meaning
❶	UID	On	Blue	Unit being identified
		Off		Normal
❷	System fault	On	Amber	Fan module cannot access controllers
		Off		Normal
❸	Heartbeat	Flashing	Green	Normal/Fan modules are accessing controllers
		Off		Power off or fault
❹	Power	On	Green	Power on
		Off	Amber	Power off

Note: The system power in the MSA1500 cs does not shut off completely with the power switch. STANDBY removes power from most of the electronics and the drives, but portions of the power supply and some internal circuitry remain active. To remove the power completely, disconnect all power cords from the equipment.

Power supply

The power supply uses a single bi-color LED to indicate status. This LED can be illuminated with either a green or amber color. The green indicator on the power supply assembly is on when the power supply is operational. When the power supply experiences a fault, the power supply indicator turns amber. If the power supply indicator is off, AC power is not present.

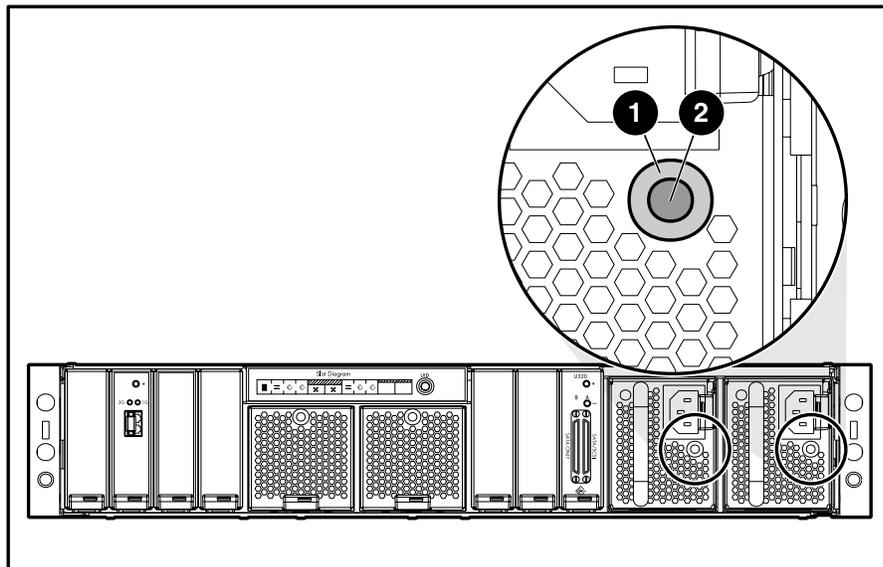


Figure 38: Power supply indicators

Table 17: Power Supply Indicators

Number	Condition	Meaning
①	Solid green/off	Power on/power off
②	Flashing amber	Fault

Fan module

The fan modules cool the enclosure by circulating air through the enclosure and elements. The rate at which air moves (the air flow) determines the amount of cooling.

The fan module uses a single bi-color LED to indicate status. This LED can be illuminated with either a green or amber color. The green indicator on the fan module assembly is on when the fan module is operational. When the fan module experiences a fault, the fan module indicator turns amber.

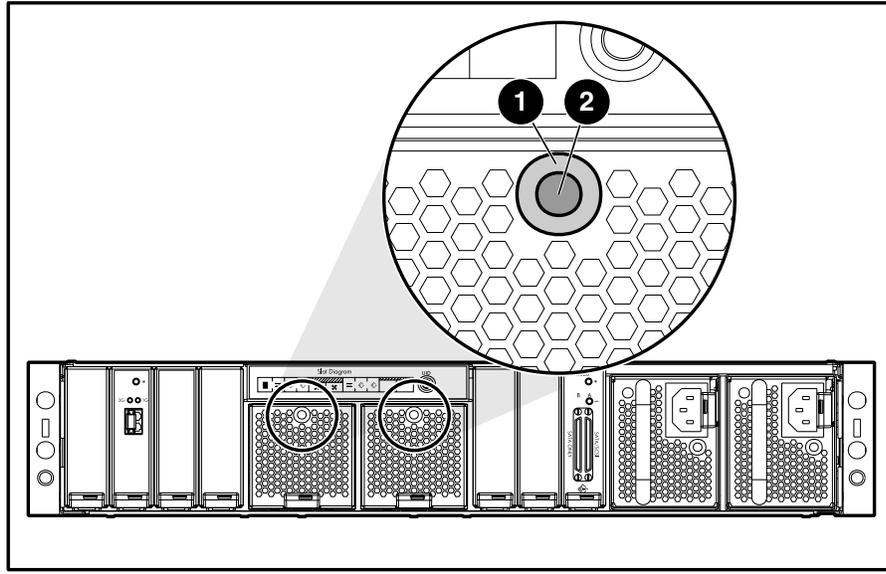


Figure 39: Fan module indicators

Table 18: Fan Module Indicators

Number	Condition	Meaning
①	Solid green	Power on
②	Flashing amber	Fault

SCSI I/O module

The SCSI I/O module has two indicators. [Figure 40](#) and [Table 19](#) describe the locations and meanings of the indicators.

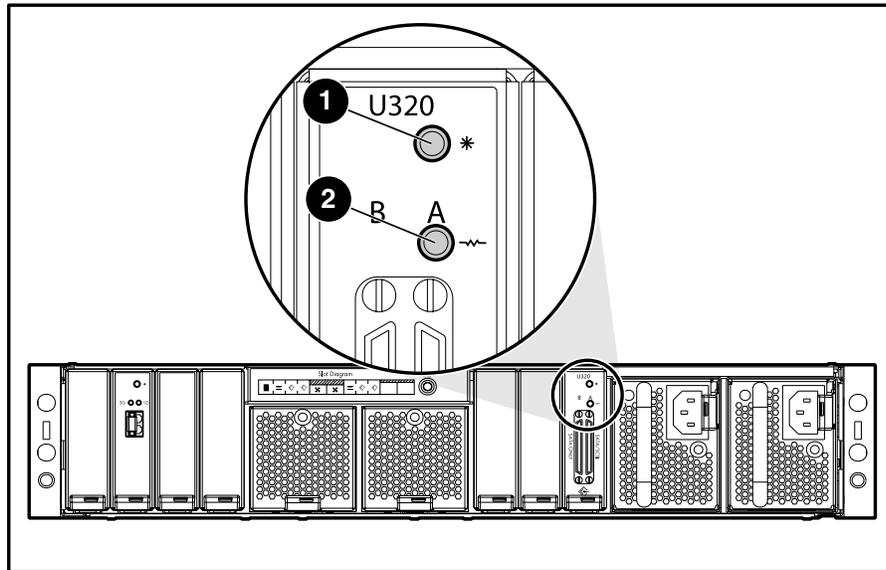


Figure 40: SCSI I/O module indicators

Table 19: SCSI I/O Module Indicators

Number	Indicator	Condition	Meaning
❶	Status	Solid green	Power on
❷	SCSI port A	Flashing green	Activity

Fibre Channel I/O module

The Fibre Channel I/O module has three bi-color LEDs to indicate status. These LEDs can be illuminated with either a green or amber color. [Figure 41](#) and [Table 20](#) describe the locations and meanings of the indicators.

Two flashing amber lights indicate that the controller is not present.

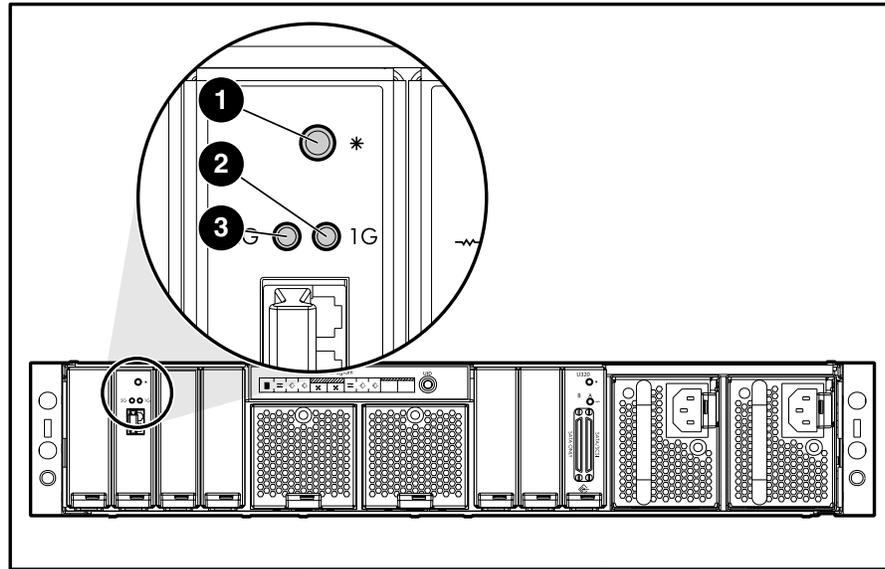


Figure 41: Fibre Channel I/O module indicators

Table 20: Fibre Channel I/O Module Indicators

Number	Indicator	Condition	Meaning
❶	Status	Solid green	Power on
		Flashing amber	A link to the controller is no longer present.
❷	1-Gb	Solid green	Port has auto negotiated to a good 1-Gb link.
		Flashing amber	Transceiver is either not plugged in or a link is no longer present.
❸	2-Gb	Solid green	Port has auto negotiated to a good 2-Gb link.
		Flashing amber	Transceiver is either not plugged in or a link is no longer present.

MSA1000 Controller indicators

During normal runtime, the MSA1000 Controller has 16 indicators that indicate activity or malfunction of the controller. They are labeled 1-16. [Figure 42](#) and [Table 21](#) describe the purpose and function of each indicator.

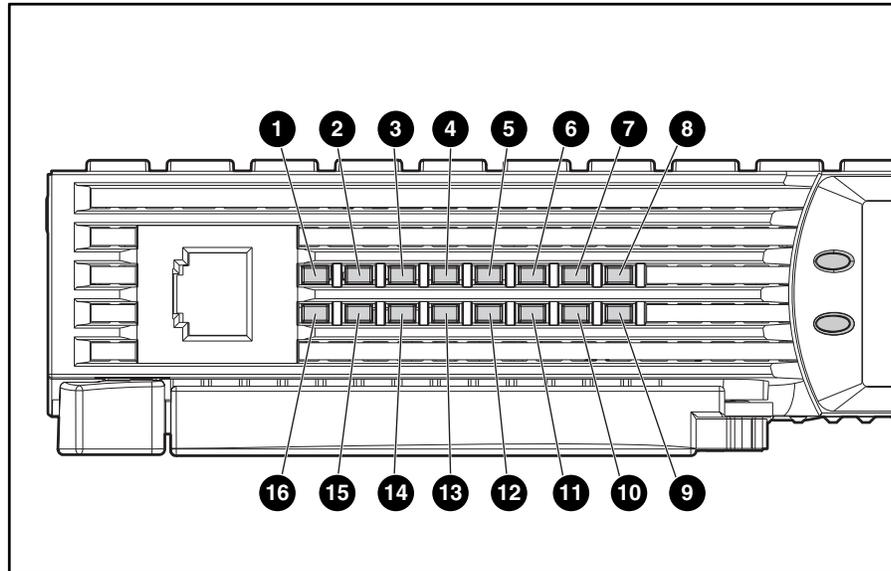


Figure 42: MSA1000 Controller indicators

Table 21: MSA1000 Controller Indicator Descriptions

Indicator	Function	Description
①	Drive failure	ON = A configured hard drive has failed in the array
②	Cache Activity	ON = Cache active OFF = No cache activity Blinking = Cache transfer pending
③	SCSI Bus 1 active	ON = Indicates requests are outstanding on the second SCSI bus
④	SCSI Bus 0 active	ON = Indicates requests are outstanding on the first SCSI bus
⑤	Logical I/O active	ON = Currently processing logical requests from the Host Adapter
⑥	Direct Memory Access (DMA) active	ON = DMA transfers are active
⑦	Active/Standby	ON=Controller is active OFF=Controller is in standby
⑧	Idle Heartbeat	Indicates the Array Controller is idle and functioning
⑨-⑪	Busy status	ON = Indicates this Array Controller is idle OFF = Indicates this Array Controller is operating at full capacity
⑫-⑯	Fibre Channel IDs	

Regulatory Compliance Notices



Regulatory Compliance identification numbers

For the purpose of regulatory compliance certifications and identification, your HP StorageWorks MSA1000 is assigned an HP Series number. The Storage System 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 is likely to cause harmful interference, in which case the user will be required to 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。

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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 MSA1000 is provided with Nickel Metal Hydride 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.



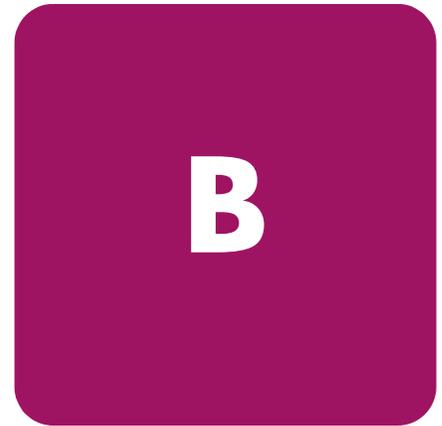
WARNING: Your Accelerator Array contains Nickel Metal Hydride batteries. There is risk of fire and burns if the battery pack is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
 - Do not expose to temperatures higher than 60° C.
 - 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.

Electrostatic Discharge



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.

To prevent electrostatic damage, observe the following precautions:

- 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

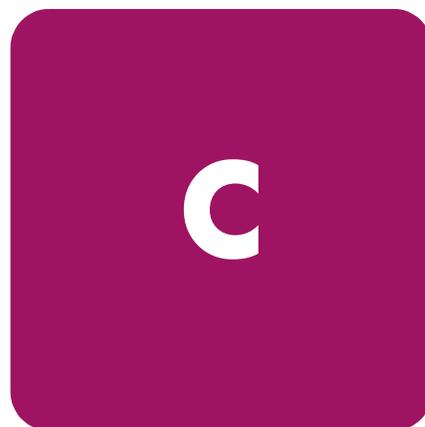
There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- 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 \pm 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 suggested equipment for proper grounding, have an Authorized HP Reseller install the part.

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

Specifications



This chapter provides operating and performance specifications for the HP StorageWorks MSA1500 cs. The sections in this chapter are:

- MSA1500 cs chassis
- Memory
- Power supply
- SCSI I/O module
- Fibre Channel I/O module
- Fan module

Note: For information on all supported components and their part numbers, see Chapter 1, [“Illustrated Parts Catalog.”](#)

MSA1500 cs chassis

Table 22: System Unit Specifications

Item	Description
Height	8.79 cm (3.46 in)
Width	48.41 cm (19.06 in)
Depth	61.77 cm (24.32 in)
Weight	24.95 kg (55lbs)
Input power requirements	
Rated input voltage	100 - 240 VAC
Rated input frequency	47 – 63 Hz
Rated input current	6.4A Max, 1A typical
Input Power (max)	400W Max, 95W typical
Temperature range	
Operating	10× to 35× C (derated 1×C per 1000 feet of elevation to 10000 ft.); (50× to 95× F)
Shipping	-30× to 50× C (-22× to 122× F)
Relative humidity (noncondensing)	
Operating	10% to 90%
Non-operating	up to 95%
Maximum wet-bulb temperature	
Long term storage	29×C (84.2×F)
Short term storage	30×C (86×F)
*Input Power and Heat Dissipation specifications are maximum values and apply to worst-case conditions at full rated power supply load. The power/heat dissipation for your installation will vary depending on the equipment configuration.	

Power supply

Table 23: MSA1500 cs System Unit Power Supply Specifications

Item	Description
Height	7.7 cm (3.0 in)
Width	6.4 cm (2.5 in)
Depth	32.0 cm (12.6 in)
Weight	1.80 kg (3.96 lbs)

SCSI I/O module

Table 24: SCSI I/O Module Specifications

Item	Description
Height	8.13 cm (3.2 in)
Width	2.34 cm (0.92 in)
Depth	37.14 cm (14.62 in)
Weight	0.46 kg (1.01lbs)

Fibre Channel I/O module

Table 25: Fibre Channel I/O Module Specifications

Item	Description
Height	8.13 cm (3.2 in)
Width	2.34 cm (0.92 in)
Depth	37.14 cm (14.62 in)
Weight	0.44 kg (.96lbs)

Fan module

Table 26: Fan Module Specifications

Item	Description
Height	6.0 cm (in)
Width	6.0 cm (in)
Depth	26.8 cm (10.6 in)
Weight	0.50 kg (1.10 lbs)

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