

StorageWorks by Compaq Modular SAN Array 1000

Maintenance and Service Guide

Part Number 257547-001

February 2002 (First Edition)

This guide provides procedures and diagnostics for maintenance and troubleshooting issues.

COMPAQ

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Printed in the U.S.A.

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About This Guide

This maintenance and service guide is a troubleshooting guide that can be used for reference when servicing the Modular SAN Array 1000 (MSA 1000).



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.

Symbols in Text

These 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 loss of life.



CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

IMPORTANT: Text set off in this manner presents clarifying information or specific instructions.

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

Important Safety Information

Before installing this product, read the *Important Safety Information* document provided.

Compaq Technician Notes



WARNING: Only authorized technicians trained by Compaq 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.

Where to Go for Additional Help

In addition to this guide, the following information sources are available:

- User documentation
- *Compaq Service Quick Reference Guide*
- Service training guides
- Compaq service advisories and bulletins
- Compaq *QuickFind*[™] information services
- Compaq Insight Manager software

For additional copies, visit the Compaq website:

www.compaq.com

Integrated Management Log

The server includes an integrated, nonvolatile management log that contains fault and management information. The contents of the Integrated Management Log (IML) can be viewed with Compaq Insight Manager.

Telephone Numbers

For the name of your nearest Compaq authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.

For Compaq technical support:

- In the United States and Canada, call 1-800-OK COMPAQ.
- For Compaq technical support phone numbers outside the United States and Canada, visit the Compaq website:

www.compaq.com

Text Conventions

This document uses the following conventions:

- *Italic type* is used for complete titles of published guides or variables. Variables include information that varies in system output, in command lines, and in command parameters in text.
- **Bold type** is used for emphasis, for onscreen interface components (window titles, menu names and selections, button and icon names, and so on), and for keyboard keys.
- `Monospace typeface` is used for command lines, code examples, screen displays, error messages, and user input.
- `Sans serif typeface` is used for uniform resource locators (URLs).

Illustrated Parts Catalog

This chapter provides the illustrated parts breakdown and a spare parts list for the *StorageWorks*[™] Modular SAN Array 1000 (MSA 1000) by Compaq. See Table 1-1 for information on referenced parts.

MSA 1000 Mechanical Parts and System Components Exploded View

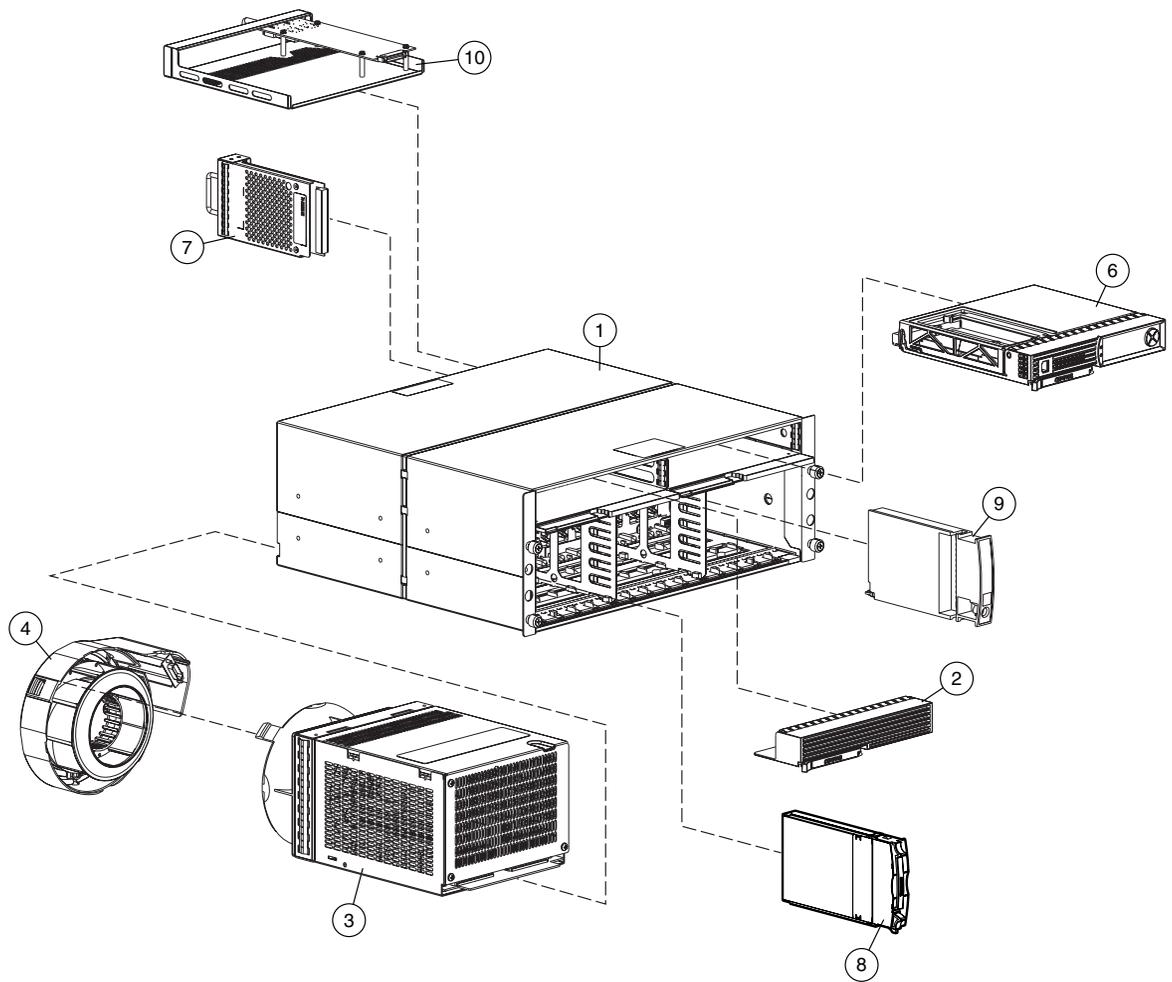


Figure 1-1: MSA 1000 mechanical parts and system components exploded view

Table 1-1: MSA 1000 Mechanical Parts and System Components Spare Parts List

Item	Description	Spare Part Number
Chassis		
1	Chassis, 4 U, with Backplane	229198-001
2	Controller Blank	229208-001
System Components		
3	Power/Cooling Assembly, 499w	212398-001
4	Shelf Blower	123482-001
*5	AC power cord (2)	187335-001
	Power cords:	
	SPT-2 IEC-C13 IEC-C14	202974-001
	SPT-2 IEC-C13 IEC-C14	202973-001
Boards		
6	Controller	229203-001
7	SCSI I/O Module with Integrated Environmental monitoring unit (I/O EMU)	229205-001
Mass Storage Devices		
8	Wide Ultra3 SCSI hard drive, 1 inch (Ultra2 drives also supported)	177986-001
Miscellaneous		
9	Power Switch Assembly	229201-001
10	Fibre Channel I/O Module	229206-001
*11	VHDCI cables:	
	1-Gb to 2-Gb connection	263894-(001-007)
	2-Gb to 2-Gb connection	263895-(001-007)
*12	MSA Fabric Switch 6	218681-001
*13	Cache Module with battery (Bd,Dimm,Sdram,128mb, with battery)	171387-001
*14	Return Kit	249670-001
*15	SFP transceiver board (Transceiver,650mm,Fc,2gb,Htplg)	229204-001
*16	Interconnect blank(s)	229200-001
*Not shown		

NOTE: The MSA 1000 supports fourteen 1-inch hot-pluggable hard drives and can support up to 42 drives with the addition of two optional storage expansion enclosures.

Removal and Replacement Procedures

This chapter provides subassembly/module-level removal and replacement procedures for the *StorageWorks* Modular SAN Array 1000 (MSA 1000) by Compaq. 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 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.

To service the MSA 1000, the following tools are recommended:

- 4-mm flat-blade screwdriver
- Phillips screwdriver
- From the Compaq *SmartStart*™ for Servers CD:
 - Advanced Diagnostics Utility (ADU)
 - System Configuration Utility software
 - Diagnostics software

Electrostatic Discharge Information

A discharge of static electricity can damage static-sensitive devices or micro-circuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. To prevent electrostatic damage, observe the following precautions:

- Transport products in static-safe containers such as conductive tubes, bags, or boxes.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Cover workstations with approved static-dissipating material. Provide a wrist strap connected to the work surface and properly grounded (earthed) tools and equipment.
- Keep work area free of nonconductive materials such as ordinary plastic assembly aids and foam packing.
- Always be properly grounded (earthed) when touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Always place drives with the Printed Circuit Board (PCB) side down.
- Use conductive field service tools.

Symbols on Equipment

These symbols may be located on equipment in areas where hazardous conditions may exist.



This symbol in conjunction with any of the following symbols indicates the presence of a potential hazard. The potential for injury exists if warnings are not observed. Consult your documentation for specific details.



This symbol indicates the presence of hazardous energy circuits or electric shock hazards. Refer all servicing to qualified personnel.

WARNING: To reduce the risk of injury from electric shock hazards, do not open this enclosure. Refer all maintenance, upgrades, and servicing to qualified personnel.



This symbol indicates the presence of electric shock hazards. The area contains no user or field serviceable parts. Do not open for any reason.

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



This symbol on an RJ-45 receptacle indicates a Network Interface Connection.

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



This symbol indicates the presence of a hot surface or hot component. If this surface is contacted, the potential for injury exists.

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



These symbols on power supplies or systems indicate the equipment is supplied by multiple sources of power.

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



Weight kg

Weight lb

This symbol 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 manual material handling.

Preparation Procedures

System power to the MSA 1000 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 storage system.

IMPORTANT: Before beginning to remove any serviceable part, determine whether the part is hot-pluggable or non-hot-pluggable. Hot-pluggable devices in the MSA 1000 include SCSI hard drives, blower assemblies/power supplies, and MSA 1000 Controllers.

Hot-Pluggable Parts

If it is hot-pluggable, do not perform a power shutdown of the device. Hot-pluggable devices in the MSA 1000 include Wide Ultra2 and Ultra3 SCSI hard drives, blower assemblies/power supplies, Fibre Channel I/O modules, and MSA 1000 controllers.

IMPORTANT: It is not necessary to power down the device to replace hot-plug devices such as SCSI hard drives, blower assemblies/power supplies, Fibre Channel I/O modules, and MSA 1000 controllers.

Non-Hot-Pluggable Parts

If the part is non-hot-pluggable, the MSA 1000 must be powered down. Non-hot-pluggable parts include the cache modules, SCSI I/O Module with an Integrated Environmental Monitoring Unit (I/O EMU), 4 U chassis with backplane, drive cages, and power switch.

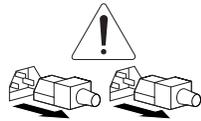


WARNING: To reduce the risk of personal injury or damage to the equipment, the installation of options other than hot-plug power devices should be performed only by individuals who are qualified in servicing computer equipment and trained to deal with products capable of producing hazardous energy levels.

Powering Down the Device

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

1. Press the Power On/Standby switch. This switch 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 blowers are off.
3. Disconnect all other 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 device being serviced.



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

NOTE: It is necessary to be knowledgeable of electrostatic discharge information before performing the preparation procedures. For electrostatic discharge information, see “Electrostatic Discharge Information,” earlier in this chapter.

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 routine maintenance 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.
 - The hot-plug access panel provides access to hazardous energy circuits.
 - The panel should remain locked during normal operation.
 - 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 device 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.

Weight Warning



50 lb

22.7 kg

WARNING: The MSA 1000 weighs 50 pounds (22.7 kilograms) when fully assembled. To reduce the risk of personal injury or damage to equipment:

- Observe local health and safety requirements and guidelines for manual material handling.
 - Obtain adequate assistance to lift and stabilize the MSA 1000 during installation or removal.
 - Remove all tape drives and blower assemblies/power supplies to reduce the overall weight of the library.
-

Connecting the Power

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 product's electrical ratings label. 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 12 feet.

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 MSA 1000. 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 either the electrical outlet or 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 MSA 1000, all components of the storage system must be installed and connected to the supported interconnect options. Hard drives should be installed in the MSA 1000 so that they can be identified and configured at power up.

The Compaq MSA 1000 components must be powered up in the following order:

1. **Storage Expansion Enclosures**—Power on all storage expansion enclosures.
2. **MSA 1000**—Power the MSA 1000 on with the power switch located in the far-right lower area of the front panel. After powering on, wait until the message “Compaq MSA 1000 Startup Complete” appears on your display. This process may take up to two minutes.
3. **Server(s)**.

MSA 1000 Drive Bay Configuration

The MSA 1000 supports a total of fourteen 1-inch, hot-plug hard drives. SCSI IDs are assigned automatically in the storage system according to the drive bay used for each drive. It is not necessary to assign SCSI IDs manually. Drive bay numbers are indicated on the front panel. Below is a complete table of SCSI ID assignments.

Table 2-1: SCSI ID Assignments

Drive Bay	SCSI ID	SCSI Bus Port
1	0	0
2	1	0
3	2	0
4	3	0
5	4	0
6	5	0
7	8	0
8	0	1
9	1	1
10	2	1
11	3	1
12	4	1
13	5	1
14	8	1

 **CAUTION:** Controlling airflow within the MSA 1000 requires a hard drive or a drive blank in each drive bay. To avoid overheating, never remove more than one drive or drive blank from an operating enclosure at the same time.

 **CAUTION:** To avoid loss of data, do not disconnect the power cord from the MSA 1000 while the server is running.

MSA 1000 Hard Drive Blank

To remove an MSA 1000 hard drive blank:

 **CAUTION:** A hard drive blank must be installed in an unused drive slot. Failure to install a hard drive blank could result in thermal failures.

1. Complete the preparation procedures. See the section titled “Preparation Procedures,” earlier in this chapter.
2. Push the tabs to unlock the MSA 1000 hard drive blank.
3. Continue to press the tabs while sliding the MSA 1000 hard drive blank out of the drive cage.

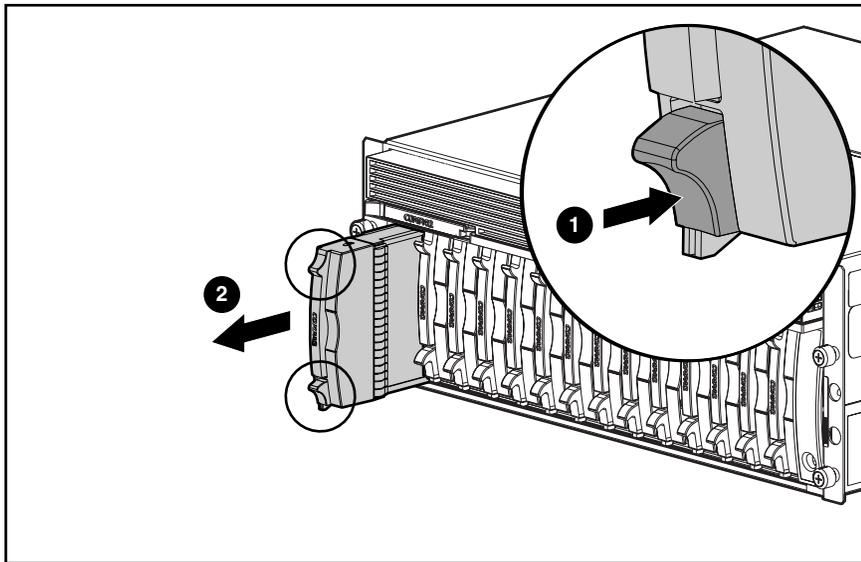


Figure 2-1: Removing an MSA 1000 hard drive blank

To replace an MSA 1000 hard drive blank, insert the blank into the bay until it clicks into place.

MSA 1000 Hot-Plug Hard Drive



CAUTION: If you must replace a hot-pluggable drive, it is important that you follow the guidelines in this section. Failure to do so could result in data loss and could void your warranty.

RAID 0 is not a fault-tolerant configuration. Never remove a drive from a RAID 0 array unless it has failed. Drive failure is indicated by an amber Drive Failure indicator. If you are using a RAID 0 configuration, removing an operating drive is not allowed and will result in loss of data. To remove a working drive without losing data, the entire array must be backed up, the drive must be replaced, and the entire array must be restored. Backing up a single drive and replacing it will not restore the array.

There are some instances in which you may replace a drive in RAID 1 or 5 and Advanced Data Guarding configurations. The section titled “Hard Drives” in Chapter 4, “Connectors, Switches, and Status Indicators,” illustrates the conditions when you may or may not remove a drive in a fault-tolerant system.

Follow these guidelines when replacing drives:

- **Never remove more than one drive at a time (two drives if you are using Advanced Data Guarding).** When you replace a drive, the controller uses data from the other drives in the array to reconstruct data on the replacement drive. If you remove more than one drive, a complete data set is not available to reconstruct data on the replacement drive(s) and permanent data loss could occur.
- **Never remove a drive while another drive is being rebuilt.** A drive’s Online indicators flash green (once per second) while it is being rebuilt. A replaced drive is rebuilt from data stored on the other drives.
- **If the system has an online spare drive, wait for it to complete rebuilding before replacing the failed drive.** When a drive fails, the online spare becomes active and begins rebuilding as a replacement drive. After the online spare has completed Automatic Data Recovery (the online indicators will be continuously lit), replace the failed drive with a new replacement drive. **Do not** replace the failed drive with the online spare. The system will automatically rebuild the replacement drive and reset the spare drive to an available state.
- **If you replace a drive while the system is off, it may be necessary to rebuild the replaced drive.**



CAUTION: Removing more than one disk drive at a time can cause the enclosure to overheat. Never remove more than one disk drive at a time. Install a disk drive or disk drive blank as soon as possible.

To remove an MSA 1000 hot-plug hard drive:

1. Complete the preparation procedures. See the section titled “Preparation Procedures,” earlier in this chapter.
2. Be sure that the Online and Drive Access indicators are both OFF.
3. Press the ejector and pull the lever to full open position.
4. Pull the drive out of the storage system drive cage.

IMPORTANT: Wait for the disk to stop spinning before continuing to the next step. Verify this by listening to the drive.

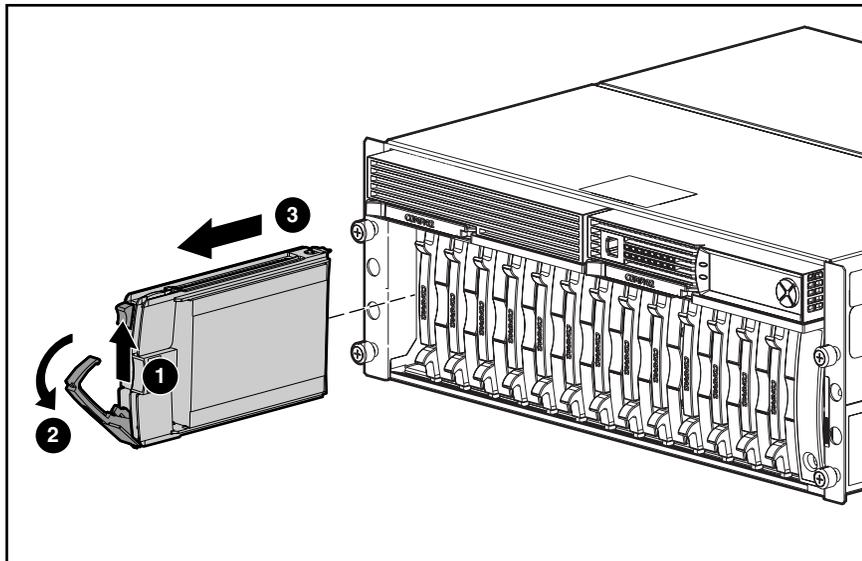


Figure 2-2: Removing an MSA 1000 hot-plug hard drive

5. To install a new hard drive, press the hard drive ejector and pull the lever to a full open position.

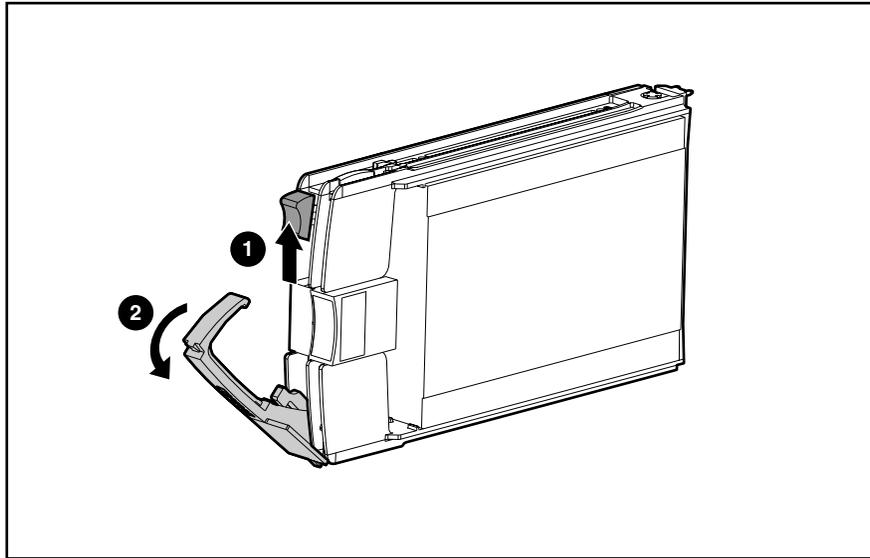


Figure 2-3: Pressing the ejector and pulling the lever

6. Insert the new drive into the same bay as the drive just removed, sliding it in as far as it will go. Make sure the ejector lever is in the full open position to ensure a correct latch.

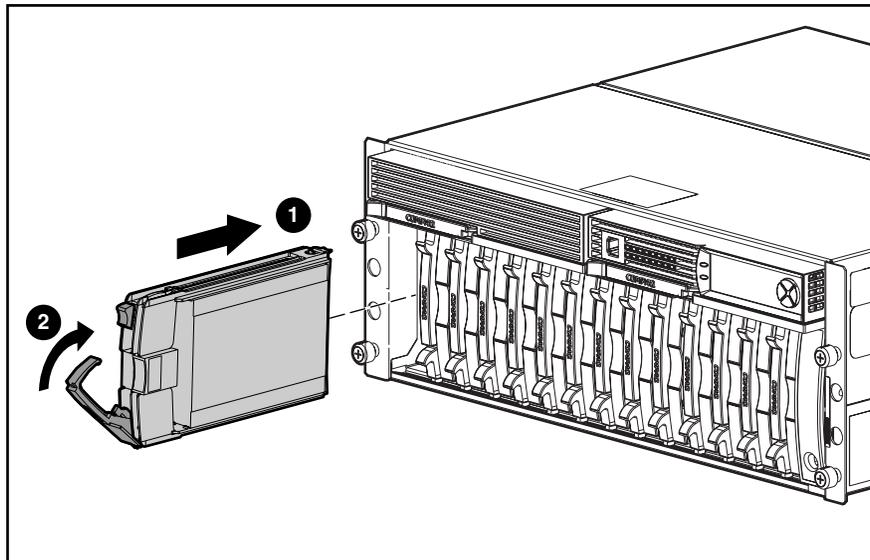


Figure 2-4: Inserting the new drive

7. Close the ejector lever against the front of the drive. The locking hinge must be engaged behind the front panel of the unit.
8. Make sure that the drive is firmly engaged and that the ejector lever is latched.



CAUTION: Data can be lost if the drive is not firmly seated.

The drive tray indicators light one at a time and then turn off together to indicate that the system has recognized the new drive. In fault tolerant configurations, allow the replacement drive to be reconstructed automatically with data from the other drives. While reconstruction is in progress, the online indicators flash.

MSA 1000 Controller

The following steps detail how to replace a failed MSA 1000 Controller.

IMPORTANT: 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.
1. Press the controller's thumb latch, and pull the latch handle towards you.
 2. Remove the MSA 1000 Controller by pulling it straight out of the chassis.

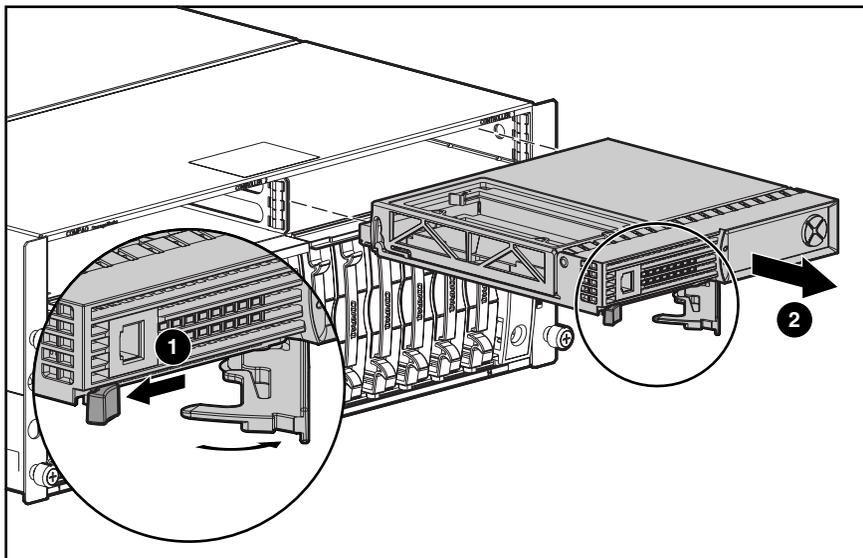


Figure 2-5: Removing the MSA 1000 Controller

3. Insert the replacement controller into the chassis.

4. Push the controller in as far as it will go and press the latch inwards until it is flush against the front panel.

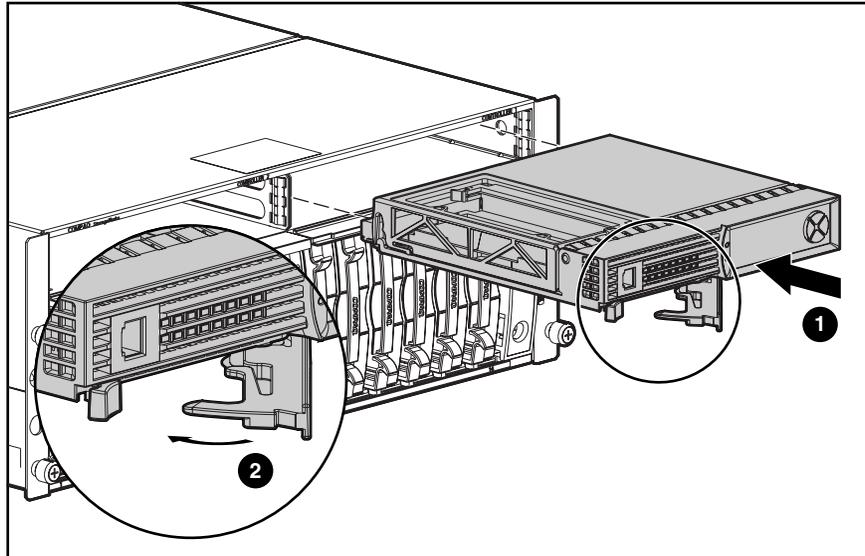


Figure 2-6: Installing the replacement controller

Replacing the MSA 1000 Controller Cache



CAUTION: It is important to follow these instructions when replacing components in the MSA 1000. If the procedure is done improperly, it is possible to lose data or damage equipment. Refer to Appendix B, "Electrostatic Discharge," for important information on using the proper procedures.

IMPORTANT: 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.

1. Press the controller's thumb latch and pull the latch handle towards you.
2. Remove the MSA 1000 Controller by pulling it straight out of the chassis.

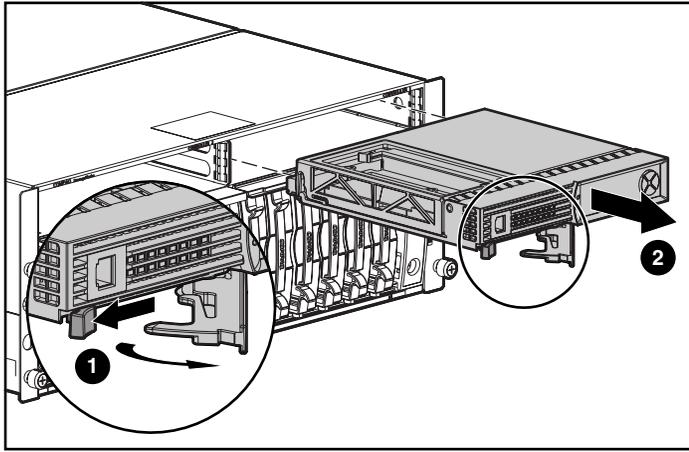


Figure 2-7: Removing the controller

3. Unlatch the clips holding the MSA 1000 Controller cover and raise the cover.
4. Simultaneously unlatch the clips holding the MSA 1000 Controller cache in place.

- Carefully pull the cache away from the controller board.

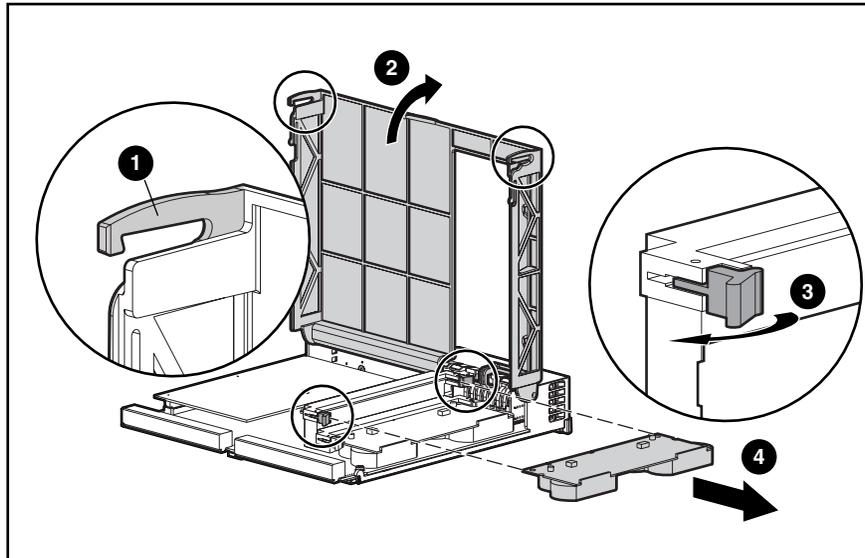


Figure 2-8: Replacing the cache module

- Slide in the new MSA 1000 Controller cache into the controller. Be sure the side latches are fully engaged.

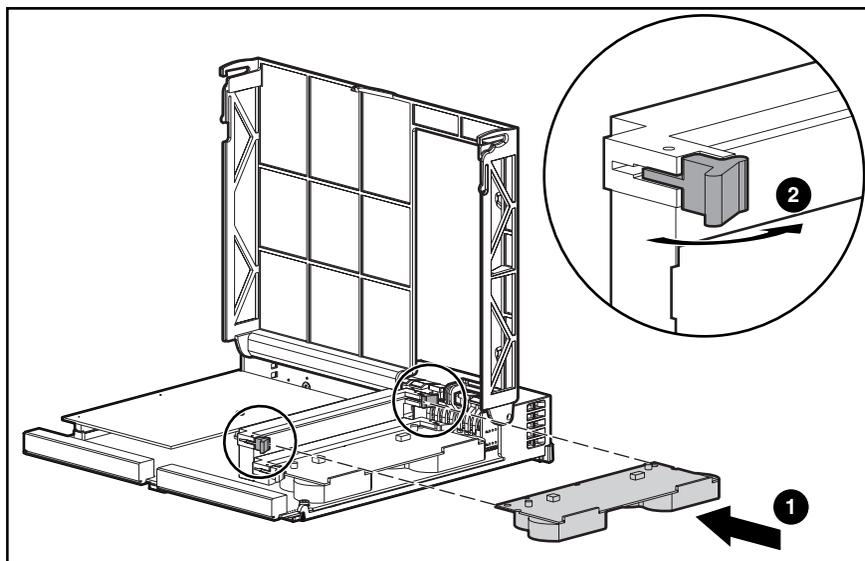


Figure 2-9: Installing the cache module

- Close the MSA 1000 Controller cover and make sure the clips are latched.
- Push the controller in as far as it will go and press the latch inwards until it is flush against the front panel.

Controller Cache Battery Pack Replacement



WARNING: There is a risk of explosion, fire, or personal injury if the battery pack is replaced incorrectly or is 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 Compaq spare designated for this product.

Array Accelerator battery disposal should comply with local regulations. Alternatively, return them by established parts return methods to Compaq Computer Corporation for disposal.



CAUTION: It is important to follow these instructions when replacing components in the MSA 1000. If the procedure is done improperly, it is possible to lose data or damage equipment. Refer to Appendix B, "Electrostatic Discharge," for important information on using the proper procedures.

To remove the old NiMH battery pack:

1. Push down on the bottom clip of the battery pack, attached near the lower corner of the Array Accelerator.

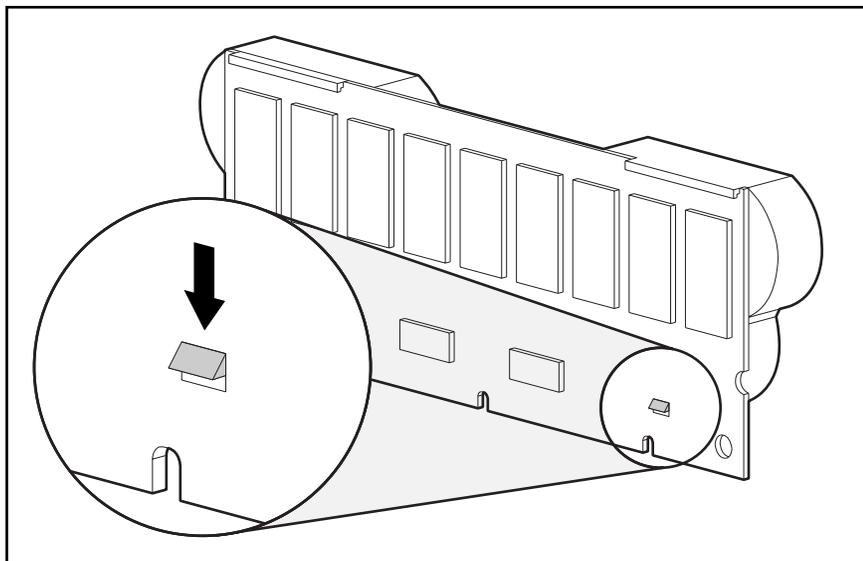


Figure 2-10: Bottom clip on battery pack

2. Swing the battery pack away from the Array Accelerator to about a 30-degree angle.

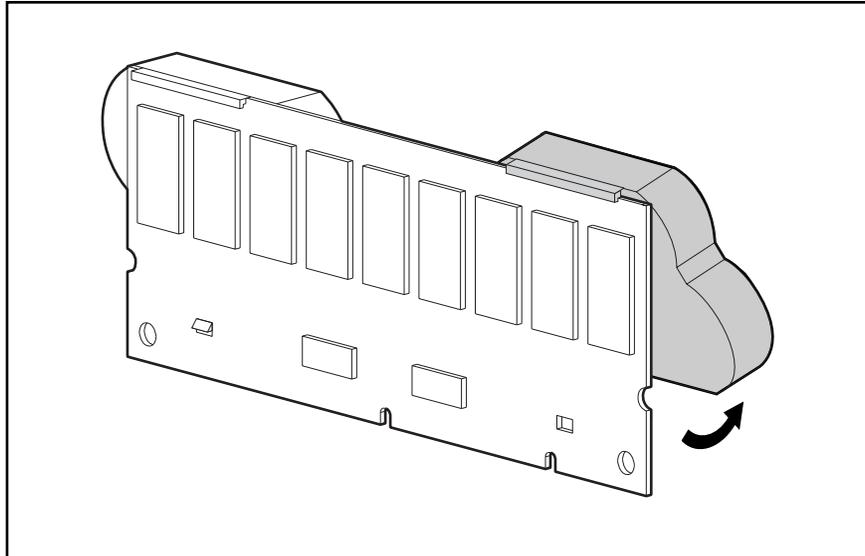


Figure 2-11: Angling the battery pack

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

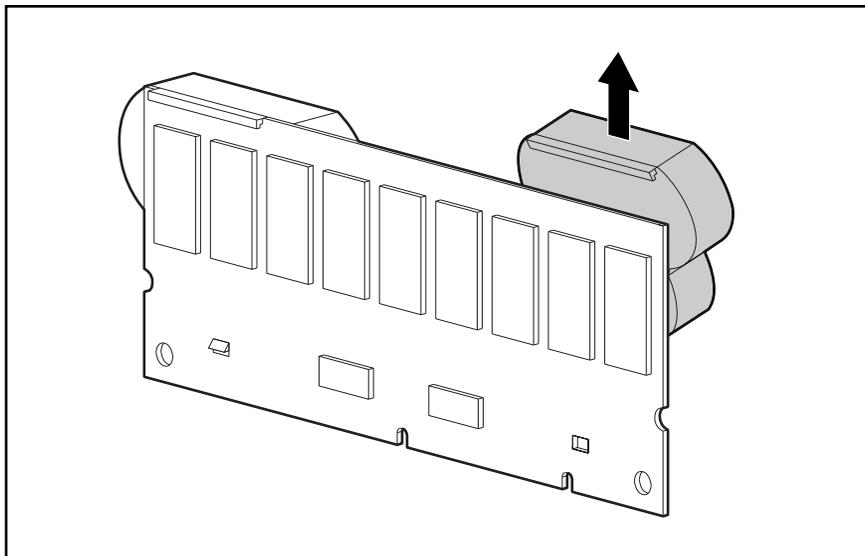


Figure 2-12: Removing the battery pack

NOTE: Repeat the replacement procedure for any batteries that were installed at the same time as the batteries that were removed.

To install a new NiMH battery pack:

1. Wait about 15 seconds after removing the old battery packs to allow the battery charge monitor to reset.
2. Hook the top of the battery pack to the top of the Array Accelerator with the pack held at a 30-degree angle to the plane of the Array Accelerator board.

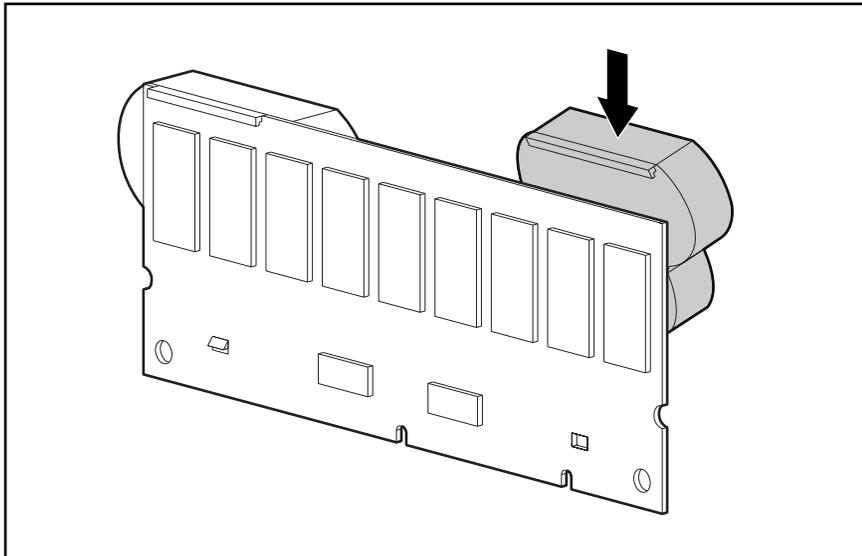


Figure 2-13: Installing the battery pack

3. 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 Array Accelerator.
4. Make sure that the top hook and bottom clip on the battery pack are securely attached to the Array Accelerator. Installation of the new battery pack is complete. Repeat for the other battery pack.

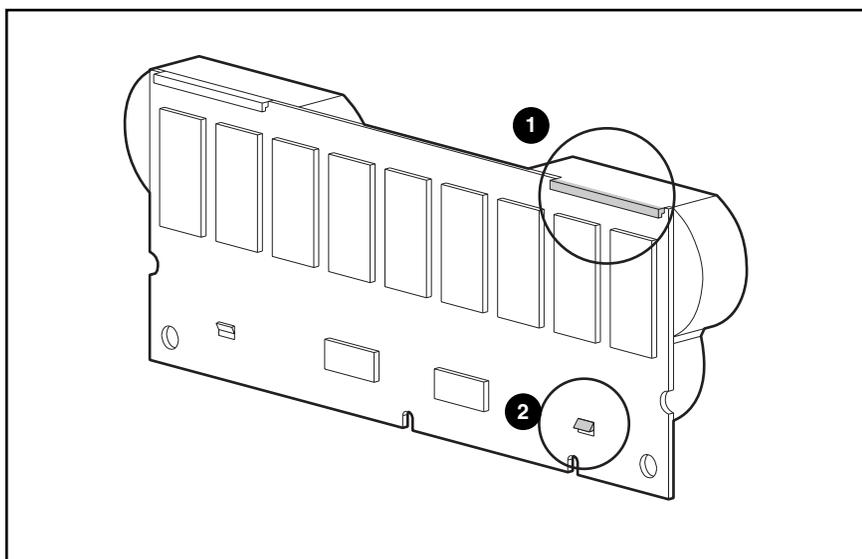


Figure 2-14: Securing the battery pack

MSA 1000 Hot-Plug Power Supply/Blower

Replacing a Variable Speed Blower



WARNING: The blower blades rotate at a high speed and do not stop immediately when power is removed from the MSA 1000. Avoid touching the rotating blades when removing the blower.



CAUTION: Removing a power supply significantly changes the airflow within the MSA 1000. After removal of a supply, the remaining supply starts a timer that will shut the system down in five minutes.

NOTE: The power supply design ensures that removing a blower does not change the airflow within the enclosure. However, do not remove a blower until the replacement blower is available.

1. Complete the preparation procedures. See the section titled “Preparation Procedures,” earlier in this chapter.
2. To remove the blower from the power supply, push in the two port-colored blower tabs while pulling the blower element.

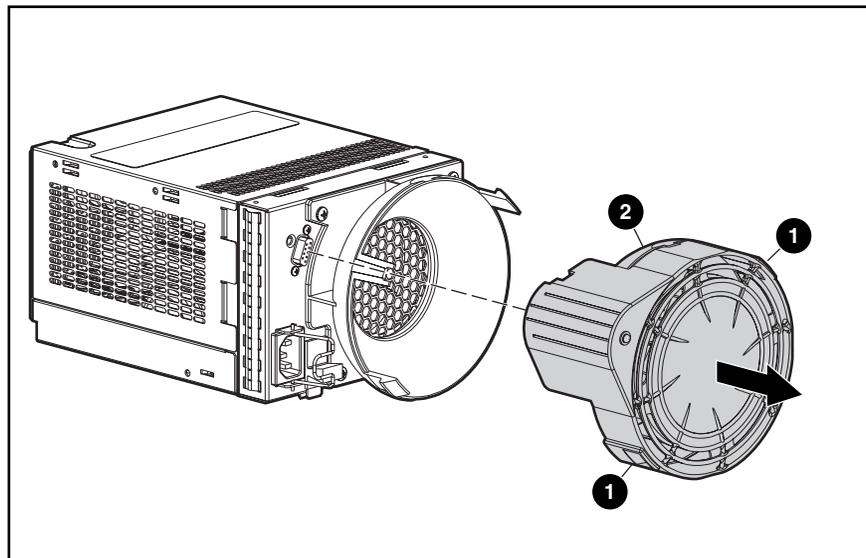


Figure 2-15: Removing the blower



CAUTION: Pressing the center section of the blower can damage the blades. To prevent this, press only the outer edge of the blower.

3. Align the new blower's guidepost with the power supply connector. Slide the replacement blower into the blower base until the tabs snap into place.

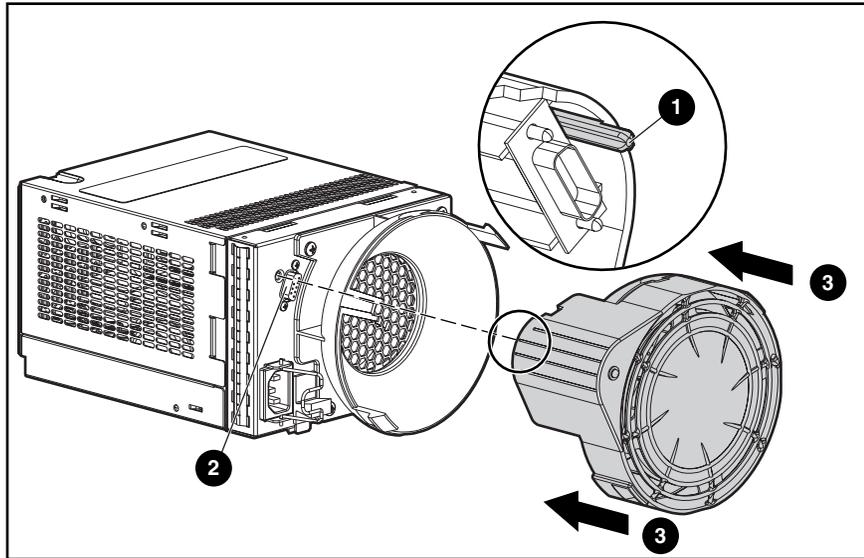


Figure 2-16: Installing the replacement blower

4. Make sure the following operational blower indications occur:
 - a. The blower starts operating immediately.
 - b. The blower indicator is On.

Replacing a Power Supply



CAUTION: Removing a power supply significantly changes the airflow within the enclosure. The system could shut down because of overheating unless the power supply is replaced within *five minutes*.



CAUTION: The blower shell must be handled carefully to avoid breaking it.

- Do not press on the center section of the blower shell (circular panel covering the blades). To avoid damaging the blower blades, grasp only the outer portion of the blower shell.
- Do not rest the power supply on the blower. Doing so might break the blower.

NOTE: Replacement power supply assemblies do not include a variable speed blower. You must remove the operational blower from the defective power supply and install the blower on the new supply.

1. Complete the preparation procedures. See the section titled “Preparation Procedures” earlier in this chapter.
2. Disconnect the AC power cord from the defective supply. While lifting up the power supply port-colored module latch, grasp the blower element and pull the defective power supply out of the enclosure.



CAUTION: Move the cord lock to the right when removing the power supply to avoid dislodging the second blower and causing your system to become overheated.

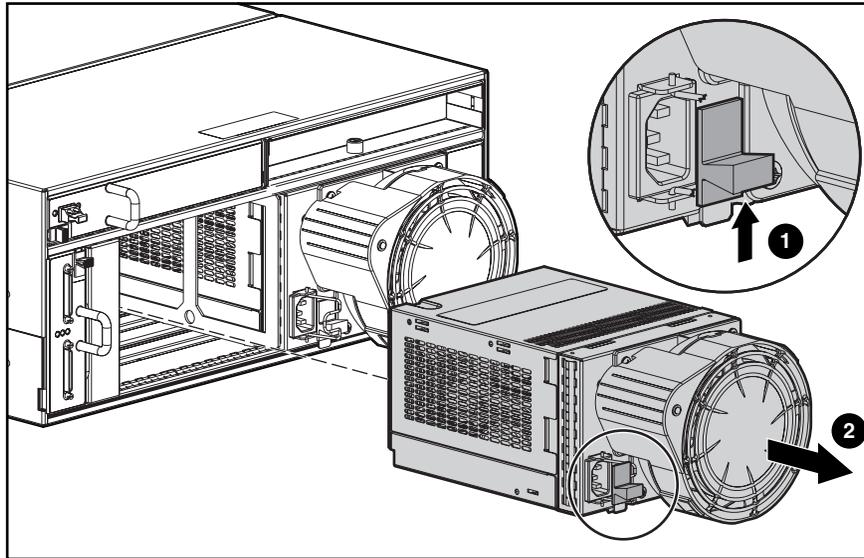


Figure 2-17: Removing the power supply

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

NOTE: Restore the cord lock to its original position to the left after installing the power supply.

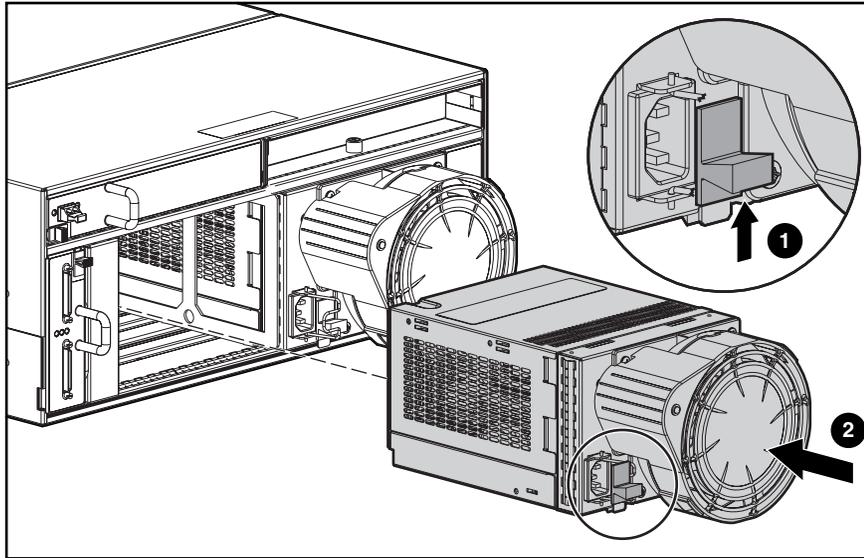


Figure 2-18: Installing the replacement power supply

MSA 1000 SCSI I/O Module with an Integrated Environmental Monitoring Unit (I/O Module)



CAUTION: Removing an Environmental Monitoring Unit (I/O EMU) significantly changes the airflow within the enclosure. To avoid possible overheating, always replace the I/O EMU as soon as possible.

To remove the I/O EMU:

1. Complete the preparation procedures. See the section titled “Preparation Procedures,” earlier in this chapter.
2. Press the I/O EMU latch and pull the I/O EMU out of the MSA 1000.

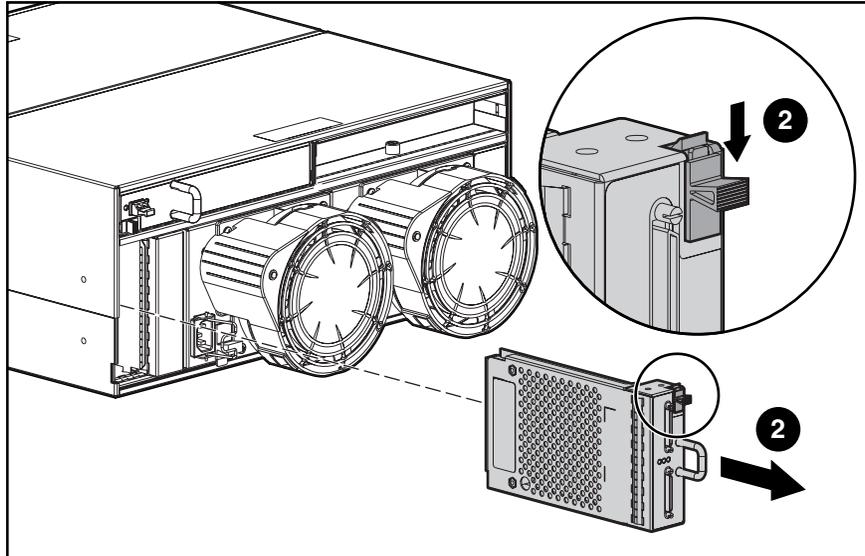


Figure 2-19: Removing the MSA 1000 I/O EMU

To replace an MSA 1000 I/O EMU, slide it into the bay until it clicks into place.

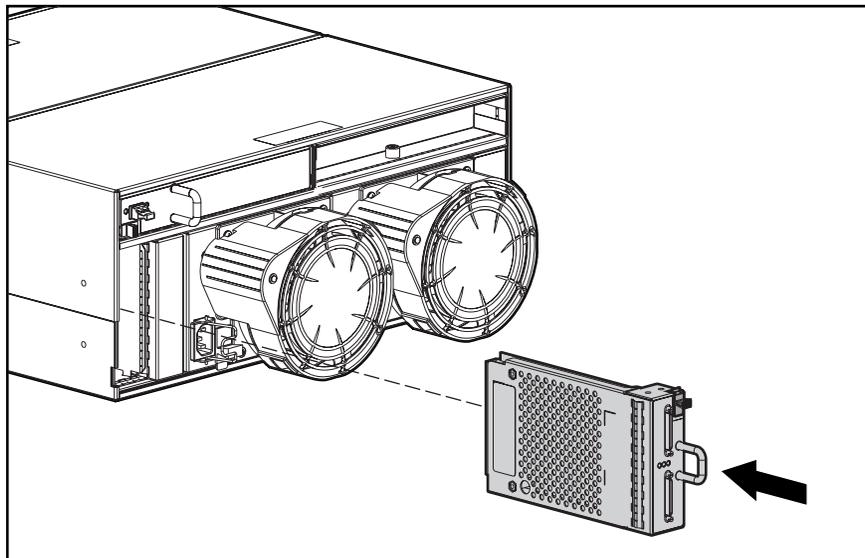


Figure 2-20: Installing the I/O EMU

MSA 1000 Fibre Channel I/O Module

To remove an MSA 1000 Fibre Channel I/O module:



CAUTION: Removing an MSA 1000 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 section titled “Preparation Procedures,” earlier in this chapter.
2. While grasping the module handle, slide the module latch to the right and pull the I/O module out of the enclosure.

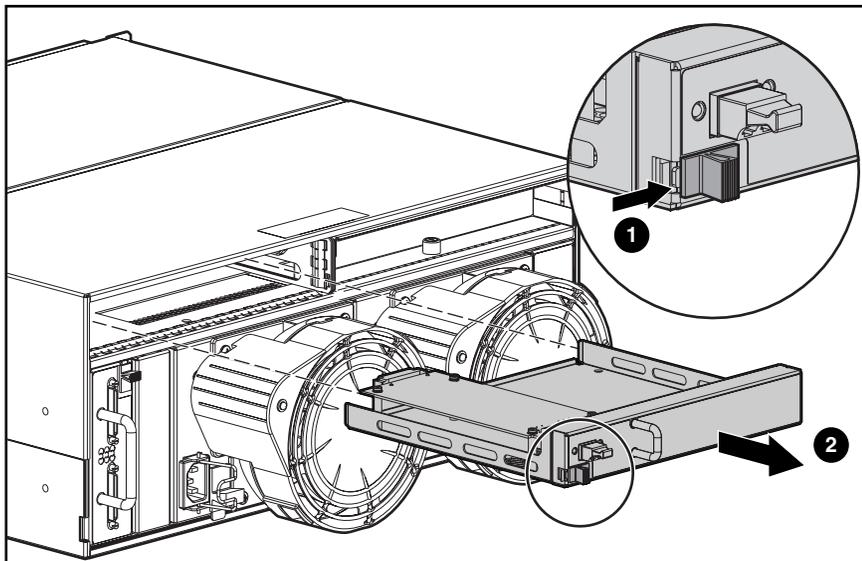


Figure 2-21: Removing the MSA 1000 Fibre Channel I/O module

To replace the I/O module, slide it into the bay until the module clicks into place.

MSA 1000 2-Gb Small Form Factor Pluggable (SFP) Transceiver

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

Laser Precautions



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

- Allow only Compaq Authorized Service Technicians to repair the equipment.
- 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 laser beam when panels are open.

1. Pull the transceiver straight out of the device.
2. 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.

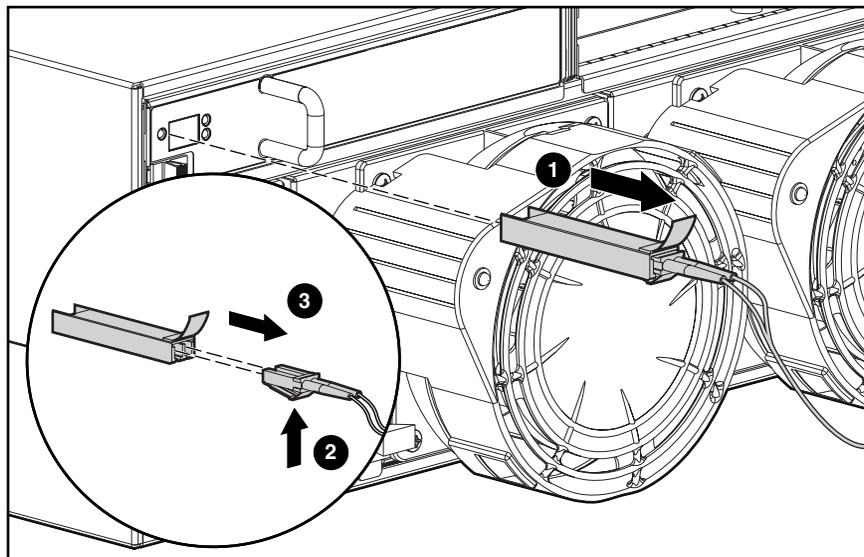


Figure 2-22: Removing the failed SFP

3. With the plastic tab facing upwards, insert the transceiver straight into the device.

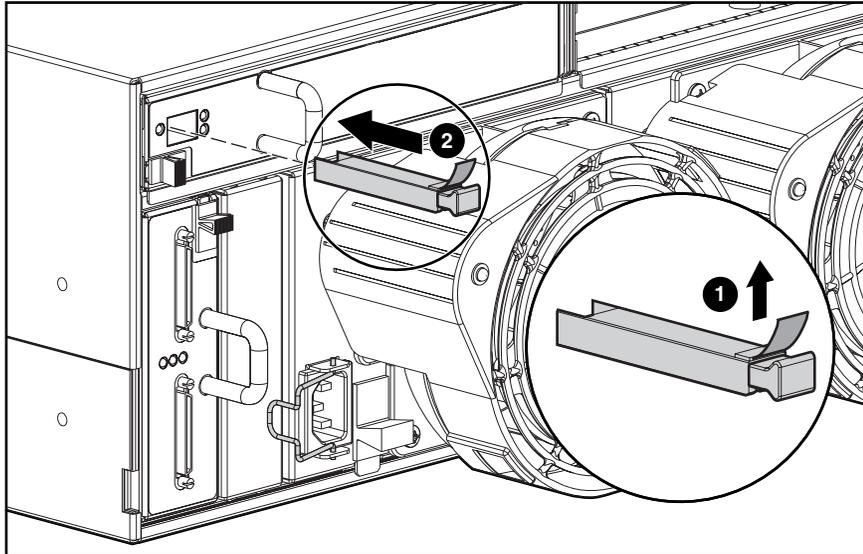


Figure 2-23: Installing a new SFP

4. Remove the dust cover from the SFP.

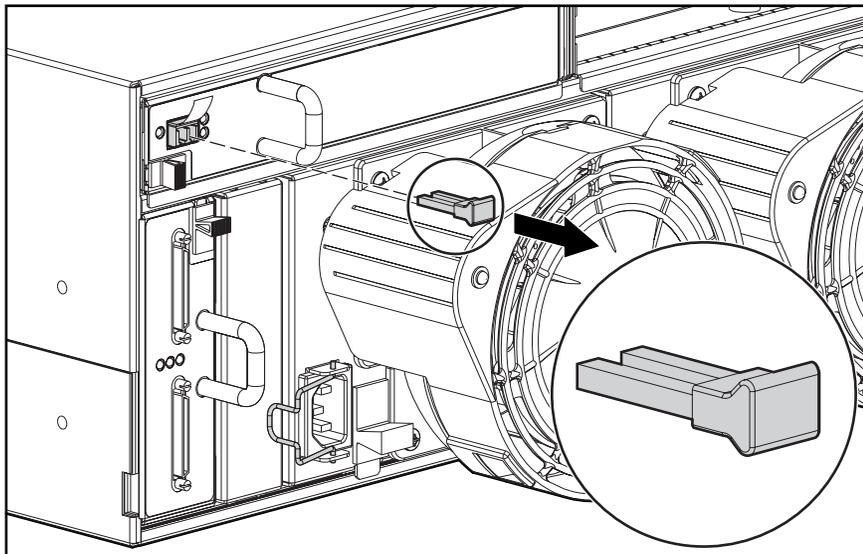


Figure 2-24: Removing the dust cover from the SFP

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

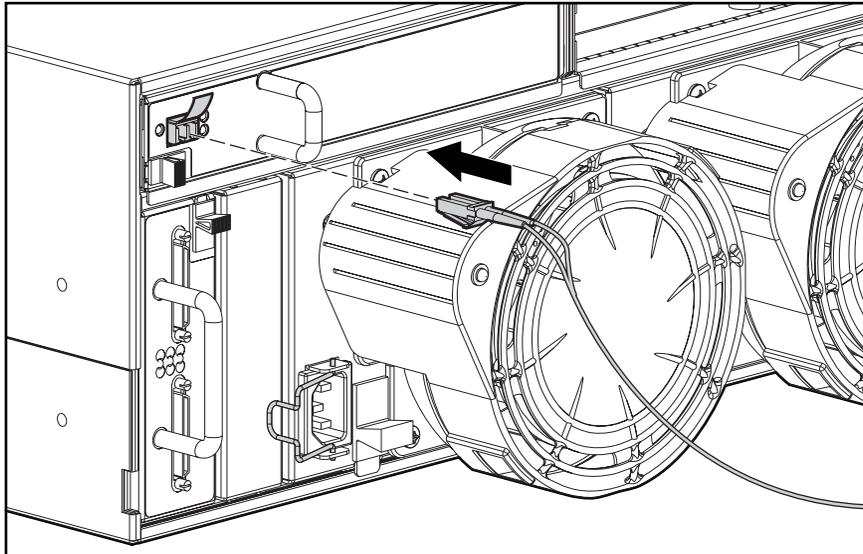


Figure 2-25: Installing the Fibre Channel I/O cable



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

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 *StorageWorks* MSA 1000, multi-mode Fibre Channel I/O cable option kits are available from Compaq. 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.

Cable Installation Considerations

To ensure the cabling in the back of a rack system does not interfere with system operation or maintenance, follow these guidelines for cable management.

This configuration allows removal of either hot-pluggable power supply in redundant power supply systems without disturbing system operation. With the cables out of the way, indicators are easily visible.



CAUTION: Do not overtighten the cable ties. Damage to the optical cables may result.



CAUTION: Make certain the Fibre Channel I/O cables are installed and supported so that no excess weight is placed on the Fibre Channel I/O connectors. This is necessary to prevent damage to the connector and cable and to prevent a cable bend radius less than 3 inches (7.62 cm) at the connector and along the cable length. Excess Fibre Channel I/O cable should be 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).

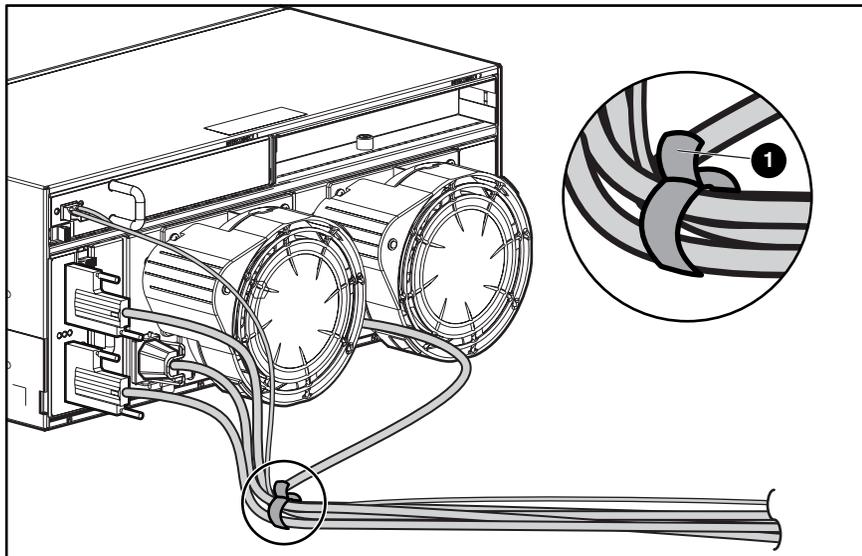


Figure 2-26: Cable management using cable ties

Enclosure Expansion

This section describes how to add SW4314/SW4214 single bus enclosures or SW5314/SW5214 dual bus enclosures to the MSA 1000 System. It does not cover adding disk drives to the MSA1000 or to disk enclosures already attached. Adding disk drives and capacity expansion is covered in the ACU and ACU-XE sections of this manual.

Older *ProLiant*[™] storage systems with high voltage SCSI connections cannot be attached to the MSA1000. New SW4314 or SW5314 enclosures must be purchased with new Ultra3 drives.

Reasons for adding a disk enclosure:

- To migrate disk enclosures from a Compaq Smart Array to the SAN
- Direct Attached Storage (DAS)

Installation Overview for Enclosure Migration

Although extensive design and testing has been performed, Compaq recommendst that you perform a backup of your data before you migrate the enclosure to the MSA1000. Perform disk administration steps to defragment your file systems or volumes prior to performing the backup. This allows more efficient use of your backup media and reduces the time for backup. Use the following steps to migrate a new enclosure to an existing MSA 1000

1. After backing up the storage systems, schedule a convenient time to shut down the servers/applications so the storage subsystem can be turned off.
2. Shut down both the system(s) you are removing the disk enclosure(s) from and the target system you are planning to migrate/consolidate your storage to.
3. Disconnect the SCSI cables from your host bus adapter and MSA 1000. If necessary, move the disk enclosure(s) to the new server rack using the existing rack mount hardware.

4. Attach SCSI cables to the MSA 1000 expansion SCSI connectors. See ❶ and ❷ in the diagram below for SCSI connector A and SCSI connector B.

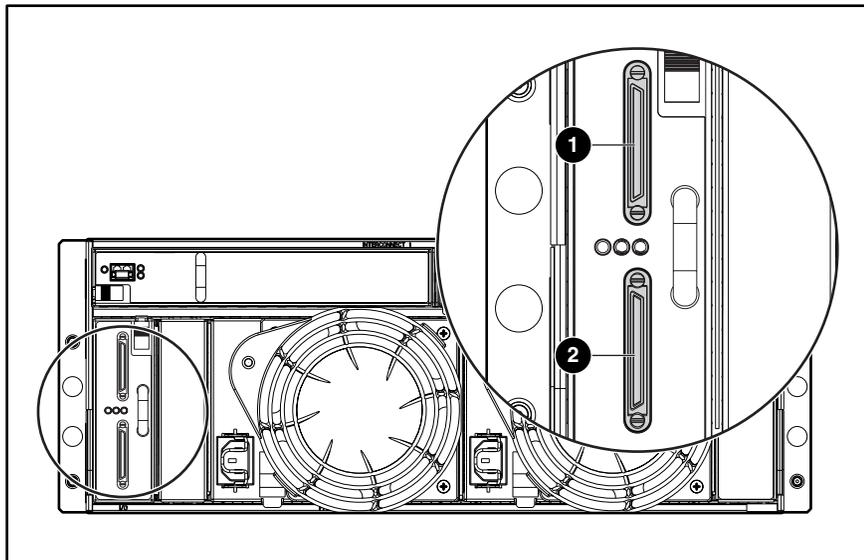


Figure 2-27: MSA 1000 expansion SCSI connectors

5. Attach the SCSI cables to the expansion disk enclosures. Attach the power cords to the power supplies at the rear of the enclosures.
6. Power on the MSA 1000 system. Use the power switch in front of the system. Turn on the host server(s) and allow it to boot.
7. Run ACU or ACU-XE to verify current configuration is maintained and new volumes are identified. If the migrated volumes are not identified, shut down the system and verify connections.
8. Run the disk administration utility to add logical drive volumes. Some systems may require rebooting to use the new volumes.

Installation Overview for Adding a New Enclosure

Even though extensive design and testing has been performed, when adding enclosures, it is recommended to perform a back up of your data before you add the enclosure to the MSA 1000. Perform disk administration steps to defragment your file systems or volumes prior to performing the backup. This allows more efficient use of your backup media and reduces the time for backup. Use the following steps for attaching and installing a new enclosure to an existing MSA 1000

1. After backing up the storage systems, schedule a convenient time to shutdown the servers/applications so the storage subsystem can be turned off.
2. Shut down the system to which the enclosure will be added.
3. Install the new MSA 1000s on the MSA 1000. Refer to instructions for mounting your disk drive enclosure in a rack.

4. Attach SCSI cables to the MSA 1000 expansion SCSI connectors. See ❶ and ❷ in the diagram below for SCSI connector A and SCSI connector B.

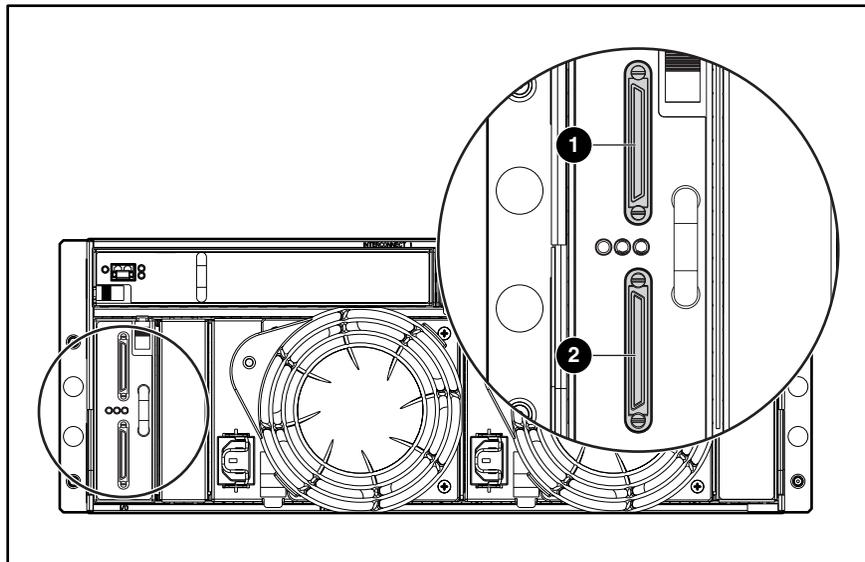


Figure 2-28: MSA 1000 expansion SCSI connectors

5. Attach the power cords to the power supplies at the rear of the enclosure.
6. Power on the MSA 1000 system. Use the power switch in front of the system. Power on server (s) with MSA 1000 attached.
7. Configure new storage with ACU or ACU-XE. Verify that additional storage is identified through the utility. See the ACU or ACU/XE sections of this manual for further information.
8. Run the disk administration utility to add logical drive volumes. Some systems may need to be rebooted to use the new storage.

MSA Fabric Switch 6 (optional)

To install the optional MSA Fabric Switch 6, follow the procedures below:

1. Complete the preparation procedures. See the section titled “Preparation Procedures,” earlier in this chapter.
2. If there is a blanking panel in place, loosen the thumbscrew that holds the panel in place **1** and remove the panel from the back of the unit.

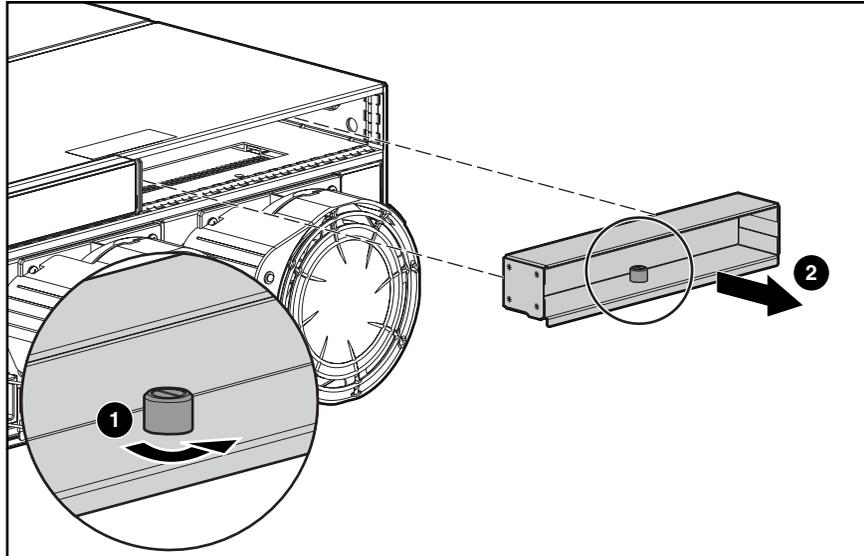


Figure 2-29: Removing blanking panel from the unit

3. If an existing Fibre Channel I/O module is being replaced by the MSA Fabric Switch 6, grasp the module handle, slide the module latch to the right, and then pull the I/O module out of the enclosure.

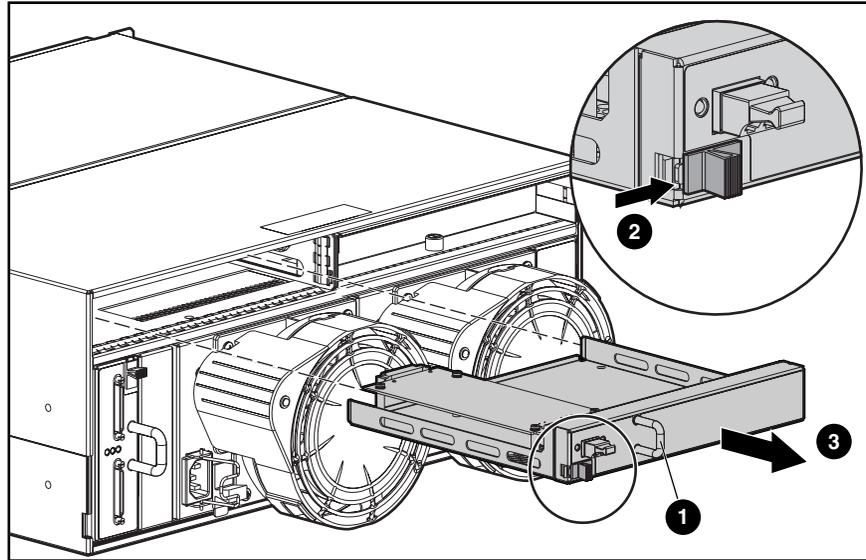


Figure 2-30: Removing the Fibre Channel I/O module

4. Insert the MSA Fabric Switch 6 into the MSA 1000.

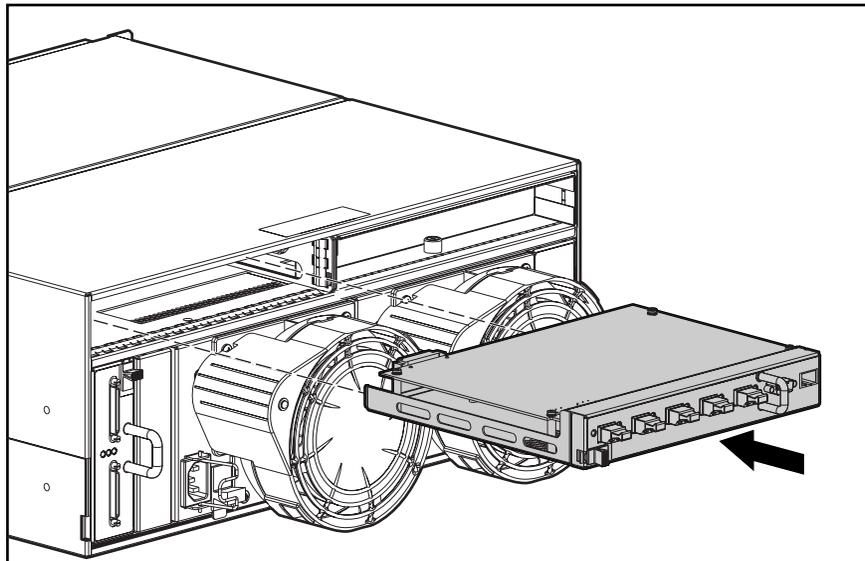


Figure 2-31: Installing the MSA Fabric Switch 6

To remove the MSA Fabric Switch 6, grasp the handle and pull the switch straight out of the chassis.

MSA 1000 Power Switch Assembly Servicing

The power switch assembly is a serviceable part. To remove the power switch assembly, follow the procedures below:

1. Turn off the power switch and remove the power cord.

2. Remove drives in slots 10-14.
3. Using a flat-head screwdriver, press the plastic latch behind the front bezel down while pulling the front bezel lightly with your other hand. When the top plastic clip has cleared the sheet metal lip of the shelf, move the flat-head screwdriver to the lower plastic clip and press up. Pull the unit clear.

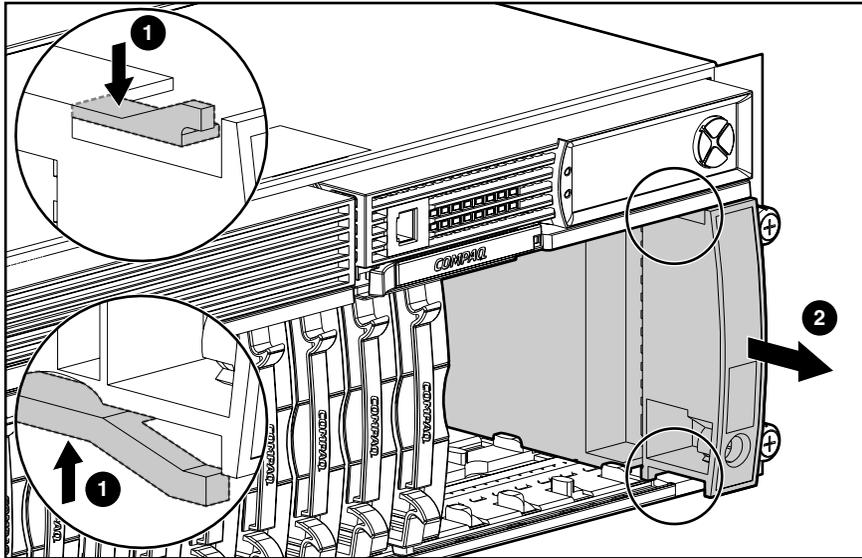


Figure 2-32: Removing the power switch assembly

MSA 1000 4 U Chassis with Backplane Replacement

In the event of a backplane board failure, a new chassis must be ordered. All of the MSA 1000's original component parts can be reinstalled to their respective locations on the new backplane. The parts that will be reinstalled include:

- Controller(s) or blank
- Hard Drives
- Power Switch Assembly
- Power Supply/Blower Assemblies
- SCSI I/O Module with an Integrated Environmental Monitoring Unit (I/O EMU)
- Hard drives
- Drive blanks
- Fibre Channel I/O Module
- MSA Fabric Switch 6 (if installed on previous system)
- Interconnect blanks (see the next section, "Interconnect Blank Replacement" for the steps in the interconnect blank removal process)

Write the serial number, shown on the original chassis, on the label of the replacement chassis, located in the area shown in Figure 2-33.

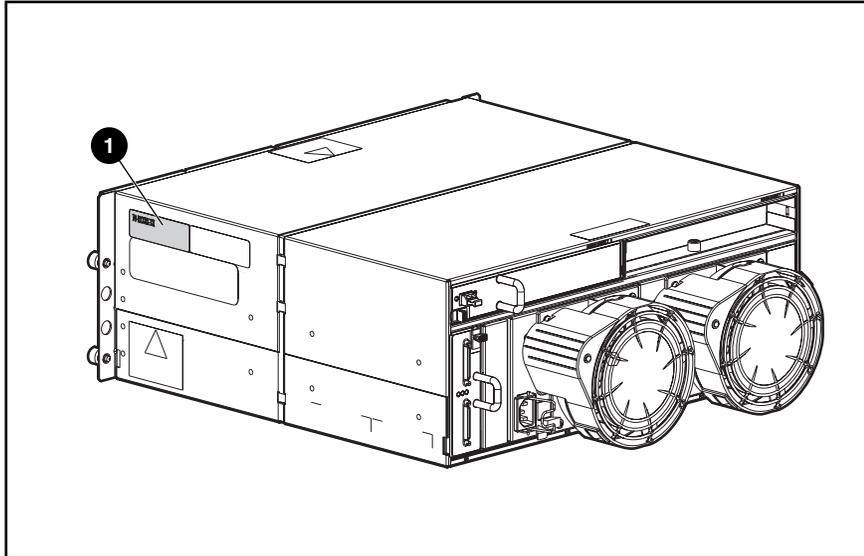


Figure 2-33: Location of the label for the handwritten serial number

Interconnect Blank Replacement

To remove the interconnect blank, loosen the thumbscrew that holds the panel in place ❶ and remove the panel from the back of the unit ❷.

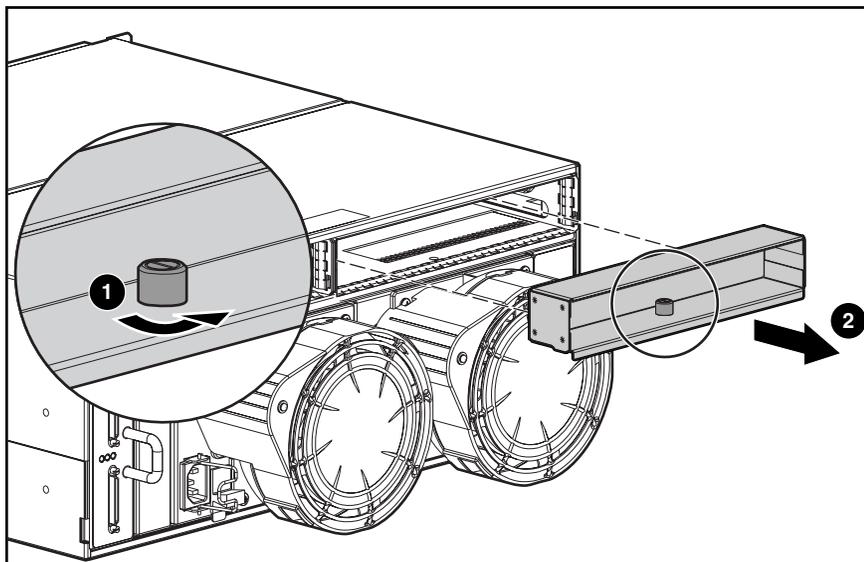


Figure 2-34: Removing the interconnect blank

To reinstall the interconnect blank, install the blank into the back of the chassis and tighten the thumbscrew that holds the panel in place.

MSA 1000 Cable Routing Diagrams



CAUTION: When routing cables, always ensure that the cables are not in a position in which they can be pinched or crimped.

AC Power Cable Assembly

To remove the AC power cable assembly:

1. Perform the preparation procedures. See “Preparation Procedures,” earlier in this chapter.
2. Unplug the primary power supply cable and the secondary power supply cable from the two rear power outlets and remove. Cut the plastic tie wrap securing the cable if there is a tie wrap.

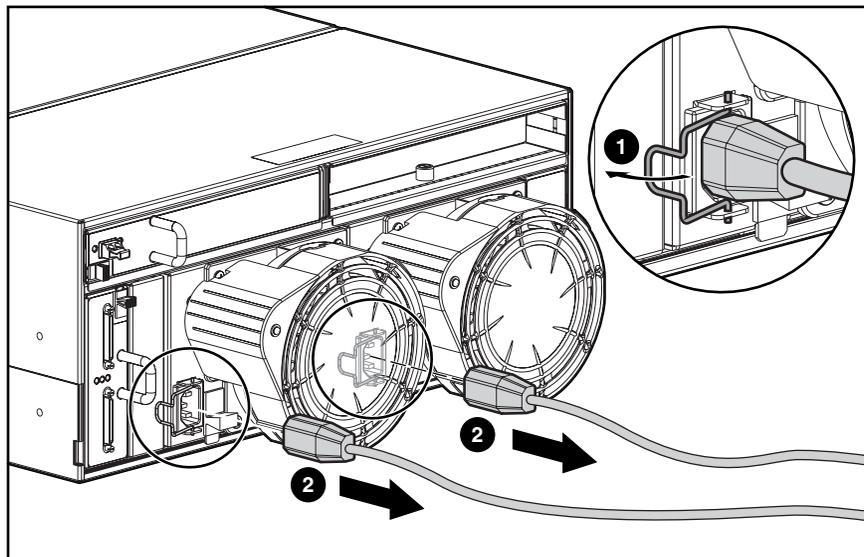


Figure 2-35: Removing the power cables

MSA 1000 SCSI Cable Routing

To remove the SCSI cables:

1. Perform the preparation procedures. See “Preparation Procedures,” earlier in this chapter.
2. Unplug the SCSI host port A cable and SCSI host port B cable from the SCSI connectors, as shown in Figure 2-36.

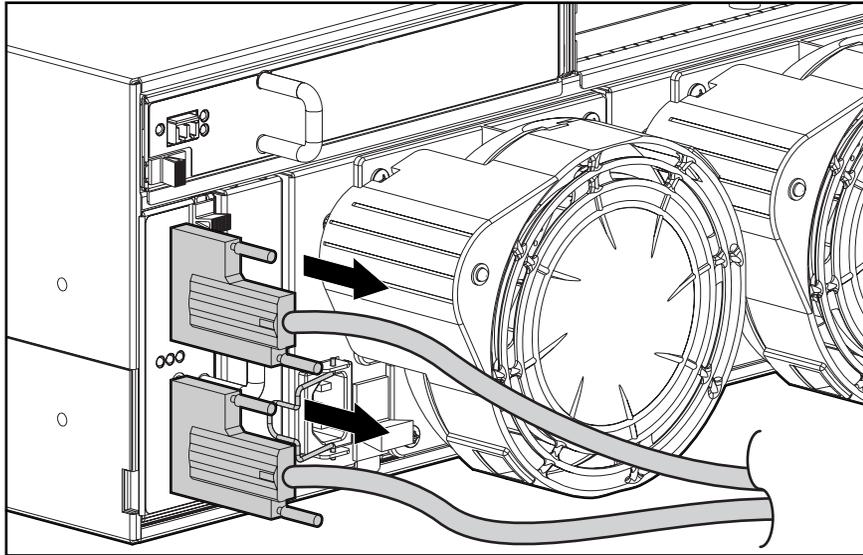


Figure 2-36: Removing SCSI cables

Diagnostics

This chapter describes software and firmware diagnostic tools available for the *StorageWorks* MSA 1000 by Compaq.

Diagnostic Tools Utility Overview

These utilities were developed to assist in diagnosing problems, testing the hardware, and monitoring and managing Compaq server hardware.

Table 3-1: Diagnostic Tools

Tool	What it is	How to run it
Compaq Diagnostics Program	Utility to assist testing and verifying operation of Compaq hardware. If problems are found, Compaq Diagnostics isolates failure(s) down to the replaceable part, whenever possible.	Diagnostics and utilities are located on a partition on the hard drive and must be accessed when a system configuration error is detected during Power-On Self-Test (POST). Compaq Diagnostics software is also available on the Compaq <i>SmartStart</i> for Servers CD. A Diagnostics diskette can be created from the SmartStart for Servers CD, and Diagnostics run from diskette.
INSPECT	INSPECT provides a report detailing system information.	INSPECT can be run from either the main menu of the System Configuration Utility or the Compaq Diagnostics program.

continued

Table 3-1: Diagnostic Tools *continued*

Tool	What it is	How to run it
Compaq Insight Manager AND Compaq Insight Manager Agent	A client/server application used to remotely manage Compaq hardware in a network environment. Reports hardware fault conditions (both failure and prefailure) and collects data for reporting and graphing.	For more information, refer to the Compaq Management CD and the <i>Compaq Insight Manager User Guide</i> . More information on viewing and printing the event list can be found in the "Compaq Insight Manager" section of this chapter.
Compaq Survey utility	An online information gathering agent that runs on servers, gathering critical hardware and software information from various sources. A utility for servers running Microsoft Windows NT or Novell NetWare. If a significant change occurs between data gathering intervals, previous information is marked, and the <i>survey text file</i> is overwritten to reflect the latest configuration and changes since last configuration. This allows a historical record of change events for server hardware and software.	
System Configuration Utility (SCU)	Utility to easily configure the hardware installed in or connected to the server. Specifically, it can: <ul style="list-style-type: none"> • Resolve resource conflicts in areas such as memory, port addresses, and interrupts (IRQs) • Automatically configure PCI boards • Manage installation of processor upgrades, and mass storage devices such as hard drives, tape drives, and diskette drives • Store configuration information in nonvolatile memory • Assist in installation of an operating system • Assist in running diagnostic tools such as Test and INSPECT • Assist in reconfiguring a server that cannot otherwise be restored 	If the server has a bootable CD-ROM drive, run Compaq System Configuration Utility directly from the Support Software CD supplied with the Compaq Controller Option Kit, or SmartStart for Servers CD-ROM. Use the CD supplied for version 5.2 or later supporting the controller. If the server does not have a bootable CD-ROM drive, create diskettes with latest version of the System Configuration Utility from the Support Software CD, or the SmartStart for Servers CD-ROM.

continued

Table 3-1: Diagnostic Tools *continued*

Tool	What it is	How to run it
ROM Based Setup Utility (RBSU)	<p>This utility is used to configure some hardware installed in or connected to the server. Specifically, it can:</p> <ul style="list-style-type: none"> • Resolve resource conflicts in areas such as memory, port addresses, and interrupts (IRQs) • Configure PCI boards automatically Provide switch and jumper settings • Manage installation of memory, processor upgrades, and mass storage devices such as hard drives, tape drives, and diskette drives • Store configuration information in nonvolatile memory • Configure the platform for an operating system 	Run RBSU directly from the system ROM by pressing the F9 key when prompted during POST to enter the utility.

Note: Depending on your configuration, this tool may not apply to your system. To determine which diagnostic tools apply, check your diagnostic user documentation.

For More Diagnostic Information

For detailed information about each of these diagnostic tools, refer to the Compaq Servers Troubleshooting Guide on the Documentation CD. For the most recent version of this guide, go to the Compaq website:

www.compaq.com

Recovery ROM

Each MSA 1000 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 one 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

IMPORTANT: For an MSA 1000 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 MSA 1000 is already operating) the firmware versions on both controllers are compared. If they are not the same, the ROM Cloning feature 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.

The determination as to which firmware version is used is based on the following criteria:

- If the MSA 1000 is being powered up with both controllers inserted, then the most recent version of firmware will be used regardless of which controller it resides on.
- If the MSA 1000 is already operating and an optional controller is hot-plugged, then the version of firmware that is on the original (non-hot-plugged) controller will be used regardless of its version. This ensures that any host-initiated I/O to the controller is not interrupted.

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, it will not be reset. The MSA 1000 will not enter redundant operation and an appropriate message will be shown on the display. After the MSA 1000 has been shut down 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.

Controller Display

Each array controller in an MSA 1000 contains an integrated Liquid Crystal Display (LCD). This module is used for displaying informational and error messages, showing the current 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 text and explanation of the display messages can be found in the section that follows titled “Controller Display Messages.”

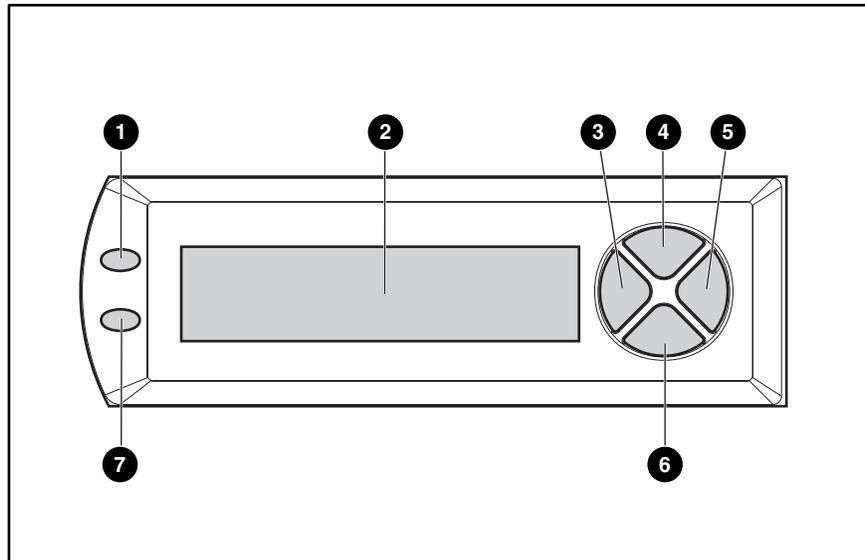


Figure 3-1: Controller display

- ❶ Fault indicator (amber)
- ❷ Display
- ❸ Left push button
- ❹ Up push button
- ❺ Right push button
- ❻ Down push button
- ❼ Redundancy Link indicator (green)

Controller Display Messages

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

Error Messages

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

An amber indicator to the left of the text display window turns on when an error message is being viewed. This indicator is also be turned on if an error message was sent to the display module but has not been viewed; non-error type messages were sent to the display module afterwards. By scrolling backwards and viewing all error messages, the indicator returns to only lighting up when on a current 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 text display window will normally be turned off when an informational message is currently being viewed unless an unviewed error message was previously sent to the display module. By scrolling backwards 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 an issue that can be handled in two different ways. It lets you either choose which way to handle the issue or it defaults to a standard choice after a set period of time. 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 text display window will blink on and off when ever 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 backwards using the up push button (with the up arrow on it). More recent messages can be viewed by scrolling forwards using the down push button (with the down arrow on it). When a new message is sent to the display, it will display that message ignoring any previous scrolling position it had. This new message will now be the most recent message available.

User Input

User input messages will allow the user two options, which are selected by either pushing the left push button (with the left arrow on it) or the right push button (with the right arrow on it). The meaning of each button will be defined in the text display window.

Deleting Messages

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

Redundancy Link Indicator

There is a green indicator to the left of the text display window that will be lit when two array controllers have been inserted into the MSA 1000 and they have enabled controller redundancy. The indicator will not be lit if there is only one array controller 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.

Special Notes

Box Numbering

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

- Box 1 is the MSA 1000 chassis.
- Box 2 is the storage enclosure attached to SCSI port A of the MSA 1000.
- Box 3 is the storage enclosure attached to SCSI port B of the MSA 1000.

Display Messages

The following table contains the defined messages and their components.

Table 3-2: Display Messages

Message	Type	Description	Action
00 ARRAY CONTROLLER FIRMWARE VER <version>	Informational	Displays the current version of the firmware running on the array controller.	
01 COMPAQ MSA 1000 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.	<p>Selecting the <i>no</i> option or not selecting any option within the timeout period will result in the volume being disabled so the user can attempt to fix the issue.</p> <p>Selecting the <i>yes</i> option will result in the volume being enabled regardless of the issue.</p>
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. Compaq support should be contacted.	<p>Remove the array controller in question, wait 10 seconds, and then reinsert it ensuring that it is fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>
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.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
05 SYSTEM NAME: <name>	Informational	Displays the user assigned name for the MSA 1000 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.	
24 BAD SCSI BUS MODE NON-LVD DEVICE FOUND	Error	The MSA 1000 does not support SCSI Single Ended (SE) devices; it only supports SCSI Low Voltage Differential (LVD) devices.	The MSA 1000 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 MSA 1000 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 Compaq support.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
31 I2C WRITE FAILURE <I2C device name>	Error	The MSA 1000 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 Compaq support.
32 CHASSIS NVRAM CONTENTS CORRUPTED	Error	The MSA 1000 has non-volatile memory on it that contains required information that is needed to operate. This non-volatile memory appears to be corrupted and the information is not valid. The MSA 1000 cannot continue to operate and will halt.	Contact Compaq support.
40 BEGIN REDUNDANCY SUPPORT	Informational	The array controllers are attempting to enter redundant mode.	
41 REDUNDANCY ACTIVE ACTIVE CONTROLLER	Informational	The array controllers are now in redundant mode and this array controller is <i>active</i> , which means that it is allowed to access the configured volumes on the MSA 1000.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
42 REDUNDANCY ACTIVE STANDBY CONTROLLER	Informational	The array controllers are now in redundant mode and this array controller is <i>standby</i> . It can be made <i>active</i> if the current <i>active</i> array controller fails, assuming you have all cables, I/O module, and software (Secure Path) 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 MSA 1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it, ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue, wait until downtime is available. Power off the MSA 1000, remove both array controllers, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 Channel Channel daughter card and the other does not.	<p>If the MSA 1000 is currently involved in host I/O, remove the <i>standby</i> array controller, add or replace the Fibre Channel Channel daughter card as needed, wait 10 seconds, and then reinsert it, ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue, wait until downtime is available. Power off the MSA 1000, remove both array controllers, add or remove Fibre Channel daughter cards as needed on both, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>
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, which attempts to make them both the same firmware level, has failed.	Manually update the firmware on the older array controller.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
46 REDUNDANCY HALTED EXPAND ACTIVE	Informational	If volume expansion is in progress then redundancy is not supported. Volume expansion is initiated and tracked using the Array Configuration Utility (ACU). Once volume expansion has completed, redundancy will automatically be reestablished.	
47 REDUNDANCY FAILED CACHE SIZE MISMATCH	Error	Both array controllers must have the same size of cache memory to successfully enter redundant mode.	<p>If the MSA 1000 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, ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue, wait until downtime is available. Power off the MSA 1000, remove both array controllers, add or remove cache memory as needed on both, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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.	
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.	<p>If the MSA 1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it, ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue, wait until downtime is available. Power off the MSA 1000, remove both array controllers, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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.	<p>If the MSA 1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue then you wait until downtime is available. Power off the MSA 1000, remove both array controllers, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>
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.	<p>If the MSA 1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it, ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue, wait until downtime is available. Power off the MSA 1000, remove both array controllers, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>

continued

Table 3-2: Display Messages *continued*

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.	<p>If the MSA 1000 is currently involved in host I/O, remove the <i>standby</i> array controller, wait 10 seconds, and then reinsert it, ensuring that it is fully seated in the chassis.</p> <p>If this does not resolve the issue, wait until downtime is available. Power off the MSA 1000, remove both array controllers, and reinsert them, ensuring they are fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq support.</p>
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 ensuring 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, ensuring that it is fully seated in the chassis.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
60 NO CACHE MODULE FOUND	Error	The array controller requires at least one cache module in order to operate. Either one is not 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, ensuring that it is fully seated in the chassis. Should the issue persist, contact Compaq 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 of the correct size, wait 10 seconds, and then reinsert it, ensuring 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.	
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.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 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, remove the <i>standby</i> array controller, replace the cache modules, wait 10 seconds, and then reinsert the array controller, ensuring that it is fully seated in the chassis.</p> <p>If the failure has occurred on the <i>active</i> array controller, wait until downtime is available. Power off the MSA 1000, remove the array controller, replace the cache modules, and reinsert the array controller, ensuring it is fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq 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.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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.	
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 is disabled. The cache is configured using the Array Configuration Utility (ACU).	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
71 SYSTEM HALTED FOR CACHE ERROR	Error	This message is generated if the user chooses not 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).	<p>The <i>no</i> option causes the array controller to halt, providing an opportunity to resolve the issue. Selecting the <i>yes</i> option results in the cache data being erased. Operation of the array controller continues 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 on the systems without allowing any host I/O and wait for the cache data to be written to the drives. The systems can be powered off and cache boards moved to their new locations.</p>

continued

Table 3-2: Display Messages *continued*

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.	The <i>no</i> option causes the array controller to halt. Selecting the <i>yes</i> option results in the cache data being erased. Operation of array controller will continue normally. 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). Error 2.1 and 2.2: A second cache board containing valid data was removed from its original array controller and added to this one (dual cache module configuration). Error 2.3: A cache board containing valid data was removed from its original array controller and added to this one (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 cache data to be written to drives. The systems can be powered off and the cache boards moved to their new locations.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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, remove the <i>standby</i> array controller, remove cache, attach cache batteries, replace the cache modules, wait 10 seconds, and then reinsert the array controller, ensuring that it is fully seated in the chassis.</p> <p>If the failure has occurred on the <i>active</i> array controller, wait until downtime is available. Power off the MSA 1000, remove the array controller, replace the cache modules, and reinsert the array controller, ensuring it is fully seated in the chassis.</p> <p>Should the issue persist, contact Compaq 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.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
82 DRIVE HOT ADDED BOX #<n>, BAY <n>	Informational	A SCSI drive has been added to the MSA 1000 or one of the MSA 1000s attached to it.	
83 DRIVE HOT REMOVED BOX #<n>, BAY <n>	Informational	A SCSI drive has been removed from the MSA 1000 or one of the MSA 1000s attached to it.	
84 DRIVE FAILURE BOX #<n>, BAY <n>	Error	A SCSI drive in the MSA 1000 or one of the MSA 1000s 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.
86 DRIVE POSITION CHANGE DETECTED	Informational	The SCSI drives that make up a configured volume have been physically moved within the MSA 1000 or an attached MSA 1000. The array controller has updated its configuration information accordingly.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 MSA 1000 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.	The failed drives should be replaced as soon as possible.
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.
103 VOLUME #<n> STATE REBUILDING	Informational	The configured volume is rebuilding data on a SCSI drive that replaced a previously failed drive.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 MSA 1000 and then all attached MSA 1000s. Unplug and reinsert all SCSI drives ensuring they are fully seated in their bays. Check the cables connecting the MSA 1000 to any attached MSA 1000s. Power on the attached MSA 1000s and then the MSA 1000.
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.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 MSA 1000 and then all attached MSA 1000s. Unplug and reinsert all SCSI drives ensuring they are fully seated in their bays. Check the cables connecting the MSA 1000 to any attached MSA 1000s. Power on the attached MSA 1000s and then the MSA 1000.
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 MSA 1000 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.	
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.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 was 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 MSA 1000 and then all attached MSA 1000s. Unplug and reinsert all SCSI drives ensuring they are fully seated in their bays. Check the cables connecting the MSA 1000 to any attached MSA 1000s. Power on the attached MSA 1000s and then the MSA 1000.
122 NEW VOLUME(S) DETECTED	Informational	Configured volumes from another array controller were migrated to this array controller. The configuration information has been updated.	

continued

Table 3-2: Display Messages *continued*

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.
124 SPARES CLEARED	Informational	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 spares defined for them that conflict with the existing configuration. The defined spares have been deleted so as to allow the migration to proceed.	Run the Array Configuration Utility (ACU) to reassign spare drives as needed.
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 conflict with the existing configuration. The access controls have 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.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 conflict with the existing configuration. The access controls have 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 that 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 MSA 1000 fans and ensure they are operating. Any failed fans should be replaced. Ensure that there are drive blank cartridges in any empty drive bays of the MSA 1000 chassis. If only one array controller is inserted, ensure that there are cover plates installed in the empty array controller bay and the Fibre Channel bay of the MSA 1000 chassis.

continued

Table 3-2: Display Messages *continued*

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 MSA 1000 should be powered off as soon as possible to avoid hardware failure. Check all MSA 1000 fans and ensure they are operating. Any failed fans should be replaced. Ensure that there are drive blank cartridges in any empty drive bays of the MSA 1000 chassis. If only one array controller is inserted, ensure that there are cover plates installed in the empty array controller bay and the Fibre Channel bay of the MSA 1000 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 ensuring that it is fully seated in the chassis. Should the issue persist, contact Compaq 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.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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 ensuring that it is fully seated in the chassis. The ROM autoflash process will be attempted again. Should the issue persist, contact Compaq support.
303 ROM CLONING STARTED	Informational	Indicates that the two array controllers in an MSA 1000 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. If both array controllers are in the power up sequence, then the most recent version of firmware will be used. 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.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
304 ROM CLONING DONE	Informational	Indicates that the two array controllers in an MSA 1000 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 an MSA 1000 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 ensuring that it is fully seated in the chassis. The ROM cloning process will be attempted again. Should the issue persist, contact Compaq support.
306 FIRMWARE FLASH STARTED	Informational	Indicates that the array controller in the MSA 1000 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 MSA 1000 has completed the firmware flash process. It is now safe to turn off power to the system.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
308 FIRMWARE FLASH FAILED	Error	Indicates that the array controller in the MSA 1000 has failed the firmware flash process.	Attempt the flash process again. Should the issue persist, contact Compaq support.
309 EMU FLASH STARTED	Informational	Indicates that the EMU in the MSA 1000 has started the firmware flash process. Do not turn off the power to the system until it has completed. This could take five minutes.	
310 EMU FLASH DONE	Informational	Indicates that the EMU in an MSA 1000 has completed the firmware flash process. It is now safe to turn off power to the system.	
311 EMU FLASH FAILED	Error	Indicates that the EMU in an MSA 1000 has failed the firmware flash process.	Attempt the flash process again. Should the issue persist, contact Compaq support.

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
400 STORAGE BOX #<n> FAN OK	Informational	The specified MSA 1000 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 MSA 1000 indicates that one of its fans has failed. The MSA 1000 and any devices in it may now be susceptible to overheating if corrective action is not taken.	Check all fans and ensure they are operating. Any failed fans should be replaced.
402 STORAGE BOX #<n> FAN DEGRADED	Error	The specified MSA 1000 indicates that one of its fans is not operating at full efficiency. The fan may eventually fail.	Check all fans and ensure they are operating. Any failed fans should be replaced.
403 STORAGE BOX #<n> FAN HOT INSERTED	Informational	The specified MSA 1000 indicates that a fan has been added.	
404 STORAGE BOX #<n> FAN HOT REMOVED	Informational	The specified MSA 1000 indicates that a fan has been removed.	
405 STORAGE BOX #<n> TEMPERATURE OK	Informational	The temperature sensor in the MSA 1000 indicates that the temperature is now back in the normal operating range.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
406 STORAGE BOX #<n> OVERHEATING	Error	The temperature sensor in the MSA 1000 indicates that the enclosure is starting to exceed the normal operating range.	Check all fans and ensure they are operating. Any failed fans should be replaced. Ensure that there are drive blank cartridges in any empty drive bays in the enclosure. If the enclosure is an MSA 1000 and only one array controller is inserted, ensure that there are cover plates installed in the empty array controller bay and the Fibre Channel bay in the chassis.
407 STORAGE BOX #<n> OVERHEATED	Error	The temperature sensor in the MSA 1000 indicates that the enclosure has exceeded the safe operating range.	The MSA 1000 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 ensure they are operating. Any failed fans should be replaced. Ensure that there are drive blank cartridges in any empty drive bays in the enclosure. If the enclosure is an MSA 1000 and only one array controller is inserted, ensure that there are cover plates installed in the empty array controller bay and the Fibre Channel bay in the chassis.
408 STORAGE BOX #<n> POWER SUPPLY OK	Informational	The specified MSA 1000 indicates that one of its power supplies which previously had been failed is now operating normally.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
409 STORAGE BOX #<n> POWER SUPPLY FAILED	Error	The specified MSA 1000 indicates that one of its power supplies has failed.	Check all power supplies and ensure they are operating. Any failed power supplies should be replaced.
410 STORAGE BOX #<n> POWER SUPPLY ADDED	Informational	The specified MSA 1000 indicates that a power supply has been added.	
411 STORAGE BOX #<n> POWER SUPPLY REMOVED	Informational	The specified MSA 1000 indicates that a power supply has been removed.	
412 STORAGE BOX #<n> EMU NOT RESPONDING	Error	The specified MSA 1000 is not responding to commands.	Make sure the storage box is powered on. Ensure all cables are connected securely. Power on the MSA 1000 and the storage box. Power on the storage box first and then the MSA 1000. Should the issue persist, contact Compaq support.
413 STORAGE BOX #<n> EMU VERSION <version>	Informational	The version of the firmware running on the EMU. This is only displayed for the internal EMU of the MSA 1000. It is not displayed for externally connected storage boxes.	

continued

Table 3-2: Display Messages *continued*

Message	Type	Description	Action
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, ensuring that it is fully seated in the chassis. Should the issue persist, contact Compaq 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, ensuring that it is fully seated in the chassis. Should the issue persist, contact Compaq support.
510 INITIALIZING FIBRE CHANNEL SUBSYSTEM	Informational	The array controller's Fibre Channel subsystem is being initialized as part of the power up sequence.	
511 FIBRE CHANNEL SUBSYSTEM HARDWARE FAILURE	Error	The array controller's Fibre Channel subsystem has encountered a critical error during the power up sequence.	Remove the failed array controller and its associated Fibre Channel module, reseal the Fibre Channel daughter card on the array controller, wait 10 seconds, then reinsert the Fibre Channel module and the array controller, ensuring that they are fully seated in their respective bays in the chassis. Should the issue persist, contact Compaq support.
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.

Connectors, Switches, and LEDs

This chapter provides figures and tables showing front and rear views and the locations of connectors, switches, and indicators on various parts of the *StorageWorks* MSA 1000 by Compaq.

Views

This section contains figures and information about the front and rear views of the MSA 1000.

Front View

The front view controls accessible to the user are displayed in the figure below.

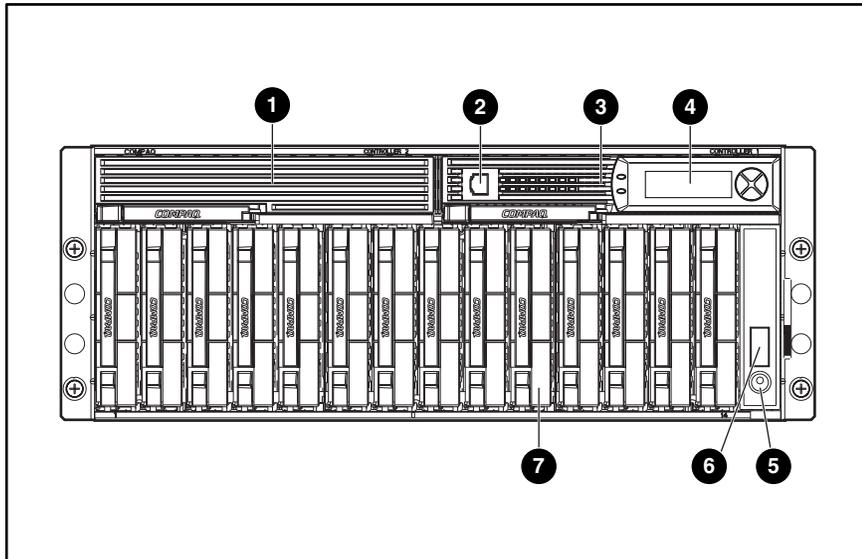


Figure 4-1: Front view

- ❶ Blank panel (when hot-pluggable redundant Controller is not present)
- ❷ Service port (not supported at this time)
- ❸ Hot-Pluggable MSA 1000 Controller
- ❹ Controller Display
- ❺ Power Switch
- ❻ Enclosure Status indicators
- ❼ Hot-pluggable hard drives

Rear View

The features and accessible components on the rear panel are displayed in the figure below.

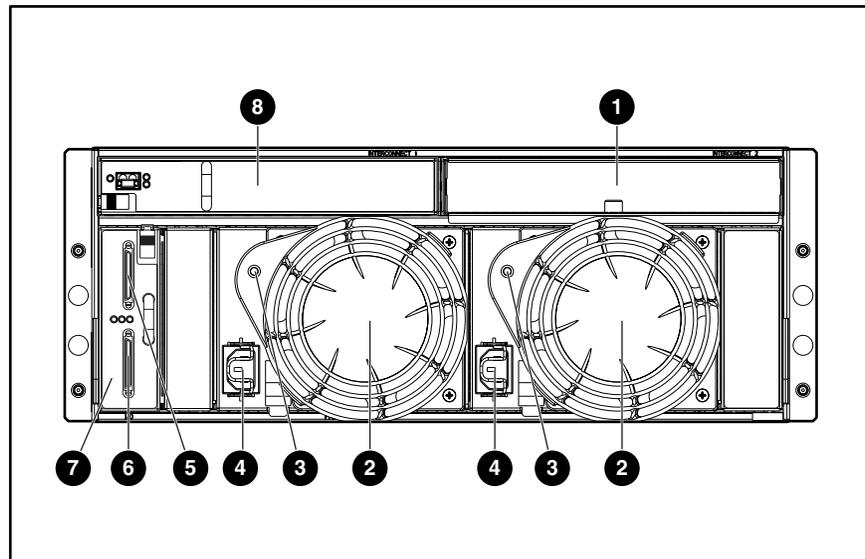


Figure 4-2: Rear view

- ❶ Blank Panel (Do not remove. The blank panels are necessary for airflow)
- ❷ Power Supply/Blower Assemblies
- ❸ Power Supply/Blower Assembly indicators
- ❹ AC Power cord connectors
- ❺ SCSI Port A connector
- ❻ SCSI Port B connector
- ❼ SCSI I/O Module with Integrated Environmental Monitoring Unit (EMU)
- ❽ Fibre Channel I/O Module

Connectors

Backplane Connectors

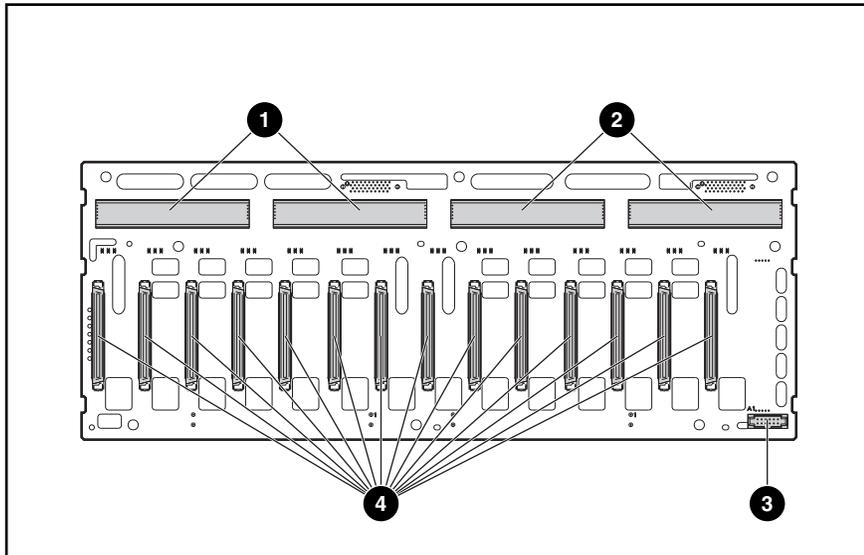


Figure 4-3: Backplane board front connectors:
controller connectors ❶, controller connectors ❷, power switch connector ❸, hard drive connectors ❹

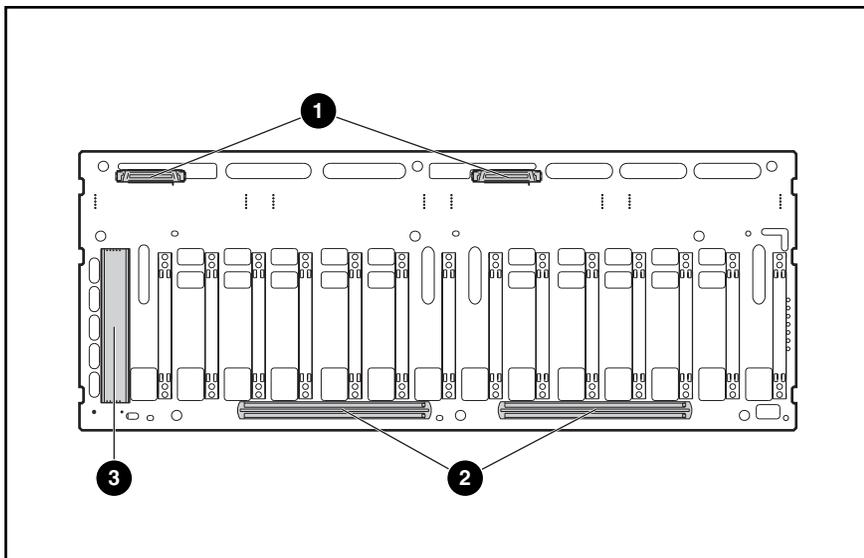


Figure 4-4: Backplane board back connectors: Fibre Channel connectors ❶, power supply connectors ❷, I/O EMU connector ❸

SCSI I/O board connectors

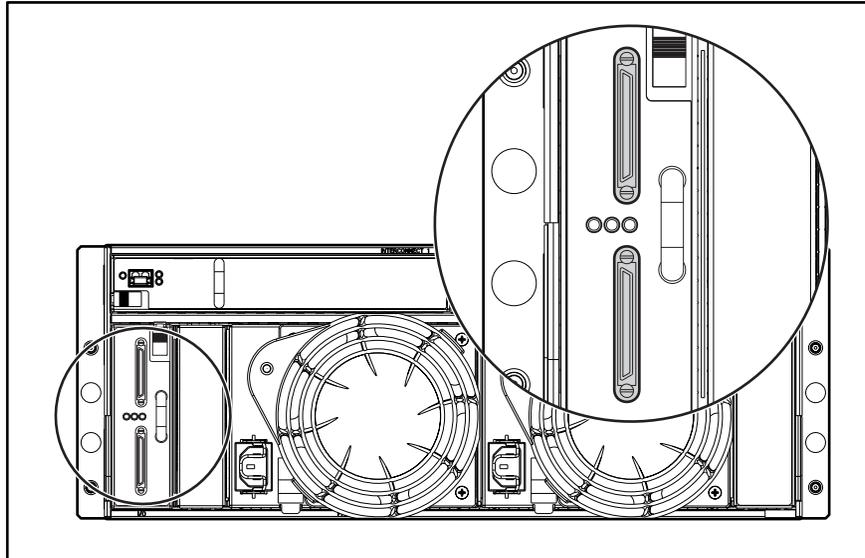


Figure 4-5: SCSI I/O board connectors

Indicators

The MSA 1000 is equipped with a series of indicators. The following sections list the indicators.

Enclosure Status Indicators

The Enclosure Status indicators are found on the MSA 1000, as displayed in the figure below.

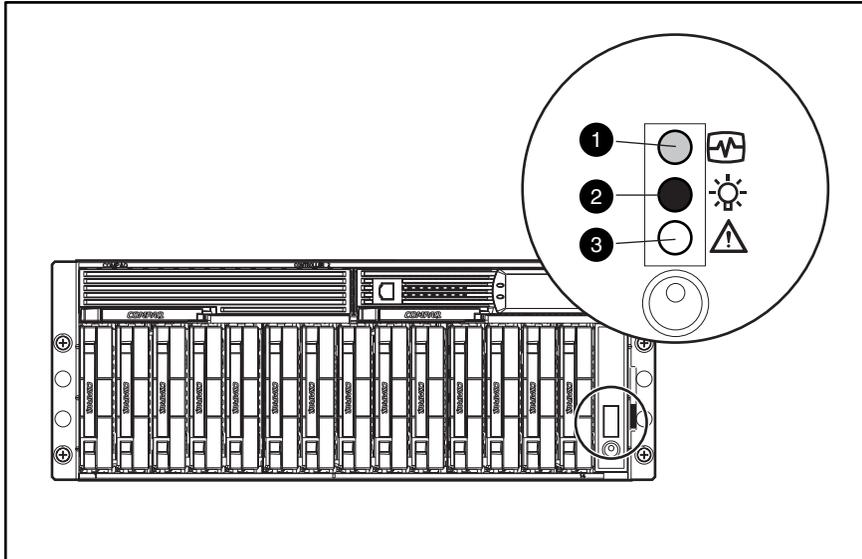


Figure 4-6: Enclosure status indicators

Table 4-1: Enclosure Status Indicators

Number	Indicator	Condition	Meaning
①	EMU	Blinking Green	EMU is operating normally
	EMU	Off/Solid	EMU is not operating normally
②	Power	Green	System power ON
	Power	Off	System in STANDBY or system power has been removed
③	Fault	Amber	Fault detected in one or more subsystems
	Fault	Off	No faults detected

IMPORTANT: The system power in the MSA 1000 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/Blower Assembly

The green indicator on the power supply assembly is on when both the power supply and the blower are operational. When there is either a power supply or blower fault, the power supply indicator goes off. If the power supply indicator is off, AC power is not present, there is a complete power supply failure, or the blower has failed.

The power supply-mounted blowers 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. This airflow is a function of blower speed (rpm). These blowers, under the control of the I/O EMU, can operate at multiple speeds. This ensures that when the enclosure temperature changes the blowers can automatically adjust the airflow.

If one blower operates too slowly, or completely shuts off, the other blower will begin to operate at a higher speed. At the same time, the error condition is reported to the user.

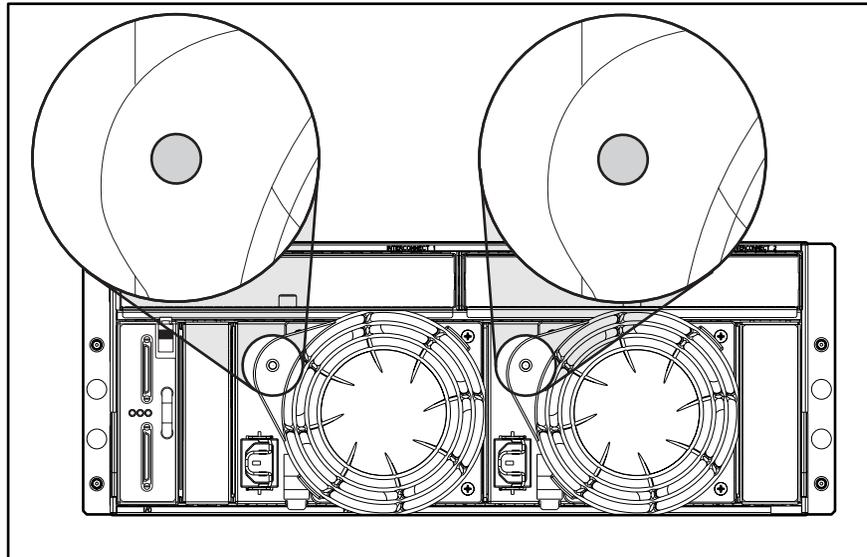


Figure 4-7: Power supply/blower assembly indicators

Hard Drives

The three disk drive status indicators, as shown in the figure below, define the operational status of each drive.

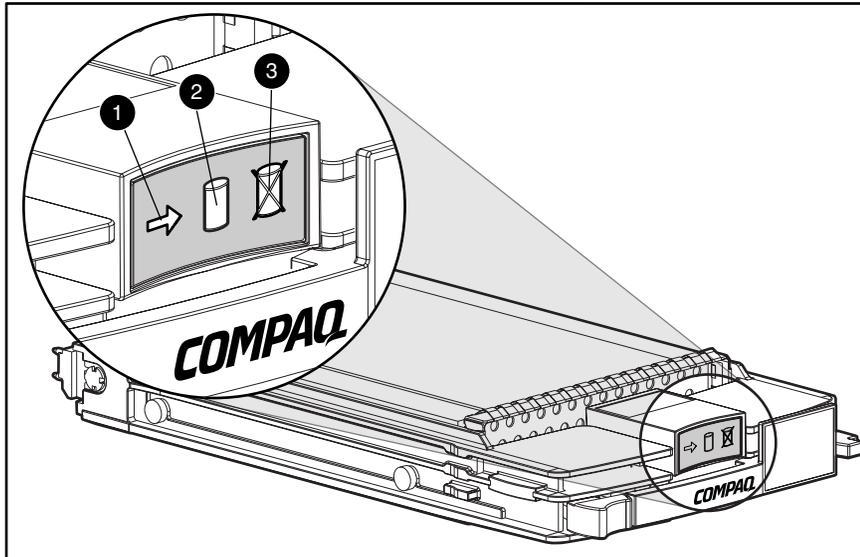


Figure 4-8: Hard drive indicators

Table 4-2: Hard Drive Status from Indicator Combinations

①	②	③③	Meaning
Activity	Online	Fault	
On	Off	Off	The drive is being accessed, but it is: <ul style="list-style-type: none"> • Not configured as part of an array, <i>or</i> • A replacement drive and rebuild has not yet started, <i>or</i> • Spinning up during POST
Flashing	Flashing	Flashing	Do not remove the drive. Removing a drive during this process can cause data loss in non-fault-tolerant configurations. <ul style="list-style-type: none"> • The drive is part of an array being selected by the Array Configuration Utility, <i>or</i> • Options ROMPaq is upgrading the drive.
Off	Off	Off	OK to replace the drive online <ul style="list-style-type: none"> • The drive is not configured as part of an array <i>or</i> • The drive is configured as an online spare.

continued

Table 4-2: Hard Drive Status from Indicator Combinations *continued*

① Activity	② Online	③③ Fault	Meaning
On	Flashing	Off	<p>Do not remove the drive. Removing a drive during this process can cause data loss in non-fault-tolerant configurations</p> <ul style="list-style-type: none"> The drive is a replacement drive and is being rebuilt <i>or</i> If all online lights in a drive array are blinking, an expansion is occurring.
Off	Off	On	<p>OK to replace the drive online.</p> <p>The drive has failed, and has been placed off-line.</p>
Off, on or flashing	On	Off	<p>Do not remove the drive. Removing a drive during this process can cause data loss in non-fault-tolerant configurations.</p> <p>The drive is online and configured as part of an array.</p>
Off, on or flashing	On or Off	Flashing	A predictive failure alert has been received for this drive. Replace the drive as soon as possible.

Interpreting Component Indicators

If the fault indicator on any of the MSA 1000 components is amber, or if Compaq Insight Manager indicates a fault, determine the reason for this alert by examining the component indicators to see if any indicates a fault.

Hard Drive Indicators



CAUTION: Failure to observe the instructions in this section can result in loss of data.

Look for amber Drive Failure indicators on any hot-pluggable drive tray.

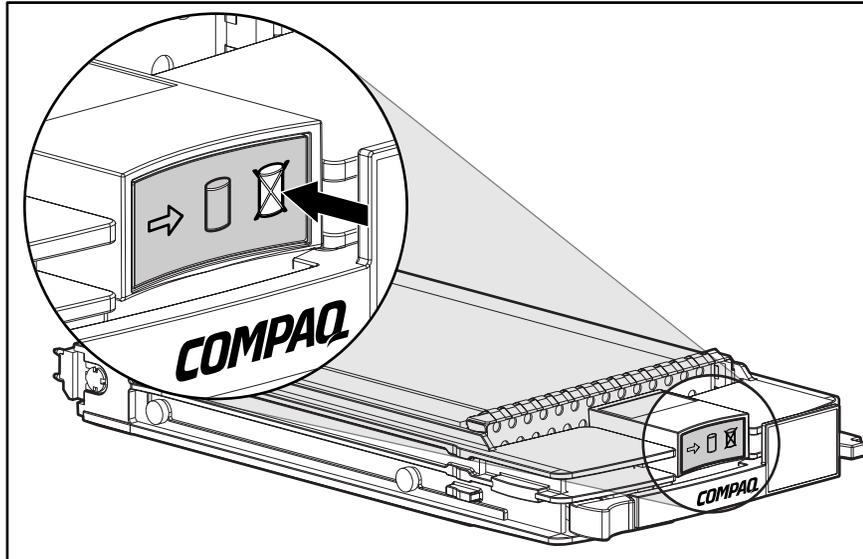


Figure 4-9: Drive failure indicator

If any Drive Failure indicator appears amber, replace that drive as soon as possible. See the section titled “Replacing Components,” in Chapter 2, for important information on when it is safe to replace drives.

SCSI I/O Module with Integrated Environmental Monitoring Unit (I/O EMU)

The I/O EMU has three indicators. The following figure and table describes their locations and meanings.

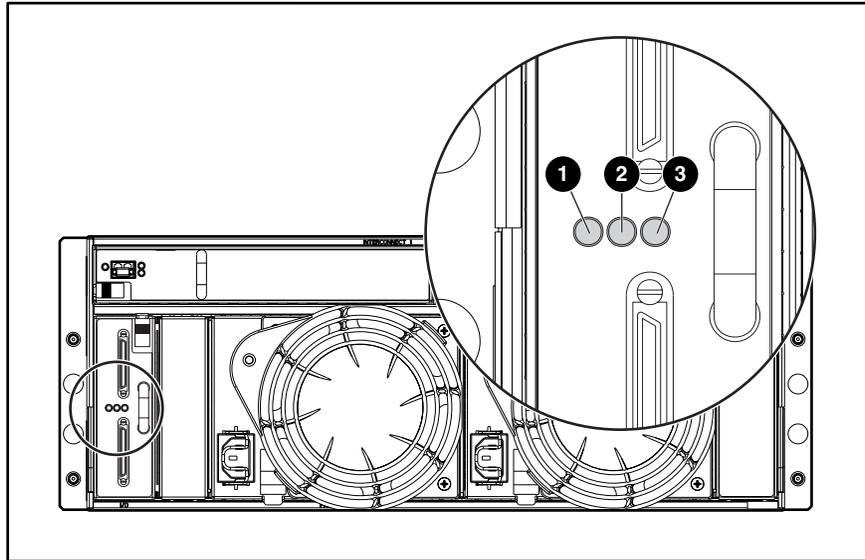


Figure 4-10: SCSI I/O Module with Integrated Environmental Monitoring Unit (I/O EMU)

Table 4-3: SCSI I/O Module Indicators

Number	Indicator	Condition	Meaning
❶	Power	Solid Green	Power on
	Power	Off/Solid	Power off
❷	SCSI Host Port A	Green/Flashing	On/Activity
	SCSI Host Port A	Off	Off
❸	SCSI Host Port B	Amber	On/Activity
	SCSI Host Port B	Off	Off

Fibre Channel I/O Module

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

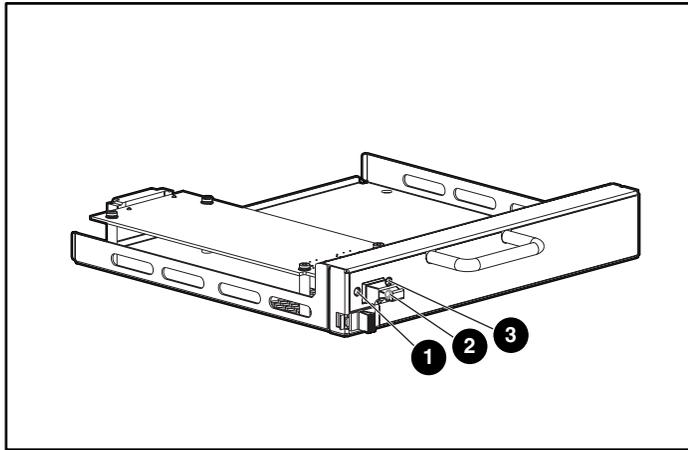


Figure 4-11: Fibre Channel I/O Module indicators: Global Service Indicator ❶, 2-Gb link light ❷, and 1-Gb link light ❸

Table 4-4: Fibre Channel I/O Module Global Status Indicator

Condition	Description
Off	Power not applied to Fibre Channel I/O module, Controller not plugged in, or unsuccessful Controller POST.
Solid Green	Power applied and connection established between Fibre Channel I/O module and Fibre Channel Controller.
Flashing Amber	Power is applied but Fibre Channel Controller is not present.

Table 4-5: Fibre Channel I/O Module Link Status Indicators

1-Gb Indicator	2-Gb Indicator	Description
Off	Off	A link has not been established since the application of power, initiation of reset, hot-plug of Fibre Channel I/O module, the removal of transceiver, or the hot-plug of the transceiver.
Green	Off	A 1-Gb link is active and the status is good.
Flashing Amber	Off	A 1-Gb link was established but is now inactive.
Off	Green	A 2-Gb link is active and the status is good.
Off	Flashing Amber	A 2-Gb link was established but is now inactive.
Flashing Amber	Flashing Amber	The Fibre Channel Controller was removed or there is no Fibre Channel Card installed.

MSA 1000 Controller Indicators

During normal runtime, the MSA 1000 Controller has 18 indicators that indicate activity or malfunction of the Controller. They are labeled 0-17. Table 4-6 describes the purpose and function of each indicator.

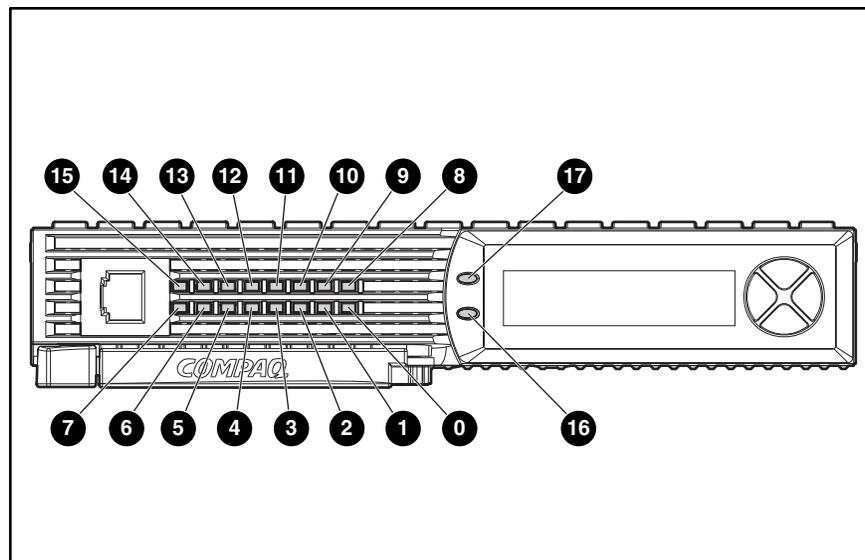
**Figure 4-12: MSA 1000 Controller indicators**

Table 4-6: MSA 1000 Controller Indicator Descriptions

Indicator	Function	Description
①-②	Busy status	ON = Indicates this Array Controller is idle OFF = Indicates this Array Controller is operating at full capacity
③-⑦	Target IDs	See table 4-7
⑧	Idle Heartbeat	Indicates the Array Controller is idle and functioning
⑨	Active/Standby	ON=Controller is active OFF=Controller is in standby
⑩	Direct Memory Access (DMA) active	ON = DMA transfers are active
⑪	Logical I/O active	ON = Currently processing logical requests from the Host Adapter
⑫	SCSI Bus 0 active	ON = Indicates requests are outstanding on the first SCSI bus
⑬	SCSI Bus 1 active	ON = Indicates requests are outstanding on the second SCSI bus
⑭	Cache Activity	ON = Cache active OFF = No cache activity Blinking = Cache transfer pending
⑮	Drive failure	ON = A configured hard drive has failed in the array
⑯	Redundancy Active	Green indicates two controllers are in a redundant mode of operation.
⑰	Fault	Amber indicates an error message has been sent to the controller display

Switches

Power

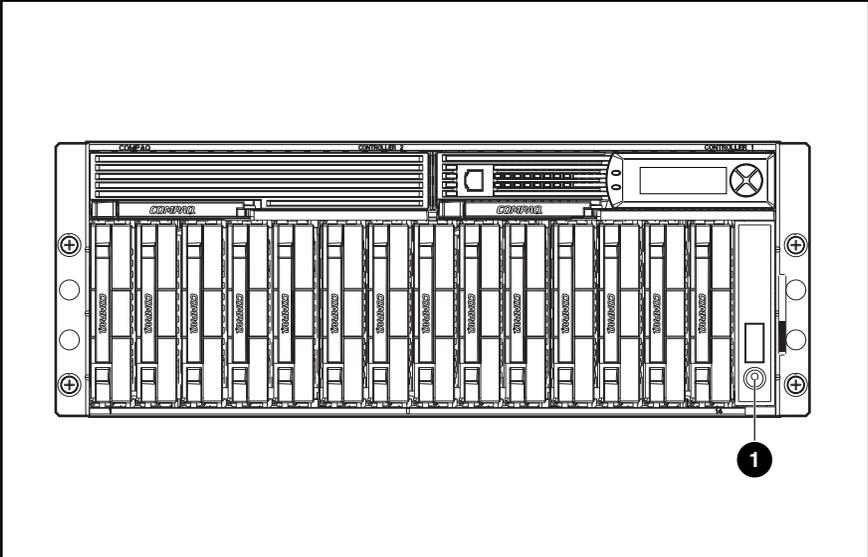


Figure 4-13: Power switch ❶

Specifications

This chapter provides operating and performance specifications for the *StorageWorks* MSA 1000 by Compaq. The sections in this chapter are:

- MSA 1000 System Unit
- Memory
- Power Supply
- SCSI I/O Module with Environmental Monitoring Unit (I/O EMU)

NOTE: For information on all supported components and their part numbers, see Chapter 1, “Illustrated Parts Catalog.”

System Unit

Table 5-1: System Unit Specifications

Item	Description
Height	17.5 cm (6.9 in)
Width	52.1 cm (20.5 in)
Depth	48.3 cm (19.0 in)
Weight (no drives installed, single power supply)	22.7 kg (50 lb)
International input voltage requirements	
Rated input voltage	100 to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	7.35 A Max
Input Power (max)	641 W*
U.S. input voltage requirements	
Rated input voltage	100 VAC to 240 VAC
Rated input frequency	50 Hz to 60 Hz
Rated input current	7.35 A Max
Input Power (max)	641 W*
Power supply specifications	
Rated steady-state power	377 watts
Maximum peak power	681 watts
Btus	2187 Btu/hr*
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%

continued

Table 5-1: System Unit Specifications *continued*

Item	Description
Maximum wet-bulb temperature	
Long term storage	29°C (84.2°F)
Short term storage	30°C (86°F)
Acoustic noise (<i>LW</i> Adc bels and <i>Lp</i> Am dBA)	
Idle	<6.9 and 53
Fixed disk (random writes)	<7.3 and 54
*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.	

Memory

Table 5-2: Memory Specifications

Item	Description
Speed	100 MHz minimum
Width	80 bits
Note: Use only Compaq battery-backed cache accelerator modules.	

MSA 1000 System Unit Power Supply

Table 5-3: MSA 1000 System Unit Power Supply Specifications

Item	Description
Height	12.7 cm (4.5 in)
Width	15.9 cm (6.25 in)
Depth	24.1 cm (9.5 in)
Weight	2.9 kg (6.4 lb)
Note: The MSA 1000 System Unit power supply specifications are calculated without the fan.	

MSA 1000 System Unit SCSI I/O Module with an Integrated Environmental Monitoring Unit (I/O EMU)

Table 5-4: SCSI I/O Module with an Integrated Environmental Monitoring Unit (I/O EMU) Specifications

Item	Description
Height	11.4 cm (4.5 in)
Width	3.5 cm (1.375 in)
Depth	24.1 cm (9.5 in)
Weight	0.6 kg (1.3 lb)

A

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