HP 8 Internal Port SAS Controller and HP Multi-Port Internal SAS Controller Support Guide

HP-UX 11i v2, 11i v3

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Preface: About This Document

This document describes how to install, configure, and troubleshoot HP internal Serial-Attached SCSI (SAS) controllers on HP-UX 11i v2 and 11i v3 platforms. The latest version of this document is available online at:

http://docs.hp.com/en/netcom.html

Intended Audience

This document is for system and network administrators responsible for installing, configuring, and managing fault tolerant data storage. Administrators must know HP-UX operating system concepts, commands, and configuration.

This document is not a tutorial.

New and Changed Documentation in This Edition

This Support Guide was published in conjunction with the March 2008 (AR0803) release of HP-UX 11i v3. This is the fifth edition of this document.

Publishing History

Table 1 Publishing History Details

Document Manufacturing Part Number	Operating Systems Supported	Supported Product Versions	Publication Date
5991-5495	HP-UX 11i v2	B.11.23.0606	September 2006
J6369-90041	HP-UX 11i v2 HP-UX 11i v3	B.11.23.0612 B.11.31	February 2007
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J6369-90071	HP-UX 11i v2 HP-UX 11i v3	B.11.23.0803 B.11.31.0803	March 2008

What's in This Document

This Support Guide is divided into several chapters containing physical descriptions, installation, configuration, and troubleshooting information.

Chapter 1 "Controller Overview" provides a general overview of controller features and functionality.

Chapter 2 "Replacing a Controller" lists the steps to replace an HP 8 Internal Port PCI-X SAS Controller.

Chapter 3 "Configuring the Controller Offline" provides information on configuring HP internal SAS controllers offline using the `drvcfg` and `cfggen` commands.

Chapter 4 "Configuring and Troubleshooting the Controller Online" provides information on configuring and troubleshooting the HP internal SAS controllers online using the `ioscan` and `sasmgr` commands.

Appendix A "Electrostatic Discharge" provides information about preventing damage due to electrostatic discharge.

Appendix B "Specifications"

Related Documents

For more information about HP internal SAS controllers, see:

http://docs.hp.com/en/netcom.html

Other documents in this collection include:

- *SerialSCSI-00 (sasd) Mass Storage Driver Release Notes*
- *HP CommonIO Release Notes*
- *SAS Host Bus Adapters Support Matrix*

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Please include document title, manufacturing part number, and any comment, error found, or suggestion for improvement you have concerning this document. Also, please let us know if there is anything about this document that is especially useful, so we can incorporate it into other documents.

1 Controller Overview

This chapter provides an overview of the SAS controller and its technology. This chapter includes the following topics:

Serial-Attached SCSI (SAS) Technology Description

Serial-attached SCSI (SAS) is a method for connecting computer peripheral devices that employs a serial (one bit at a time) means of digital data transfer over thin cables. The method is specified in the American National Standard Institute standard called *Serial-attached SCSI (Small Computer System Interface)*, also known as ANSI/INCITS 376-2003. In enterprise computing, SAS is of particular interest for access to mass storage devices, particularly hard disks.

Serial-attached SCSI offers the following advantages over older parallel SCSI technologies:

- The cables are thinner, and the connectors are less bulky.
- Serial data transfer allows the use of longer cables than parallel data transfer.
- Problems related to crosstalk are less likely in serial interfaces than in parallel interfaces, because there are fewer conductors in the cables.
- The hardware for serial interfaces is less costly than the hardware for equivalent parallel interfaces.

SAS offers data transfer rates in excess of 3 gigabits per second (Gb/s), with potential rates of 10 Gb/s or more. Serial-attached SCSI provides an ideal solution for businesses with substantial storage, backup, and archiving demands.

Controller Description

There are two internal SAS controller form factors, depending on the server model:

- HP 8 Internal Port SAS Controller, a low-profile, 64-bit, 133-MHz PCI-X host bus adapter which is available only as a factory-integrated core I/O option in certain servers.
- HP Multi-Port Internal SAS Controller, an embedded controller on the server motherboard.

Both controllers are supported by the SerialSCSI-00 operating system driver bundle, and by utilities delivered in the CommonIO bundle.

Both controllers have the same key features:

- SAS data transfer rates of up to 3 Gb/s
- Data protection through Integrated Mirror (RAID 1)

Figure 1-1 HP 8 Internal Port PCI-X SAS Controller

Connectors and Indicators

Figure 1-2 illustrates the connectors and indicator LEDs on the HP 8 Internal Port PCI-X SAS Controller. Table 1-1 describes each component.

Figure 1-2 Connectors and Indicators

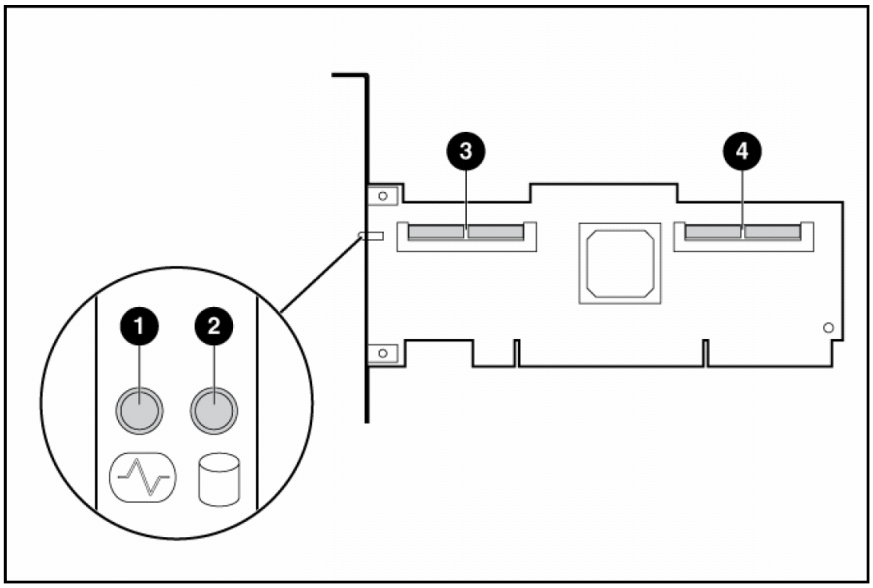


Table 1-1 Component Descriptions

Number	Description
1	Heartbeat LED (green/amber). Flashing green indicates normal operation. Amber indicates that the card's firmware has detected a fault.
2	Activity LED (green). Blinks when there is I/O activity on any port.
3	Internal 4x SAS connector, port 1.
4	Internal 4x SAS connector, port 2.

See the server documentation for the location of HP 8 Internal Port Embedded SAS Controller connectors and indicator LEDs.

2 Replacing a Controller

This chapter provides information on replacing an HP 8 Internal Port PCI-X SAS Controller. This chapter includes the following topics:

NOTE: The HP 8 Internal Port PCI-X SAS Controller is a factory-integrated core I/O card. Online Addition, Deletion, and Replacement are not supported.

Replacement Overview

The installation procedure involves the following steps:

- Preparing the server.
- Replacing the controller.
- Completing the controller replacement.

Preparing the Server

To prepare the server for add or replacement, use the following steps:

1. Perform a normal system shutdown.
2. Power down the server.
3. Power down all peripheral devices attached to the server.
4. Unplug the AC power cord from the outlet, and then unplug it from the server.
5. Disconnect all peripheral devices attached to the server.

Replacing the Controller

WARNING! To reduce the risk of personal injury or damage to the equipment, consult the safety information and user documentation provided with the server before attempting the installation. Many servers are capable of producing energy levels that are considered hazardous and are intended to be serviced only by qualified personnel who have been trained to deal with these hazards. Do not remove enclosures or attempt to bypass any interlocks that may be provided for the purpose of removing these hazardous conditions.

WARNING! WARNING! To reduce the risk of personal injury from hot surfaces, allow the internal system components to cool before touching them.

CAUTION: Electrostatic discharge (ESD) can damage electronic components. Be sure that you are properly grounded before beginning this procedure. For more information, see the "Electrostatic Discharge" section of this guide.

To replace the PCI-X card, follow these steps:

1. Remove or open the server access panel and locate the PCI/PCI-X bus expansion slots.

   For instructions on opening the server, see the server documentation at:

   http://docs.hp.com/en/hw.html
2. Identify the controller that you need to replace.

3. Label the connectors to the internal drive bays. The connector closest to the mounting bracket is Port 1, and the connector closest to the interior of the server is Port 2.
4. Disconnect the cables from the PCI-X card.
5. Depending on the server model, remove the retaining screw or open the expansion slot latch that secures the PCI-X card.
6. Remove the card.
7. Insert the new card into the slot, and press it firmly into place. The contacts on the adapter edge should be fully seated in the system board connector.
8. Depending on the server model, secure the adapter by replacing the retaining screw or by closing the slot latch.
9. Reconnect the cables to the internal drive bays.

Completing the Controller Replacement

To complete the replacement and boot the server, follow these steps:

1. Verify that all cables are routed correctly and are not restricting or being pinched by other components. For the correct routing of the cables, see the server documentation.
2. Replace or close the server access panel.
3. Reconnect the peripheral devices.
4. Reconnect the AC power cord.
5. Power on the peripheral devices.
6. Power on the server.
7. Configure the replacement controller.

   See Chapter 3 (page 15).
8. Update the adapter firmware, if necessary.

3 Configuring the Controller Offline

The following information provides steps needed to configure the SAS controller during installation. This chapter includes the following topics:

Integrated RAID

Use Integrated RAID (IR) when the fault tolerance of a RAID configuration are required. The components of IR are:

- Integrated Mirror (IM)
- Global Hot Spare

Use the `drvcfg` and `cfggen` EFI utilities to configure and maintain IR volumes offline. See "The drvcfg Utility" (page 16), and "The cfggen Utility" (page 41).

Use the `sasmgr` HP-UX command to configure and maintain IR volumes online. See "The sasmgr Command Set" (page 54).

Integrated Mirror

IM maintains a mirrored copy of the data in the array. An IM provides data protection for the system boot volume to safeguard critical information such as the operating system on servers and high performance workstations. An IM supports two simultaneous mirrored volumes, making an array, providing fault-tolerant protection for critical data. Typically, one of these volumes is the boot volume. If a disk in an IM fails, the hot swap capability enables you to easily restore the volume by replacing the failed disk. The firmware then automatically re-mirrors to the new disk.

Global Hot Spare

Each SAS controller can have one global hot spare disk available to automatically replace a failed disk in the one or two IM volumes configured on the controller. The hot spare makes the IM array more fault-tolerant. Up to two IM volumes are supported per SAS controller plus the hot spare.

Configuration Utilities

Table 3-1 lists the offline and online utilities you can use to configure IM arrays on your HP Integrity Server.

Table 3-1 SAS Controller Configuration Utilities

Utility Name	Interface Type	Operating System or Environment	Online or Offline	For more information
`drvcfg`	GUI	EFI	Offline	See ""The drvcfg Utility"."
`cfggen`	CLI			See "The cfggen Utility" (page 41).
`sasmgr`	CLI	HP-UX 11i v2 and 11i v3	Online	See "The sasmgr Command Set" (page 54).

The drvcfg Utility

This section describes in detail all of the available commands and options in the `drvcfg` utility. For step-by-step examples of common configuration procedures using `drvcfg`, see:

- "Determining the Driver ID and Ctrl ID" (page 32).
- "Adding An Integrated Mirror Volume" (page 33).
- "Viewing the Properties of an Array" (page 37).
- "Deleting an Integrated Mirror Volume" (page 38).

Starting the drvcfg Utility

To start the `drvcfg` utility, follow these steps:

1. Power on or reboot the server.
2. Choose **EFI shell** from the console menu.
3. At the Shell> prompt, enter **`drvcfg -s`** and press **Enter**.

Using the drvcfg Utility With a Terminal Emulation Program

The `drvcfg` utility uses input keys (**F1**, **F2**, **Home**, **End**, etc.) that may not be supported by all terminal emulation programs. Review the terminal emulation program documentation to determine which input keys are supported. If you have problems using any of the Function keys or navigation keys, use the alternate keys that are shown at the bottom of each `drvcfg` screen.

The following Function and navigation keys apply on all `drvcfg` screens:

F1 Help	Context sensitive help for the field in which the cursor is located.
Arrow Keys	Select Item - Up, down, left, right movement to position the cursor.
Home/End	Select Item - Up, down, left, right movement to position the cursor.
+/-	Change Item - Items with values in [brackets] are modifiable. Numeric keypad + and numeric keypad - (minus) update a modifiable field to its next relative value.
Esc	Abort/Exit - Aborts the current context operation, or exits the current screen. If you have changed settings, you will be asked to confirm the exit. If you are using a serial console, pressing the **Esc** key causes a delay of several seconds before the takes effect. This is normal system behavior and is not an error.
Enter	Execute <item> - Executable items are indicated by highlighted text and a different background color. Press **Enter** to perform the field's function.

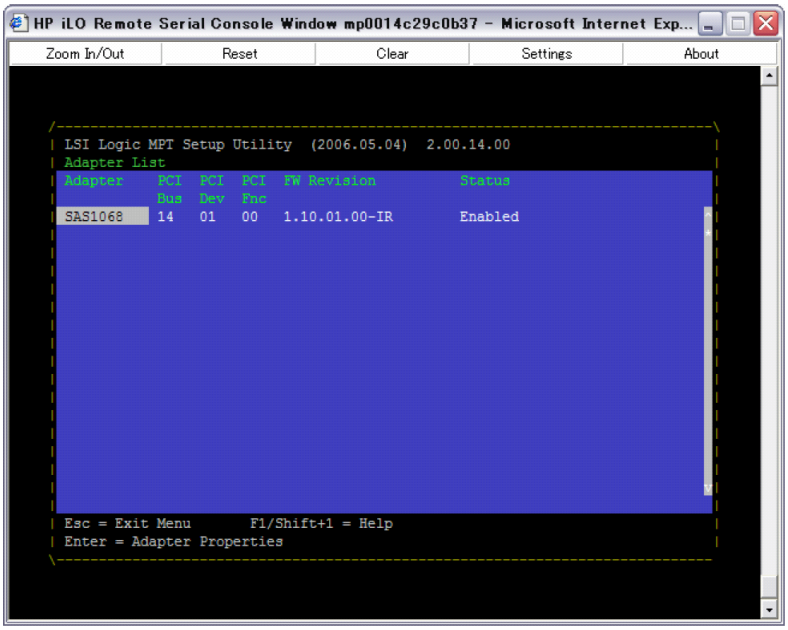
Configuration Utility Screens

SAS BIOS configuration utility screens contain the following areas, starting at the top of the screen:

- Header area: Identifies the utility and version number.
- Menu area: Gives the title of the current screen, and on screens other than the Adapter List screen also identifies the adapter.
- Main area: The main area for presenting data. This area has a cursor for item selection, and horizontal and vertical scroll bars if necessary.
- Footer area: Provides general help text, and lists the available key commands.

Adapter List Screen

When you start `drvcfg`, the Adapter List appears:



The Adapter List screen displays a scrolling list of up to 256 SAS controllers in the system, and provides information about each of them.

Use the arrow keys to select a SAS controller, and then press **Enter** to view and modify the selected SAS controller's properties.

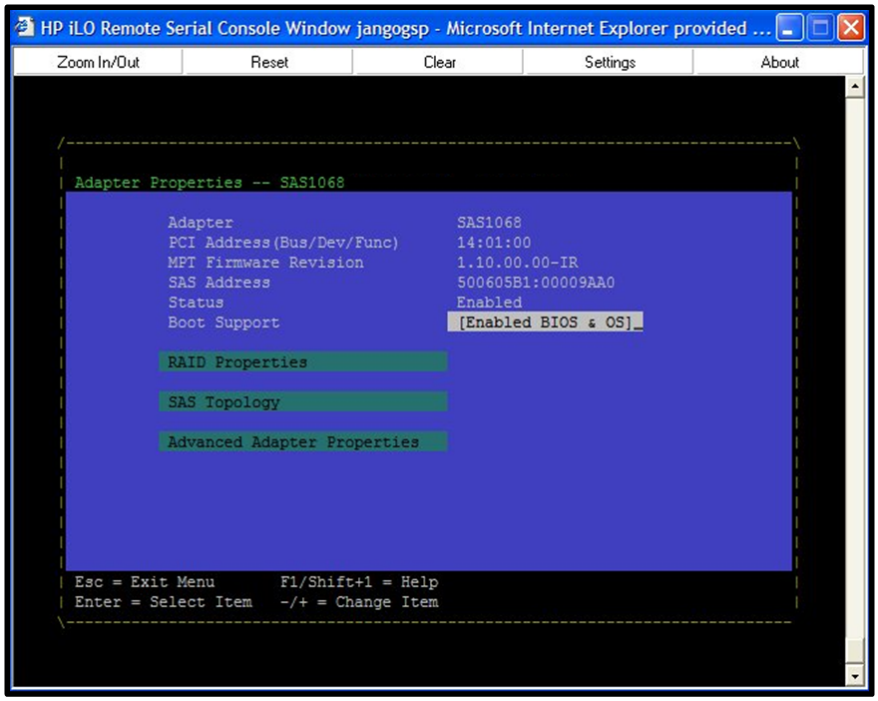
The status of each adapter may be Enabled or Disabled. You can view and modify the SAS controller settings for adapters in either status. Use the Boot Support setting in the Adapter Properties screen to change the status of this setting. The EFI Driver must reconnect for a new Boot Support setting to take effect; this occurs automatically when you exit `drvcfg`.

The information fields on the Adapter List Screen are as follows:

Adapter	Indicates the specific SAS Host Bus Adapter type.
PCI Bus	Indicates the PCI Bus number assigned by the system BIOS to an adapter (0x00 - 0xFF, 0 - 255 decimal)
PCI Dev	Indicates the PCI Device assigned by the system BIOS to an adapter (range 0x00 - 0x1F, 0 - 31 decimal)
PCI Fnc	Indicates the PCI Function assigned by the system BIOS to an adapter (range 0x00 - 0x7, 0 - 7 decimal)
FW Revision	Displays the Fusion MPT firmware version and type (IR or IT)
Status	Indicates whether the adapter is eligible for software control: Enabled, Disabled, or Error.
Enabled	Indicates the EFI driver is controlling the adapter or will attempt to control the adapter upon reload.
Disabled	Indicates the EFI driver is not controlling the adapter or will discontinue control of the adapter upon reload.
Error	Indicates that the EFI driver encountered a problem with the adapter. You can view and modify settings for the adapter but the available information and functionality may be limited.

Adapter Properties Screen

After you select a SAS controller and press **Enter**, `drvcfg` scans the SAS controller and its attached devices, and the Adapter Properties screen (similar to the following) appears. Use this screen to view and modify adapter settings.



The information fields on the Adapter Properties screen are as follows:

Adapter — Indicates the specific SAS Host Bus Adapter type.

PCI Address — Displays the PCI address assigned by the system BIOS to the adapter.

- Bus value range 0x00 - 0xFF, 0 - 255 decimal
- Device value range 0x00 - 0x1F, 0 - 31 decimal
- Function range 0x00 - 0x7, 0 - 7 decimal

MPT Firmware Revision — Displays the MPT firmware version and type in the format `x.xx.xx.xx-yy`, where `x.xx.xx.xx` indicates the firmware version and `yy` indicates the type. In the example screen the firmware version is `1.23.33.00` and the type is `IR`.

SAS Address — Displays the SAS Address assigned to this adapter.

Status — Indicates whether the adapter is eligible for configuration utility software control or is reserved for control by other software: Enabled, Disabled, or Error.

- Enabled — Indicates the EFI driver is controlling the adapter, or will attempt to control the adapter upon reload.
- Disabled — Indicates the EFI driver is not controlling the adapter or will discontinue control of the adapter upon reload.
- Error — Indicates that the EFI driver encountered a problem with the adapter. You can view and modify settings for the adapter but the available information and functionality may be limited.

Boot Support — Indicates whether the adapter is eligible for configuration utility software control, or is reserved for control by other software: Enabled BIOS & OS, Enabled BIOS Only, Enabled OS Only, or Disabled.

- Enabled BIOS & OS — The SAS controller is controlled by both the BIOS and OS driver

Enabled BIOS Only	The SAS controller is controlled only by the BIOS. This setting may not be supported by all OS drivers. For example, it is not possible to disable an adapter in a Windows driver.
Enabled OS Only	SAS controller is controlled only by the OS driver.
Disabled	SAS controller is not controlled by the BIOS when the SAS controller is loaded. However, the adapter is visible through the Configuration Protocol.

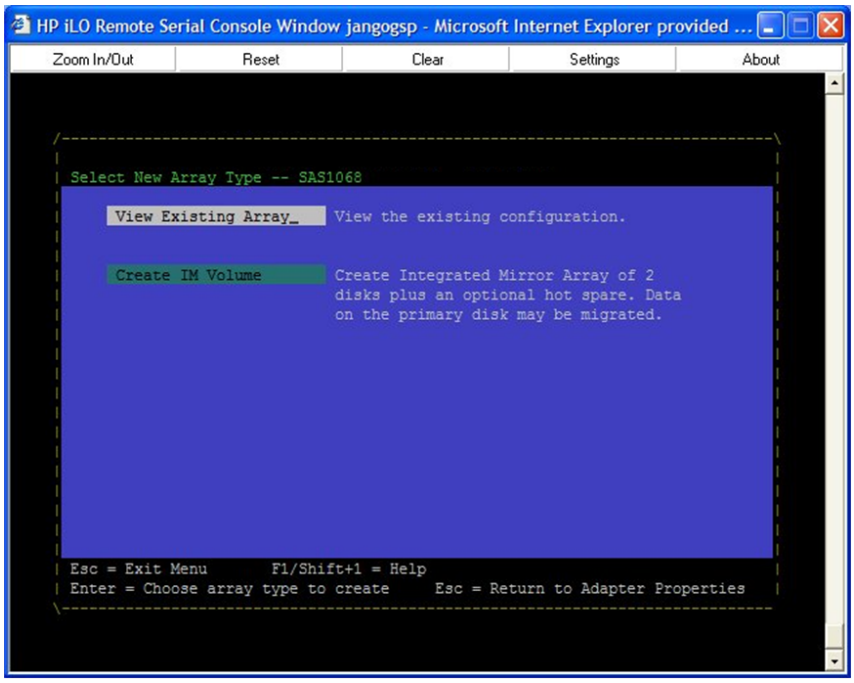
Changes to the Boot Support setting are reflected in the Status field of the Adapter List menu. However, the new setting does not take effect until you reboot the system.

To access the following additional screens, use the arrow keys to highlight the option and press **Enter**:

- RAID Properties. See "RAID Properties Screens."
- SAS Topology. See "SAS Topology Screen."
- Advanced Adapter Properties. See "Advanced Adapter Properties Screen" (page 26).

RAID Properties Screens

There are four screens within RAID properties, all of which are initially accessed by selecting **RAID Properties** from the Adapter Properties screen. The first screen displayed is the **Select New Array Type** screen:



Select New Array Type Screen

Use the Select New Array Type screen to view an existing array, or create an Integrated Mirror array of two disks with an optional hot spare. See "Viewing the Properties of an Array" (page 37), and "Adding An Integrated Mirror Volume" (page 33).

Create New Array Screen

The Create New Array screen is accessed by pressing **Enter** on the **Create IM Volume** field from the Select New Array Type screen.

Use the following steps to create a new array:

1. Press **M** to migrate to an IM array. This keeps the existing data, and the disk is synchronized.
2. Press **D** to delete all data on all the disks in the array. This overwrites existing data when creating a new IM array, and the disk is not synchronized.
3. After the volume is configured, press **C** to create the array. The system prompts you to save changes; if you do so, the array is created. During the creation process, the utility pauses. You are then taken back to the Adapter Properties screen.

The following are the descriptions for the Create New Array Screen:

Array Type	Indicates the type of array being created.
Array Size	Indicates the size of the array in MB.
Bay	Displays the bay in which devices are located.
Device Identifier	Displays the device identifier.
RAID Disk	Specifies the devices (disks) that make up an IM array. If RAID Disk is "Yes," the device is part of an IM array, if "No," the device is not part of an IM array. If this field is grayed out, one of the following conditions applies: • The device does not meet the minimum requirements for use in an IM array. • The device is not large enough to mirror existing data on the primary drive. • This disk has been selected as the Hot Spare for the IM array.
Hot Spr	Specifies whether a device is the Hot Spare for an IM array. If Hot Spr is "Yes," the device will be used as a Hot Spare for the IM array, if "No," the device will not be used as a Hot Spare for the IM array. Only one Hot Spare per IM array is permitted. A Hot Spare is not required in an IM. A Hot Spare can be specified at array creation, or at any time after creation, provided the array is made up of 5 disks or fewer. If this field is grayed out, one of the following conditions applies: • The device does not meet the minimum requirements for use in an IM array. • The array already has a Hot Spare. • The array is made up of the maximum number of devices (6). • The device isn't large enough to mirror existing data on the primary. The Hot Spare drive must be greater than or equal to the size of any drive in any IM volume.
Drive Status	One of the following will be displayed:

OK	Disk is online and fully functional.
Missing	Disk is not responding.
Failed	Disk has failed.
Initializing	Disk is initializing.
CfgOffln	Disk is offline at host's request.
User Fail	Disk is marked failed at host's request.
Offline	Disk is offline for some other reason.
Inactive	Disk has been set inactive.

	Not Syncd	Data on disk is not synchronized with the rest of the array.
	Primary	Disk is the primary disk for a 2 disk mirror and is OK.
	Secondary	Disk is the secondary disk for a 2 disk mirror and is OK.
	Wrg Type	Device is not compatible for use as part of an IM array.
	Too Small	Disk is too small to mirror existing data
	Max Dsks	Maximum number of disks allowed for this type of Array reached and/or Maximum number of total IM disks on a controller reached
	No SMART	Disk doesn't support SMART, cannot be used in an RAID array
	Wrg Intfc	Device interface (SAS) differs from existing IM disks
Pred Fail		Indicates whether device SMART is predicting device failure (Yes, No).
Size(MB)		Indicates the size of the device in megabytes. If the device is part of a two-disk array, this field will reflect the size of the array, not the size of the individual disk. If the device is part of a three or more disk array, this field is the size that the disk makes up within the array. In arrays consisting of different sized disks, excess space on larger disks will be unusable.

View A New Array Screen

The View Array screen is accessed by pressing **Enter** on the **View Existing Array** field from the Select New Array Type screen. The View Array screen enables you to view the current array configuration.

The following screen is accessed by selecting the appropriate field and pressing **Enter**:

- Manage Array

You can perform the following actions from the View Array screen:

- Press **N** to view the next array.
- Press **C** to create a new array.

The following fields of information are available on the View Array screen:

Array	Displays the number of this array.
Identifier	Displays the identifier of this array.
Type	Displays the RAID type.
Scan Order	Displays the scan order of the array.
Size (MB)	Displays the size of the array.
Status	Displays the status of the array.
Bay	Displays the bay in which devices are located.
Device Identifier	Displays the device identifier.
RAID Disk	Specifies the devices (disks) that make up an IM array. If RAID Disk is “Yes,” the device is part of an IM array; if “No,” the device is not

part of an IM array. If this field is grayed out, one or more of the following conditions applies:

- The device does not meet the minimum requirements for use in an IM array.
- The device is not large enough to mirror existing data on the primary drive.
- This disk has been selected as the Hot Spare for the IM array.

Hot Spr

Specifies whether a device is the Hot Spare for an IM array. If Hot Spr is "Yes," the device will be used as a Hot Spare for the IM array, if "No," the device will not be used as a Hot Spare for the IM array. Only one Hot Spare per IM array is permitted. A Hot Spare is not required in an IM. A Hot Spare can be specified at array creation, or any time after creation, provided the array is made up of 5 disks or fewer. This field is grayed out under the following conditions:

- The device does not meet the minimum requirements for use in an IM array.
- The array already has a Hot Spare.
- The array is made up of the maximum number of devices (6).
- The device isn't large enough to mirror existing data on the primary. The Hot Spare drive must be greater than or equal to the size of any drive in any IM volume.

Drive Status

One of the following will be displayed:

OK	Disk is online and fully functional.
Missing	Disk is not responding.
Failed	Disk has failed.
Initializing	Disk is initializing.
CfgOffln	Disk is offline at host's request.
User Fail	Disk is marked failed at host's request.
Offline	Disk is offline for some other reason.
Inactive	Disk has been set inactive.
Not Syncd	Data on disk is not synchronized with the rest of the array.
Primary	Disk is the primary disk for a 2 disk mirror and is OK.
Secondary	Disk is the secondary disk for a 2 disk mirror and is OK.
Wrg Type	Device is not compatible for use as part of an IM array.
Too Small	Disk is too small to mirror existing data
Max Dsks	Maximum number of disks allowed for this type of Array reached and/or Maximum number of total IM disks on a controller reached
No SMART	Disk doesn't support SMART, cannot be used in an RAID array
Wrg Intfc	Device interface (SAS) differs from existing IM disks

Pred Fail

Indicates whether device SMART is predicting device failure (Yes, No).

Size(MB)

Indicates the size of the device in megabytes (1 megabyte = 1024 x 1024 bytes = 1,048,576 bytes). If the device is part of a two-disk array,

this field will reflect the size of the array, not the size of the individual disk. If the device is part of an array of three or more disks, this field is the size that the disk makes up within the array. In arrays consisting of different sized drives, excess space on larger drives will be unusable.

Manage A New Array Screen

Manage Array is accessed by pressing **Enter** on the **Manage Array** field from the View Array screen. This screen allows you to manage the current array.

The following actions are performed from the Manage Array screen:

Manage Hot Spare

By pressing **Enter** on Manage Hot Spare, the utility will display a hot spare management screen that has same layout as the Create New Array screen. This field is grayed out under the following conditions:

1. The array is inactive.
2. The array is at its maximum number of devices.
3. Non-IR firmware is used.
4. IR is disabled. The array is inactive.

Synchronize Array

Press **Enter** on Synchronize Array to perform a synchronization of the IM array. You will be prompted to be sure you want to perform this action. Press Y for yes and N for no. This field is grayed out under the following conditions:

1. The array is inactive.
2. The array does not need to be resynchronized.
3. The adapter's MPT Firmware does not support the feature.
4. Non-IR firmware is used.
5. IR is disabled. The array is inactive.

Activate Array

Press **Enter** on Activate Array to perform an activation of an IM array. You will be prompted to be sure you want to perform this action. Press Y for yes and N for no.

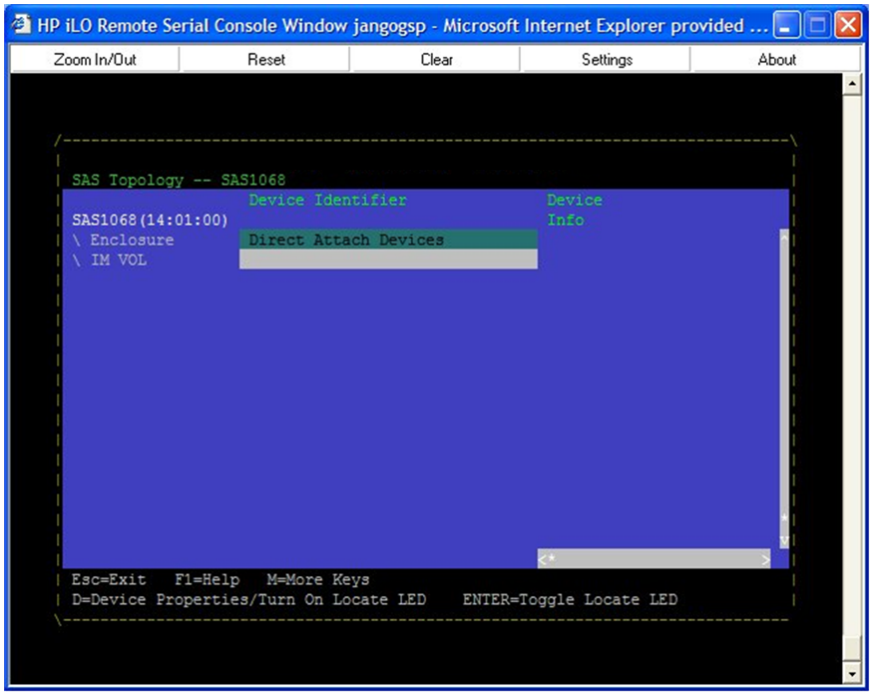
Delete Array

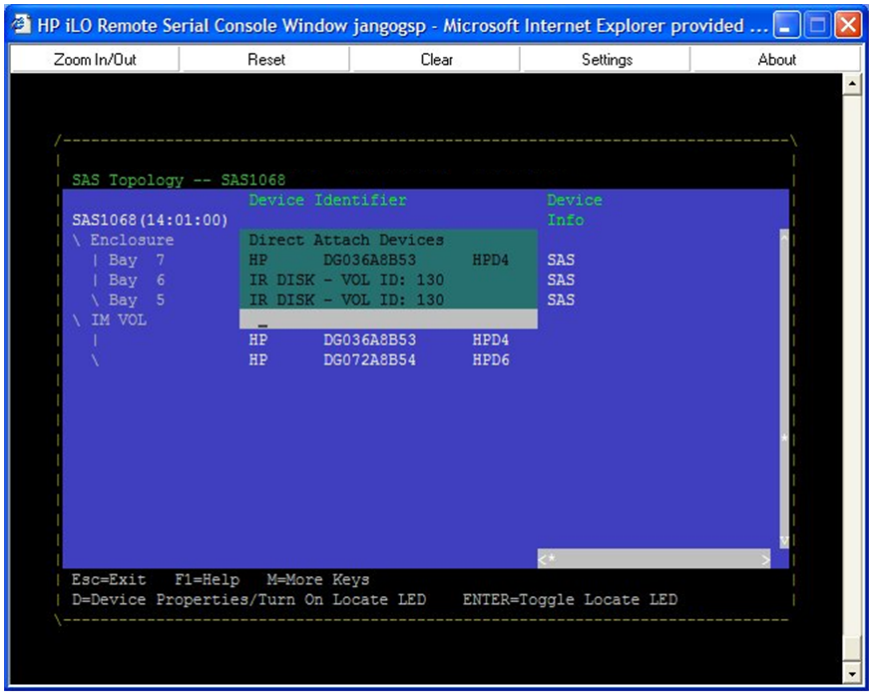
Press **Enter** on Delete Array to perform the deletion of the currently displayed IM array. You will be prompted to be sure you want to perform this action. Press Y for yes and N for no.

Identifier	Displays the identifier of this array.
Type	Displays the RAID type.
Scan Order	Displays the scan order of the array.
Size (MB)	Displays the size of this array.
Status	Displays the status of this array.

SAS Topology Screen

SAS Topology is accessed by pressing **Enter** on SAS Topology from the adapter Properties screen. This screen presents a view of the adapter's SAS hierarchy, and provides other user functionality.





The following objects along with their significant properties are shown:

- Adapter
- PHYs
- Expanders/Enclosures
- Attached Devices

The following screen is accessed from SAS Topology:

- Pressing D from an expanded enclosure accesses the Device Properties screen for the specific device, and turns on the locate LED.

The following actions are performed from SAS Topology:

- The SAS Topology is expanded for display by select an expander/enclosure and pressing **Enter**. This displays all Phys/Devices/Bays. Press **Enter** again to collapse the expander/enclosure.
- Pressing **Enter** while on a device activates the locate LED.
- Pressing C clears device mappings for non-present devices.

Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
Device Info	Indicates if a device is SAS, Expander, or Enclosure.
Neg. Link Speed	Indicates the negotiated link speed for this Phy or whether it has been disabled.
Phy. Link Speed	Indicates the maximum hardware link rate possible for this Phy.

Device Properties Screen

Device Properties is accessed by pressing D from the SAS Topology screen when the cursor is on an expanded enclosure of the Device Identifier field of a device. This screen displays information about a specific device.

The following screens are accessed from Device Properties by selecting the appropriate field and pressing **Enter**:

- Device Format
- Device Verify

The following actions are performed from Device Properties:

- Press N to cycle to the next device.
- Press P to cycle to the previous device.

Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
SAS Address	Indicates the SAS Address of this device.
Serial Number	Indicates the serial number for this device.
Elapsed Time	Displays the total time elapsed since Format or Verify Operation started.
Percent Complete	Graphical status bar display that indicates the current relative percentage complete of the operation.

Device Format and Device Verify Screens

The Format and Verify screens have similar layout and are accessed by pressing **Enter** on the appropriate field from the Device Properties screen. These screens include an Elapsed Time and status bar that begin incrementing once the operation is started, enabling the user to determine progress of the operation.

Device Identifier	Indicates the ASCII device identifier string extracted from the device's Inquiry Data.
SAS Address	Indicates the SAS Address of this device.
Serial Number	Indicates the serial number for this device.
Elapsed Time	Displays the total time elapsed since Format or Verify Operation started.
Percent Complete	Graphical status bar display that indicates the current relative percentage complete of the operation.

Formatting

On the Device Format screen, if enabled, a low-level formatting on a disk drive is allowed. Low-level formatting will completely and irreversibly erase all data on the drive. Press **F** to begin the format

CAUTION: Once format has begun it cannot be stopped or cancelled

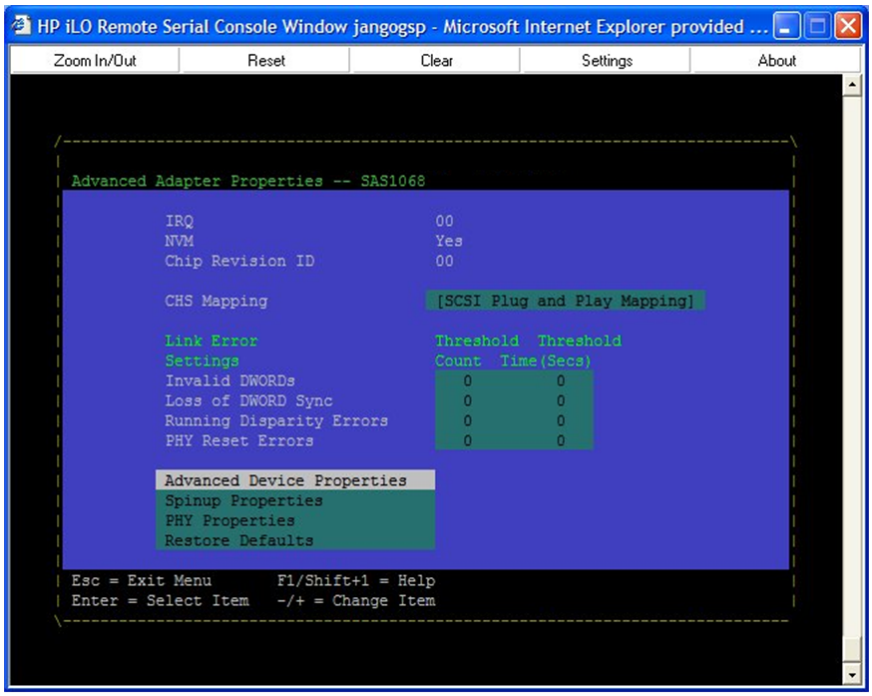
NOTE: Formatting will default the drive to a 512-byte sector size even if the drive had previously been formatted to another sector size.

Verifying

On the Verify screen you can verify of all sectors on the device, and if needed, reassign defective Logical Block Addresses (LBAs). Press **Enter** to start the verification.

Advanced Adapter Properties Screen

To access the Advanced Adapter Properties screen, highlight the Advanced Adapter Properties field on the Adapter Properties Screen and press **Enter**. A screen similar to the following appears:



Information fields on the Advanced Adapter Properties screen are as follows:

IRQ	Indicates the Interrupt Request Line used by the adapter. This is assigned by the system BIOS.
NVM	Indicates whether the adapter has nonvolatile memory (NVM), which is used to store configuration settings.
Chip Revision ID	Indicates the revision ID of this adapter.
CHS Mapping	Specifies how the Cylinder Head Sector (CHS) is mapped on a disk that does not have existing CHS information: SCSI Plug and Play Mapping, or Alternate CHS Mapping
SCSI Plug and Play Mapping	Automatically determines the most efficient and compatible settings. This is the default setting.

	Alternate CHS Mapping	Uses an alternate and potentially less-efficient mapping system that might be required if a device is moved between adapters from different vendors.
Link Error Settings	Indicates error conditions: Invalid DWORDs, Loss of DWORDs Sync, Running Disparity Errors, and PHY REset Errors.	
	Invalid DWORDs	Indicates the number of invalid DWORDs received (outside of PHY reset sequences) since the last PHY Link Error reset.
	Loss of DWORDs Sync	Indicates the number of times that DWORD synchronization was lost since the last PHY Link Error Reset.
	Running Disparity Errors	Indicates the number of DWORDs with running disparity errors that have been received (outside of PHY reset sequences) since the last PHY Link Error reset.
	PHY REset Errors	Indicates the number of times that the PHY Reset sequence has failed since the last PHY Link Error Reset.

To access the following additional screens, use the arrow keys to highlight the option and press **Enter**:

- Advanced Device Properties. See "Advanced Device Properties Screen."
- Spinup Properties. See "Spinup Properties Screen" (page 29).
- PHY Properties. See "PHY Properties Screen" (page 29).

To reset all of the settings on the Advanced Adapter Properties screen to their default values, highlight the Restore Defaults field and press **Enter**.

Advanced Device Properties Screen

To access the Advanced Device Properties, highlight the Advanced Device Properties field on the Advanced Adapter Properties screen and press **Enter**.

Use the Advanced Device Properties screen to view and modify infrequently accessed device settings.

You can change the values in the following fields on the Advanced Device Properties screen:

Maximum Block IO Devices	Specifies the maximum number of devices attached to the adapter that you can nstall a pre-OS IO interface on.
NCQ	Native Command Queuing for SATA devices: Enabled or Disabled. • Disabled: Default setting. • Enabled: Not supported at the time of publication.

IO Timeout for Block Devices	Specifies the time out value for I/Os to the following devices with non-removable media: • SCSI Device Type 00h - Direct Access • SCSI Device Type 04h - Write Once • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access
IO Timeout for Block Devices (Removable)	Specifies the time out value for I/Os to the following devices with removable media: • SCSI Device Type 00h - Direct Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access
IO Timeout for Sequential Devices	Specifies the time out value in seconds for "SCSI Device Type 01h - Sequential Access" devices. The value range for this field is 0 to 999. A value of 0 specifies no time out.
IO Timeout for Other Devices	Specifies the time out value for I/Os to devices other than the following: • SCSI Device Type 00h - Direct Access • SCSI Device Type 01h - Sequential Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access To toggle between `LUN 0` and `All`, press **+** or **-**. `LUN 0` scans only LUN 0. `All` scans all LUNs.
LUNs to Scan for Block Devices	Controls LUN scans for the following devices with non-removable media: • SCSI Device Type 00h - Direct Access • SCSI Device Type 04h - Write Once • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access To toggle between `LUN 0` and `All`, press **+** or **-**. `LUN 0` scans only LUN 0. `All` scans all LUNs.
LUNs to Scan for Block Devices (Removable)	Controls LUN scans for the following devices with removable media: • SCSI Device Type 00h - Direct Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access To toggle between `LUN 0` and `All`, press **+** or **-**. `LUN 0` scans only LUN 0. `All` scans all LUNs.
LUNs to Scan for Sequential Devices	Controls LUN scans for "SCSI Device Type 01h - Sequential Access" devices.

LUNs to Scan for Other Devices	Controls LUN scans for devices other than the following: • SCSI Device Type 00h - Direct Access • SCSI Device Type 01h - Sequential Access • SCSI Device Type 04h - Write Once • SCSI Device Type 05h - CD-ROM • SCSI Device Type 07h - Optical • SCSI Device Type 0Eh - Simplified Direct Access To toggle between `LUN 0` and `All`, press **+** or **-**. `LUN 0` scans only LUN 0. `All` scans all LUNs.

To set all fields to their default values, highlight the Restore Defaults field and press **Enter**.

To return to the Advanced Adapter Properties screen, press **Esc**.

Spinup Properties Screen

To access the Spinup Properties, highlight the Spinup Properties field from the Advanced Adapter Properties Screen and press **Enter**.

Use the Spinup Properties Screen to view and modify spinup settings. Spin up occurs when disk drives reach normal rotation speed during system boot. To reduce power requirements and stress on the system backplane, the system inserts a brief delay between drive spin ups.

Direct Attached Spinup Delay	Time in seconds between each disk drive spin up. The default value is 3.
Direct Attached Max Targets	Number of disk drives that spin up at the same time. The default value is 1.
Expander Spinup Delay	Expanders are not supported.
Expander Max Target Devices	Expanders are not supported.

To return to the Advanced Adapter Properties screen, press **Esc**.

PHY Properties Screen

To access the PHY Properties screen, highlight the PHY Properties field on the Advanced adapter Properties Screen and press **Enter**.

Use the PHY Properties screen to view and modify PHY settings.

Information fields on the PHY Properties screen are as follows:

PHY	Indicates the active PHY number.
SAS Port	Indicates the associated SAS Port (0 to N) as configured on this adapter
Link Status	Indicates the PHY link status. Possible values are: • Enabled, Unknown Link Rate • PHY Disabled • Enabled, negotiation failed • Enabled, SATA OOB Complete • Enabled, 1.5 Gb/s • Enabled, 3.0 Gb/s
Discovery Status	A 32 bit hexadecimal that indicates the discovery status for the PHY or expander. Possible values: • Discovery completed successfully - 0x00000000 • Loop Detected - 0x00000001 • Unaddressable device exists- 0x00000002 • Multiple Ports - 0x00000004

	• Expander Error - 0x00000008 • SMP Timeout - 0x00000010 • Out of route entries - 0x00000020 • SMP Response Index Does Not Exist - 0x00000040 • SMP Response Function Failed - 0x00000080 • SMP CRC error - 0x00000100	
Device Identifier	Indicates the ASCII device identifier string extracted from the device's inquiry data.	
Scan Order	Indicates the scan order for this device. This is equivalent to the SCSI ID value in parallel SCSI configurations.	
Device Information	Indicates whether a device is SAS.	
SAS Address	Indicates the SAS address of the device.	
Link Error Settings	Invalid DWORDs	Number of invalid DWORDs received outside of PHY reset sequences since the last PHY link error reset.
	Loss of DWORD Sync	Number of times that DWORD synchronization was lost and the link reset sequence occurred since the last PHY link error reset.
	Running Disparity Errors	Number of dwords with running disparity errors that have been received outside PHY reset sequences since the last PHY link error reset.
	PHY Reset Errors	Number of times the PHY reset sequence has failed since the last PHY link error reset.
	Error counts stop when they reach the maximum value.	
Link Error Count	Actual link error count values since the last PHY Link Error Reset.[a]	
Threshold Count	Link error count threshold values. When a link error count exceeds the threshold count within the threshold time, the MPT firmware may reduce the link rate. You can modify the threshold values on the Advanced Adapter Properties screen.	
Threshold Time	Time, in seconds, over which to apply Threshold Count. When a link error count exceeds the threshold count within the threshold time, the MPT firmware may reduce the link rate. You can modify the threshold values on the Advanced Adapter Properties screen.	

To return to the Advanced Adapter Properties screen, press **Esc**.

To display the next PHY, press **N**.

To display the previous PHY, press **P**.

Resetting the Error Counts

To reset the link error counts for this PHY or all PHYs, highlight the Reset Link Error Counts field and press **Enter**. The following prompt appears:

```
Are you sure you want to reset Phy error counts?

Reset error counts for this Phy only

Reset error counts for all Phys

Cancel
```

To perform the reset, highlight an option and press **Enter**.

Exiting drvcfg

Because some changes only take effect when you exit `drvcfg`, follow these steps to exit the utility:

1. From Adapter Properties press **Esc** to return to the Adapter List.
2. From the Adapter List, press **Esc** to exit the utility.

The exit screen shows some options that are grey, indicating they are not available. Only available options are selectable. Your exit choices are as follows:

- `Cancel Exit`
- `Save changes and reboot`
- `Discard changes and reboot`
- `Exit the Configuration Utility and Reboot`

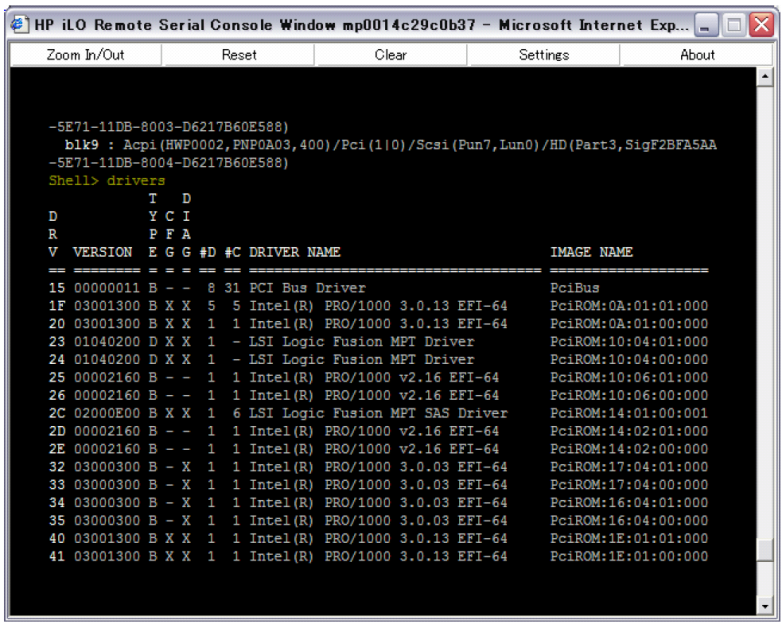
Example: Adding, Viewing, and Deleting An Integrated Mirror Volume Using drvcfg

This section provides step-by-step procedures for creating, viewing the properties of, and deleting an Integrated Mirror volume using the `drvcfg` utility. For a detailed discussion of all of the available `drvcfg` options, see "The drvcfg Utility" (page 16).

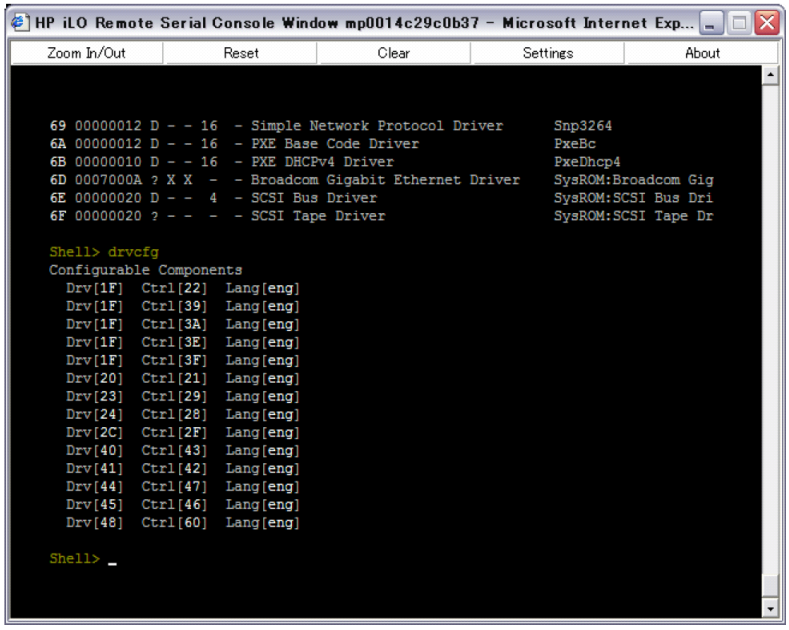
Determining the Driver ID and Ctrl ID

Before you can create an integrated mirror volume, use the EFI shell commands to find the Driver ID for the SAS Host Bus Adapter, and the corresponding Ctrl ID. To determine these ID values, follow these steps:

1. Start the EFI shell, by choosing **EFI Shell** from the **Console** menu.
2. At the `Shell>` prompt, enter **`drivers`** and press **Enter**:



3. Find the SAS Host Bus Adapter in the list of drivers, and make a note of the Driver ID from the left column. In this example, the Driver ID is "2C."
4. At the `Shell>` prompt, enter **`drvcfg`** and press **Enter**:



5. Find the SAS Host Bus Adapter's Driver ID in the list, and make a note of the corresponding Ctrl ID. In this example, the SAS Host Bus Adapter is `Drv[2C]`, and the Ctrl ID is 2F.

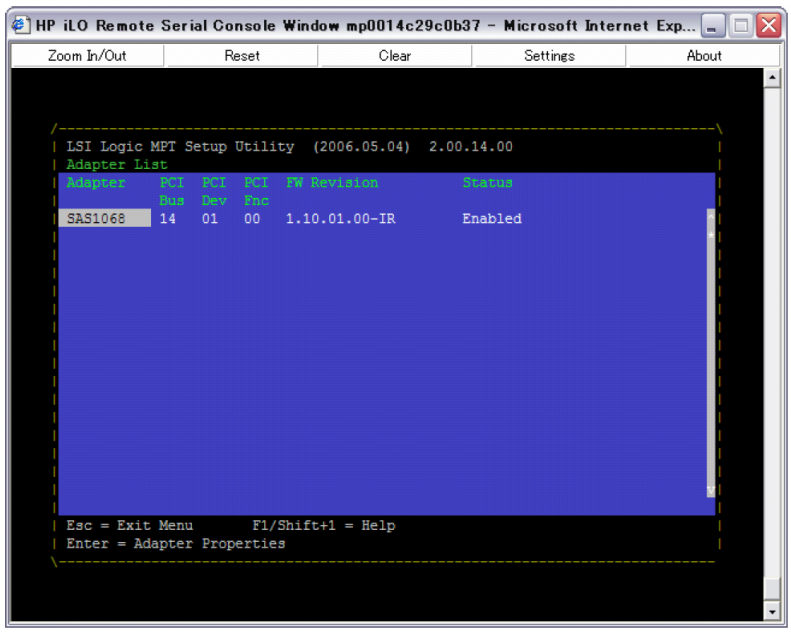
Adding An Integrated Mirror Volume

To add an Integrated Mirror volume, follow these steps:

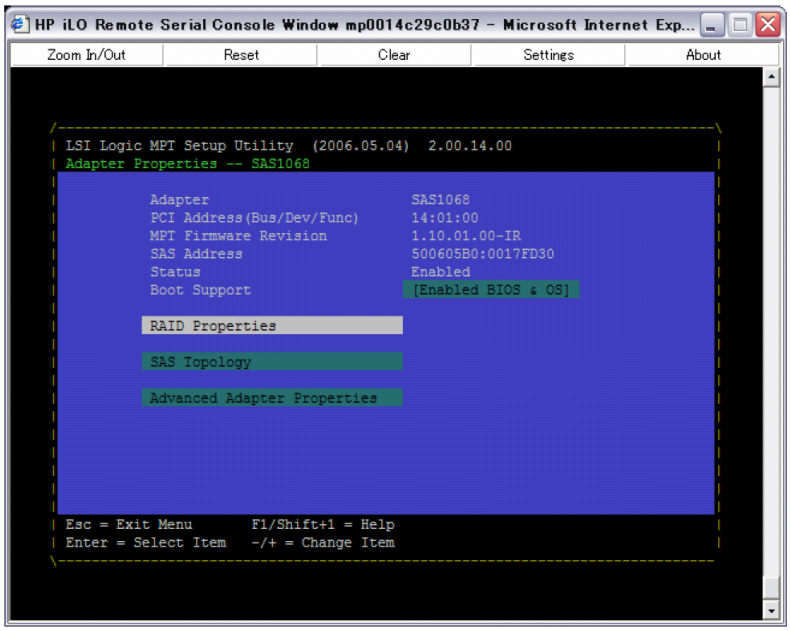
1. Start `drvcfg`, using the Driver ID and Ctrl ID of the SAS Host Bus Adapter (See "Determining the Driver ID and Ctrl ID" (page 32)). In this example, the Driver ID is 2C, and the Ctrl ID is 2F:

   ```
   Shell> drvcfg -s 2C 2F
   ```

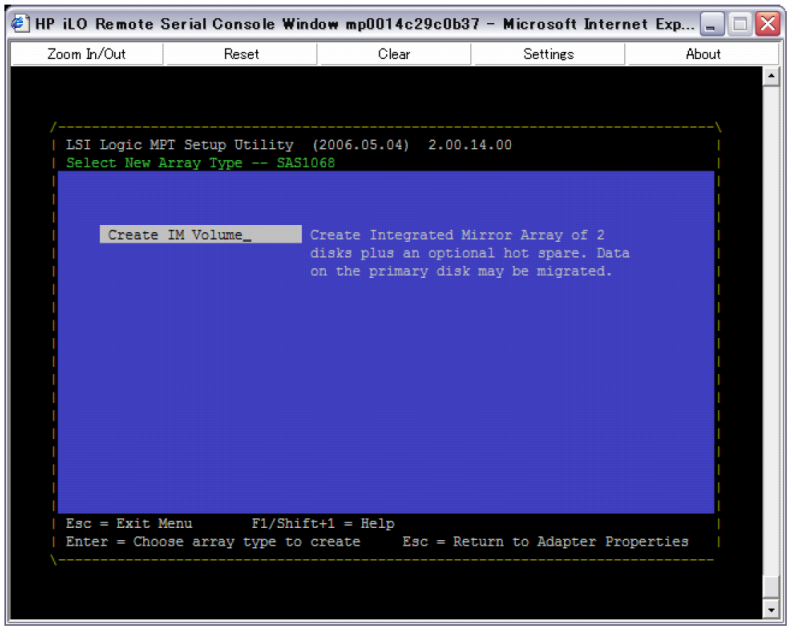
   The Adapter List screen appears:



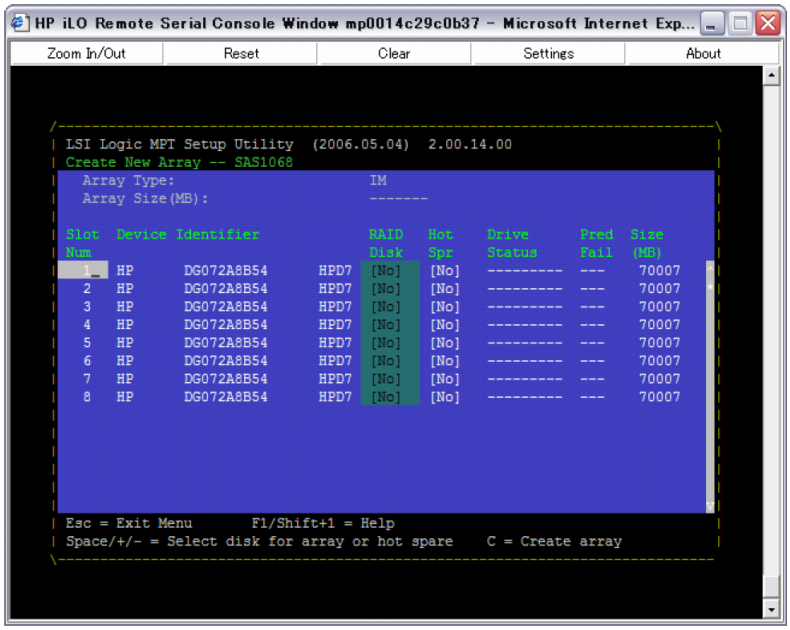
2. Select the SAS Host Bus Adapter (**SAS1068**) and press **Enter**. The **Adapter Properties** screen appears:



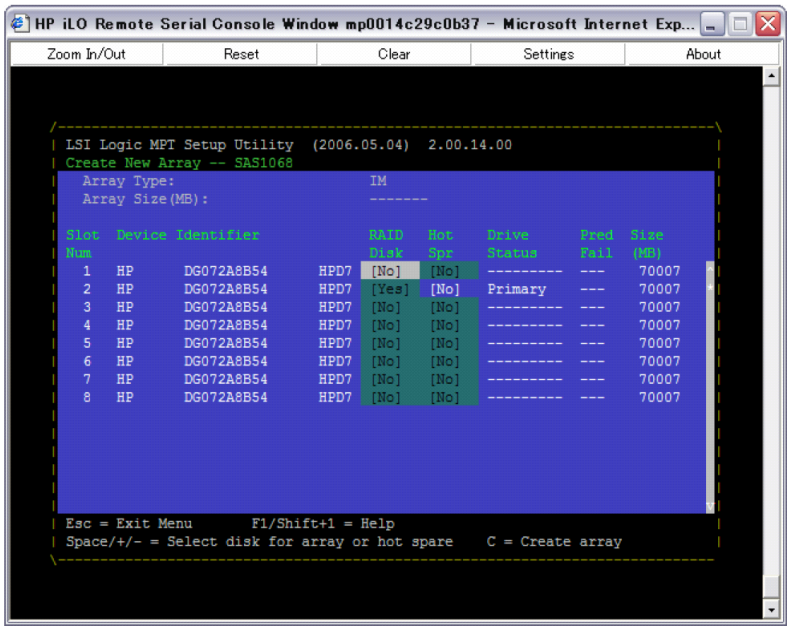
3. Select **RAID Properties** and press **Enter**. The **Select New Array Type** screen appears:



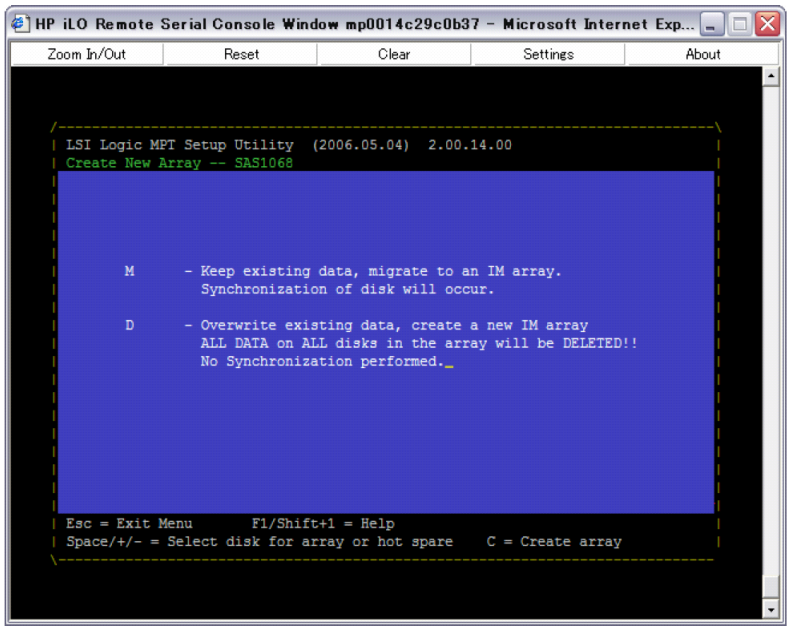
4. Select **Create IM Volume** and press **Enter**. The **Create New Array** screen appears:



5. Assign a disk to be the Primary disk in the array. Move the cursor to the **RAID Disk** column, and then to the row for the disk that will be the Primary; then press **Enter**. In this example, the disk in Slot Num (or port) 2 has been assigned to be the Primary:



6. Repeat the process from the previous step to assign another disk as the Secondary; the Secondary disk will contain the mirrored copy of the data on the Primary disk.
7. When you have assigned Primary and Secondary disks, press C to create the array. The following screen appears:

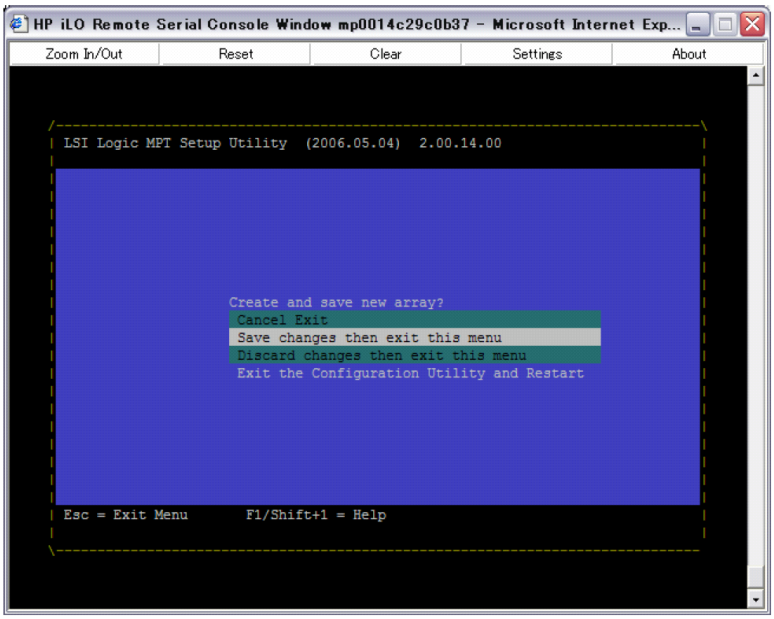


8. Press **D** to overwrite (erase) all of the data on the disks and create a new, empty logical volume with RAID 1 mirroring.

⚠ **WARNING!** Option **M**, "Keep existing data and migrate to an IM array," is not supported. This function has been disabled in later versions of `drvcfg`.

WARNING! If you overwrite the disks with option D and create a new array, all of the data on the disks will be permanently lost. If you are not certain that the disks are empty or that their contents have been backed up, press **Esc** to cancel the Create New Array process. Repeat the process when the disk contents have been verified.

When you have chosen an option, the following screen appears:



9. Select **Save changes then exit this menu** and press **Enter**. The array is created.

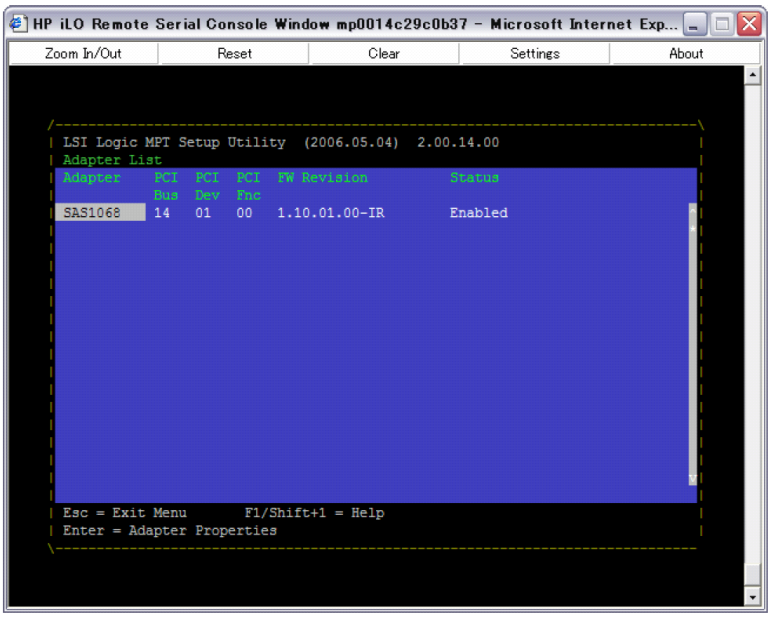
Viewing the Properties of an Array

To view the properties of an existing array volume, follow these steps:

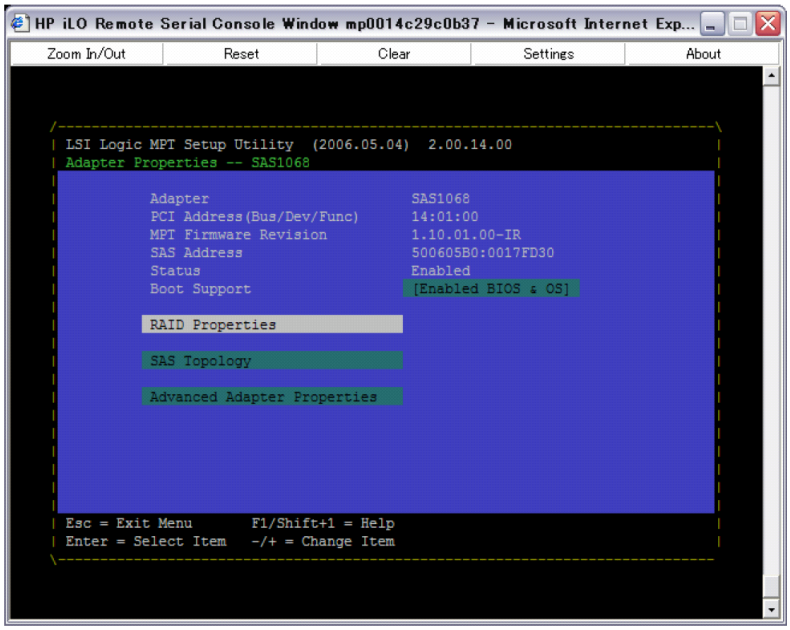
1. Start `drvcfg`, using the Driver ID and Ctrl ID of the SAS Host Bus Adapter (See "Determining the Driver ID and Ctrl ID" (page 32)). In this example, the Driver ID is 2C, and the Ctrl ID is 2F:

   ```
   Shell> drvcfg -s 2c 2F
   ```

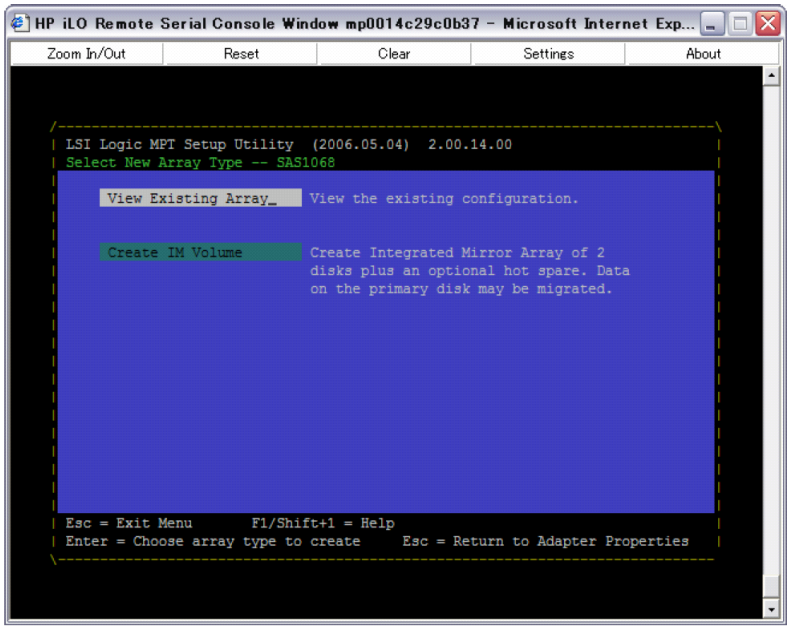
   The Adapter List screen appears:



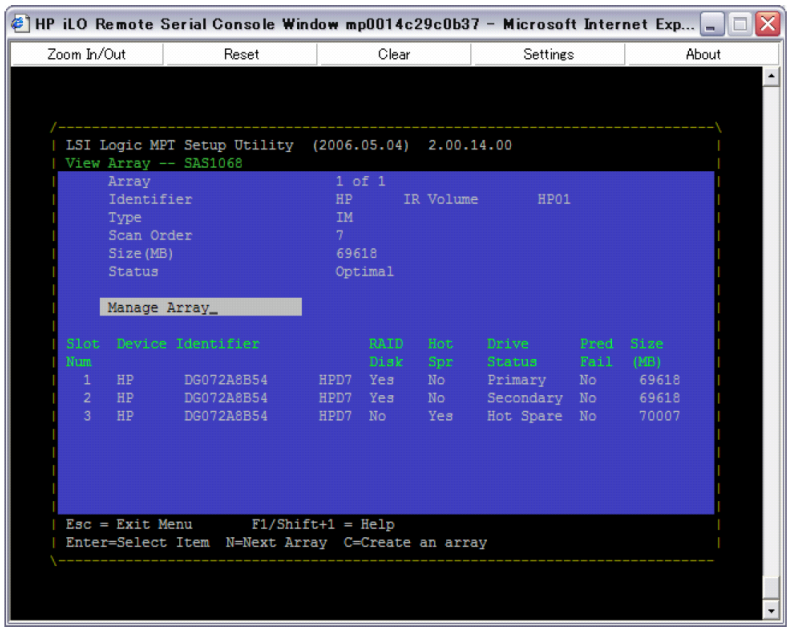
2. Select the SAS Host Bus Adapter (**SAS1068**) and press **Enter**. The **Adapter Properties** screen appears:



3. Select **RAID Properties** and press **Enter**. The **Select New Array Type** screen appears:



4. Select **View Existing Array** and press **Enter**. The **View Array** screen displays, showing the total array capacity, and the assignments and status of all disks that are in arrays. In this example, one Integrated Mirror array has been defined:



5. To change array settings, choose **Manage Array** and press **Enter**. To exit `drvcfg` without making any changes, press **Esc**.

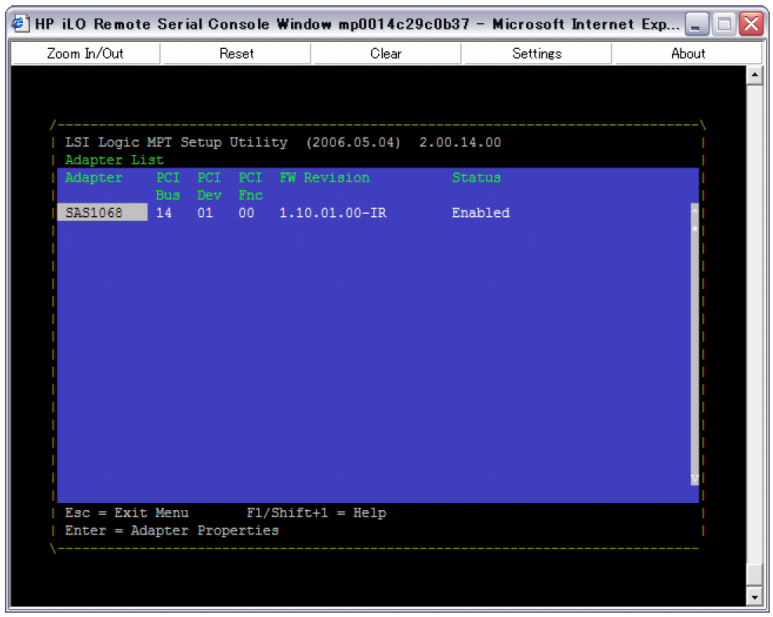
Deleting an Integrated Mirror Volume

To delete an Integrated Mirror volume, follow these steps:

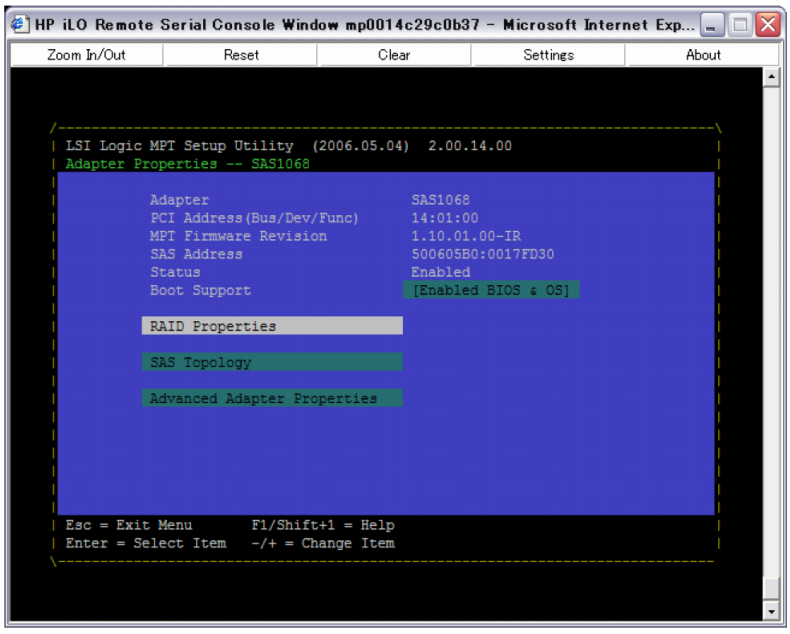
1. Start `drvcfg`, using the Driver ID and Ctrl ID of the SAS Host Bus Adapter (See "Determining the Driver ID and Ctrl ID" (page 32)). In this example, the Driver ID is 2C, and the Ctrl ID is 2F:

   ```
   Shell>drvcfg -s 2C 2F
   ```

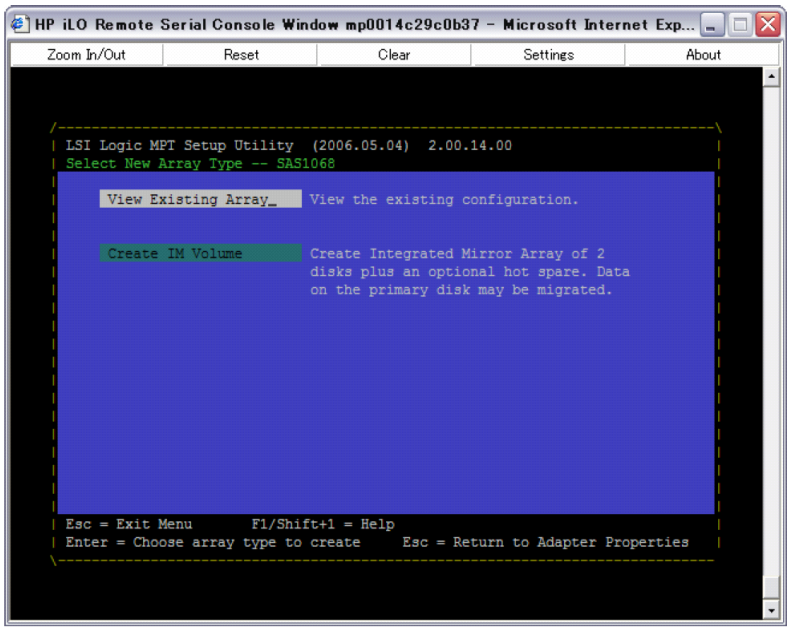
   The Adapter List screen appears:



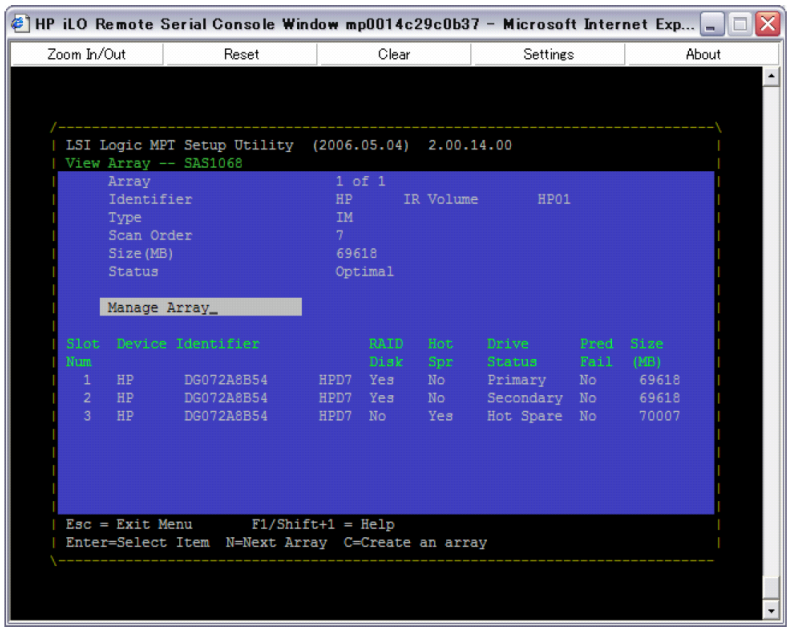
2. Select the SAS Host Bus Adapter (**SAS1068**) and press **Enter**. The **Adapter Properties** screen appears:



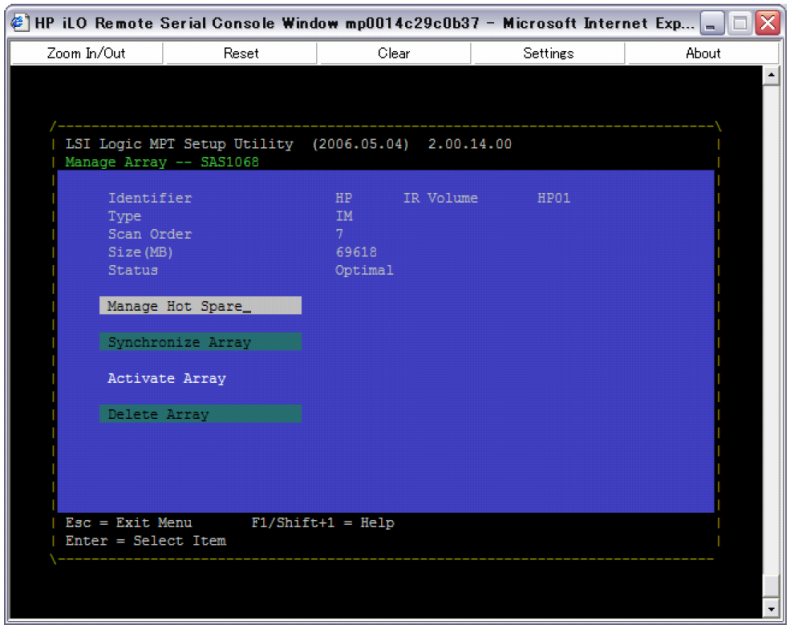
3. Select **RAID Properties** and press **Enter**. The **Select New Array Type** screen appears:



4. Select **View Existing Array** and press **Enter**. The **View Array** screen displays, showing the total array capacity, and the assignments and status of all disks that are in arrays. In this example, one Integrated Mirror array has been defined:



5. Select **Manage Array** and press **Enter**. The Manage Array screen appears:



6. Select **Delete Array** and press Enter. An additional confirmation appears.

WARNING! If you delete an array, all data on the array is lost.

The cfggen Utility

The `cfggen` utility is a command line utility that runs in the Linux, EFI, and Windows Pre-Installation (WinPE) environments. It is a minimally interactive program that you execute from a command line prompt, or a shell script. The results from invoking this utility are communicated through the program status value that is returned when the program exits. Use `cfggen` to create IM storage configurations on SAS controllers. Some `cfggen` commands work only with SAS adapters in the EFI environment.

Starting cfggen

To use `cfggen`, navigate to the directory that contains the utility. To navigate to the directory, follow these steps:

1. Insert the HP IPF Offline Diagnostic and Utilities CD into the CD drive.
2. Boot the system to the EFI shell prompt.
3. From the EFI shell prompt, change to the CD drive.

```
shell> fs0:
fs0:\>
```

4. Change to the directory that contains `cfggen.efi`.

```
fs0:\> cd \EFI\HP\TOOLS\IO_CARDS\SAS
fs0: EFI\HP\TOOLS\IO_CARDS\SAS>
```

5. Run `cfggen` commands from this directory. See "Using cfggen."

Using cfggen

The `cfggen` utility uses a command line interface. Command syntax is not case sensitive;, you can enter `cfggen` commands and parameters in uppercase, lowercase, or a mixture of the two. The following conventions are used in the command descriptions:

- Text in italics must be entered exactly as shown on the command line.
- Text surrounded by <> must be replaced with a required parameter.

- Text surrounded by [ ] may be replaced by an optional parameter.
- Parameters surrounded by {} must be entered one or more times, as appropriate for the executed command.
- Do not enter the command line definition characters (<>, [ ], and {}) on the command line.

Syntax: `cfggen <controller #> <command> <parameters>`

NOTE: The program name, controller number, command, and parameters fields must be separated by the ASCII space character. The format of the parameters is command specific. The program return value is returned to the user when the program exits. A value of 0 is returned if the command is successful. Otherwise, a value of 1 is returned.

Rules for creating IM volumes and hot spare disks:

The following rules apply when creating IM volumes and hot spare disks:

1. All disks that are part of an IM volume or a hot spare for an IM volume must be on the same SAS controller.
2. IM volumes are supported.
3. Only two IM volumes (plus a global hot spare) per controller can be created.
4. An IM array must have exactly two disks.
5. A hot spare disk cannot be created without at least one IM volume already created.
6. The utility does not allow adding a hot spare disk of type different from disk types in any of the volume.
7. With the `AUTO` command all drives used are the same type as the first available disk found, and the size is limited to the size of the smallest disk.

The cfggen Command Set

Using the CREATE Command

The CREATE command creates IM volumes on the SAS controller. Firmware and hardware limitations for this family of cards limit the number of configurations that are possible.

Syntax

```
cfggen <controller #> create <volume type> <size> [qsync] [noprompt]
```

Parameters

<volume type>	Volume type for the volume to be created. Valid value is IM.
<size>	Size of the IM volume in Mbytes or “MAX” for the maximum size available.
[*qsync*]	Quick synchronization of the volume created.
[*noprompt*]	Eliminates warnings and prompts.

Operation

Once a disk has been added to an IM volume, all of its storage capacity may or may not be used depending on drive capacity and volume capacity. For example, if you add a 36 GB disk drive to a volume that only uses 9 GB of capacity on each disk drive, the remaining 27 GB of capacity on the disk drive is unusable.

The first disk specified on the command line will be assigned as the primary disk drive when creating an IM volume. If the SAS controller is allowed to resync the disk drives, the data on the primary disk drive will be available by accessing the newly created volume.

Using the AUTO Command

The AUTO command automatically creates an IM volume on the SAS controllers. The volume will be created with the maximum number of disks available for use in the specified volume type. The main difference from the CREATE command is that with AUTO command user does not specify SCSI ID values for disks to use in the volume. The `cfggen` utility automatically uses the first disks it finds that are usable in the IM volume. Firmware and hardware limitations for the family of controllers limit the number of configurations that are possible.

Syntax

```
cfggen <controller #> auto <volume type> <size> [qsync] [noprompt]
```

Parameters

<volume type>	Volume type for the volume to be created. Valid value is IM.
<size>	Size of the RAID volume in Mbytes or “MAX” for the maximum size available.
[qsync]	Quick synchronization of the volume created
[noprompt]	Eliminates warnings and prompts.

Operation

When AUTO creates an IM volume, the first disk found is assigned as the primary disk drive. If the controller is allowed to resync the disk drives, the data on the primary disk drive is available by accessing the newly created volume. Reply **`Yes`** if you want to complete the creation.

HOTSPARE

The HOTSPARE command creates a hot spare disk drive. The hot spare drive will be added to hot spare pool 0.

Syntax

```
cfggen <controller #> HOTSPARE [DELETE] <Encl:Bay>
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
[DELETE]	Specifies that the hot-spare is to be deleted (Omit the DELETE keyword to specify hot-spare creation).
<Encl>:<Bay>	Enclosure number and Bay number of the disk that is to be configured as the Hot Spare.

Operation

An IM array can contain a total of three disks, including the hot spare. Only one hot spare disk can be created. The capacity of the hot spare disk must be greater than or equal to the capacity of the smallest disk in the logical drive. You can use the “DISPLAY” command to verify disk capacity. For more information on disk requirements, see “Rules for creating IM volumes and hot spare disks:” (page 42).

DELETE

The DELETE command sets the controller configuration to factory defaults. This command will also delete any existing IR volumes.

Syntax

```
cfggen <controller #> delete [noprompt]
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
[noprompt]	Eliminates warnings and prompts.

Operation

After entering the DELETE command you will be prompted to be sure if you want to proceed with the command. Answer "yes" if you want to proceed.

DISPLAY

This DISPLAY command displays information about controller configurations: controller type, firmware version, BIOS version, volume information, and physical drive information.

Syntax

```
cfggen <controller #> display [filename]
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
[filename]	Valid filename to store output of command to a file.

Sample Output

```
Read configuration has been initiated for controller 0
------------------------------------------------------------------------
Controller information
------------------------------------------------------------------------
  Controller type                         : SAS1068
  EFI BSD version                         : 2.00.09.00
  Firmware version                        : 1.10.01.00
  Channel description                     : 1 Serial Attached SCSI
  Initiator ID                            : 63
  Maximum physical devices                : 62
  Concurrent commands supported           : 511
------------------------------------------------------------------------
IR Volume information
------------------------------------------------------------------------
IR volume 1
  Volume ID                               : 2
  Status of volume                        : Okay (OKY)
  RAID level                              : 1
  Size (in MB)                            : 34304
  Physical hard disks (Target ID)         : 9 1
------------------------------------------------------------------------
Physical device information
------------------------------------------------------------------------
Initiator at ID #63
Target on ID #1
  Device is a Hard disk
  Enclosure #                             : 1
  Slot #                                  : 8
  Target ID                               : 1
  State                                   : Online (ONL)
  Size (in MB)/(in sectors)               : 34732/71132960
  Manufacturer                            : HP
  Model Number                            : DG036A8B53
  Firmware Revision                       : HPD6
  Serial No                               : 3LC04757000085425VFK
  Drive Type                              : SAS
Target on ID #4
  Device is a Hard disk
  Enclosure #                             : 1
```

```
  Slot #                                  : 5
  Target ID                               : 4
  State                                   : Ready (RDY)
  Size (in MB)/(in sectors)               : 70007/143374738
  Manufacturer                            : HP
  Model Number                            : DG072A8B54
  Firmware Revision                       : HPD6
  Serial No                               : 3LB02CXH00008523E83Z
  Drive Type                              : SAS
Target on ID #5
  Device is a Hard disk
  Enclosure #                             : 1
  Slot #                                  : 4
  Target ID                               : 5
  State                                   : Ready (RDY)
  Size (in MB)/(in sectors)               : 70007/143374738
  Manufacturer                            : HP
  Model Number                            : DG072A8B5C
  Firmware Revision                       : HPD4
  Serial No                               : B062P5B011M00547
  Drive Type                              : SAS
Target on ID #6
  Device is a Hard disk
  Enclosure #                             : 1
  Slot #                                  : 3
  Target ID                               : 6
  State                                   : Ready (RDY)
  Size (in MB)/(in sectors)               : 70007/143374738
  Manufacturer                            : HP
  Model Number                            : DG072A8B5C
  Firmware Revision                       : HPD4
  Serial No                               : B062P5B011RK0548
  Drive Type                              : SAS
Target on ID #7
  Device is a Hard disk
  Enclosure #                             : 1
  Slot #                                  : 2
  Target ID                               : 7
  State                                   : Ready (RDY)
  Size (in MB)/(in sectors)               : 70007/143374738
  Manufacturer                            : HP
  Model Number                            : DG072A8B5C
  Firmware Revision                       : HPD4
  Serial No                               : B062P5B011NB0548
  Drive Type                              : SAS
Target on ID #9
  Device is a Hard disk
  Enclosure #                             : 1
  Slot #                                  : 7
  Target ID                               : 9
  State                                   : Online (ONL)
  Size (in MB)/(in sectors)               : 70007/143374738
  Manufacturer                            : HP
  Model Number                            : DG072A8B5C
  Firmware Revision                       : HPD4
  Serial No                               : B062P5B010R10547
  Drive Type                              : SAS
------------------------------------------------------------------------
Enclosure information
------------------------------------------------------------------------
Enclosure#                                : 1
Logical ID                                : 500605B0:0001A950
Numslots                                  : 8
StartSlot                                 : 1
```

```
Start TargetID                          : 0
Start Bus                               : 0
```

Logical drive status values:

Okay (OKY)	Volume is Active and drives are functioning properly and user data is protected if the current RAID level provides data protection.
Degraded (DGD)	Volume is Active and the user's data is not fully protected due to a configuration change or drive failure; a data resync or rebuild may be in progress.
Inactive (OKY)	Volume is inactive and drives are functioning properly and user data is protected if the current RAID level provides data protection.
Inactive (DGD)	Volume is inactive and the user's data is not fully protected due to a configuration change or drive failure; a data resync or rebuild may be in progress.

Physical device status values are as follows:

Online (ONL)	The drive is operational and is part of a logical drive.
Hot Spare (HSP)	The drive is a hot spare that is available for replacing a failed drive in an array.
Ready (RDY)	The drive is ready for use as a normal disk drive or it can be, but has not been, assigned to a disk array or hot spare pool.
Available (AVL)	The hard disk drive may or may not be ready, and it is not suitable for inclusion in an array or hot spare pool (i.e., it is not spun up, its block size is incorrect, or its media is removable).
Failed (FLD)	Drive was part of a logical drive or was a hot spare drive, and it failed. It has been taken offline
Standby (SBY)	This status is used to tag all non-hard disk devices.

FORMAT

The FORMAT command performs a low-level format of a disk drive. This operation can only be performed on a physical disk. FORMAT cannot be used on an IR volume or a hot spare.

Syntax

```
cfggen <controller #> format <Encl:Bay> [noprompt]
```

Parameters

<controller #>	A SAS controller number between 0 and 255.
<Encl:Bay>	Enclosure number and Bay number that identifying the disk drive that will be formatted.
[noprompt]	Eliminates warnings and prompts.

WARNING! Performing a low-level format on a hard disk drive will result in the destruction of all data stored on that disk drive. The operation cannot and should not be interrupted; doing so may result in irreparable damage to the hard disk drive.

Operation

Unless `noprompt` is included on the command line, warning messages will be displayed. You will be required to properly answer a series of prompts or the command will be aborted. The answers are case sensitive and must be entered in upper case.

This command will not complete and return to a shell prompt until the format operation is complete. Depending on the capacity and model of disk drive, this can take a considerable amount of time.

STATUS

The STATUS command displays the status of any volume synchronization operation that is currently in progress on the controller.

Syntax

```
cfggen <controller #> status
```

Parameters

<controller #> A SAS controller number between 0 and 255.

Operation

If no volume synchronization is in progress, CFGIR will print a message so indicating before exiting. The STATUS command will add the flag "Inactive" to the Volume State field, if the volume is marked as Inactive by the controller firmware.

Sample Output

The following is an example of the status information returned when a volume resynchronization is in progress.

```
Background command progress status for controller 0...
IR Volume 1
  Current operation                     : None
  Volume ID                             : 2
  Volume status                         : Enabled
  Volume state                          : Optimal
  Physical disk I/Os                    : Not quiesced
```

The status fields in the data displayed can take on the following values:

- Current operation - Synchronize or None
- Volume status - Enabled or Disabled
- Volume state - [Inactive] Optimal, Degraded or Failed
- Physical disk I/Os - Quiesced or Not quiesced

ENABLEIR

The ENABLEIR command turns on IR functionality on a SAS controller. The enabling is accomplished by clearing the `MPI_IOUNITPAGE1_DISABLE_IR` bit in the IO Unit 1 MPT Configuration Page.

Syntax

```
cfggen <controller #> enableir
```

Parameters

<controller #> A SAS controller number between 0 and 255.

Operation

If there are any existing IR volumes when this command is run you will be notified via an output message, no action will be taken and `cfggen` will return SUCCESS. If IR is currently enabled when this command is run `cfggen` will return SUCCESS.

Faulty controller or peripheral hardware (such as cables, disk drives, etc.) will not cause this utility to hang. It will exit with the appropriate return value. If an operation fails, clear the fault condition by whatever means necessary and retry the operation.

DISABLEIR

The DISABLEIR command turns off IR functionality on a SAS controller, by setting the MPI_IOUNITPAGE1_DISABLE_IR bit in the IO Unit 1 MPT Configuration Page.

Syntax

```
cfggen <controller #> disableir
```

Parameters

This command does not require <controller #>.

Sample Output

```
 Vendor  Device
Index  ID  ID  Bus Device
-----  ------  ------  ---------
0  1000h  0054h  14h 08h LSI 1068 SAS Host Adapter
```

LOCATE

The LOCATE command turns locate LED's on and off.

Syntax

```
cfggen <controller #> locate
```

Parameters

<controller #> A SAS controller number between 0 and 255.

Updating the Adapter Firmware

Follow the procedures in this section to update the adapter firmware. For information on recommended firmware versions, see the *SAS Host Bus Adapters Support Matrix* at:

http://docs.hp.com/en/netcom.html

There are two methods to update the adapter firmware, depending on the HP-UX and SerialSCSI-00 versions installed on the server:

- In some SerialSCSI-00 bundle versions, the `sasd` driver updates the adapter firmware when the system boots.
- In later SerialSCSI-00 versions, the firmware is not updated by the driver. Use the `sasflash` EFI utility to update adapter firmware offline.

Table 3-2 lists the method you must use to update the adapter firmware for each supported HP-UX and SerialSCSI-00 bundle version.

Table 3-2 Adapter Firmware Update Methods

HP-UX Version	SerialSCSI-00 Version	Adapter Firmware Update Method
HP-UX 11i v3	B.11.31.0803 or later	`sasflash.efi`
	B.11.31.0712 or earlier	`sasd` driver
HP-UX 11i v2	B.11.23.0803 or later	`sasflash.efi`
	B.11.23.0712 or earlier	`sasd` driver

The `sasflash.efi` utility and firmware images are included on the *IPF Offline Diagnostics and Utilities CD*, version 0803 and later. To update the adapter firmware offline, follow the procedures provided with the `sasflash` utility.

△ **CAUTION:** If you have updated the adapter firmware using `sasflash`, booting a disk with an older version of SerialSCSI-00 (including Ignite-UX) might download an older version of the firmware and EFI driver to all HBAs controlled by SerialSCSI-00 in the system. In this case, use `sasflash` to reinstall the correct adapter firmware.

---

4 Configuring and Troubleshooting the Controller Online

This chapter describes the online configuration, troubleshooting, and maintenance tools for HP internal SAS controllers. This chapter includes the following topics:

Introduction

A systematic approach to troubleshooting helps isolate the problem. If you cannot solve the problem on your own, contact your HP representative.

NOTE: Before using these troubleshooting steps, you must have installed, configured, and verified the HP 8 Internal Port SAS Controller hardware and software on the host and on any devices.

Troubleshooting sasd

Troubleshooting `sasd` requires the use of the following two utilities:

- `ioscan`
- `sasmgr`

The ioscan Utility

By default, `ioscan` scans the system and lists all reportable hardware found. The types of hardware reported include processors, memory, interface cards and I/O devices. For HP-UX 11i v2, the `ioscan` command syntax is as follows:

```
SYNTAX

/usr/sbin/ioscan [-k|-u] [-e] [-d driver|-C class] [-I instance]
[-H hw_path] [-f[-n ]|-F[-n]] [devfile]

/usr/sbin/ioscan -M driver -H hw_path [-I instance]

/usr/sbin/ioscan -t
```

For HP-UX 11i v3, the `ioscan` command syntax is as follows:

```
SYNTAX

/usr/sbin/ioscan [-N] [-k|-u] [-e] [-d driver | -C class] [-I instance]
[-H hw_path] [ -f[-n] | -F[-n] ] [devfile]

/usr/sbin/ioscan [-b] -M driver -H hw_path [-I instance]

/usr/sbin/ioscan -t

/usr/sbin/ioscan -P property [-d driver | -C class] [-I instance]
[-H hw_path] [devfile]

/usr/sbin/ioscan -m lun [-F] [-d driver | -C class] [-I instance]
[-H lun hw_path] [devfile]
```

```
/usr/sbin/ioscan [-F] -m dsf [devfile]

/usr/sbin/ioscan -m hwpath [-F] [-H hw_path]

/usr/sbin/ioscan -s

/usr/sbin/ioscan -r -H hw_path

/usr/sbin/ioscan -B

/usr/sbin/ioscan -U

/usr/sbin/ioscan -a [-F]
```

For a complete explanation of `ioscan` command line options and parameters for the version of HP-UX that you are using, see the `ioscan(1M)` manpage.

Displaying Interface and Disk Information

The following example will display information about interface cards which use the `sasd` driver:

```
# ioscan -fnkd sasd
Class        I  H/W Path  Driver S/W State   H/W Type     Description
===================================================================
escsi_ctlr   0  0/4/1/0   sasd CLAIMED     INTERFACE    HP  PCI/PCI-X SAS MPT Adapter
                         /dev/sasd0
```

The following example will display information about disk devices:

```
# ioscan -fnkC disk
Class        I  H/W Path        Driver         S/W State   H/W Type     Descript
ion
=============================================================================
disk         0  0/0/2/1.0.16.0.0  sdisk          CLAIMED     DEVICE       TEAC    DV-28E-N
                              /dev/dsk/c0t0d0   /dev/rdsk/c0t0d0
disk         3  0/4/1/0.0.0.2.0   sdisk          CLAIMED     DEVICE       HP      DG072A9BB7
                              /dev/dsk/c1t2d0   /dev/rdsk/c1t2d0
disk         4  0/4/1/0.0.0.3.0   sdisk          CLAIMED     DEVICE       HP      DG072A9BB7
                              /dev/dsk/c1t3d0   /dev/rdsk/c1t3d0
disk         5  0/4/1/0.0.0.4.0   sdisk          CLAIMED     DEVICE       HP      DG036A8B5B
                              /dev/dsk/c1t4d0   /dev/rdsk/c1t4d0
disk         8  0/4/1/0.0.0.7.0   sdisk          CLAIMED     DEVICE       HP      DG036A9BB6
                              /dev/dsk/c1t7d0     /dev/rdsk/c1t7d0
                              /dev/dsk/c1t7d0s1   /dev/rdsk/c1t7d0s1
                              /dev/dsk/c1t7d0s2   /dev/rdsk/c1t7d0s2
                              /dev/dsk/c1t7d0s3   /dev/rdsk/c1t7d0s3
disk        11  0/4/1/0.0.0.10.0  sdisk          CLAIMED     DEVICE       HP      IR Volume
                              /dev/dsk/c1t10d0   /dev/rdsk/c1t10d0
```

For each hardware module on the system, `ioscan` displays by default the hardware path to the hardware module, the class of the hardware module, and a brief description. If the device is connected, but not found, then it is in a “no hardware” state. If the device is in a no hardware state, use `sasmgr` to further check the state of the I/O card; see “Displaying General Statistics and Information” (page 57).

The sasmgr Utility

You can use the `sasmgr` utility to manage HP-UX Serial Attached SCSI (SAS) mass storage core I/O controllers. The `sasmgr` command syntax is as follows:

```
SYNTAX

      Path:  /opt/sas/bin

      sasmgr [-h][-f] add -D device_file -q raid -q level=raid_level -q
         enc_bay=enc:bay[,enc:bay] [-q size=size] [-q rebuild_rate=rate]

      sasmgr [-h][-f] add -D device_file -q raid -q spare -q enc_bay=enc:bay

      sasmgr [-h][-f] bdr -D device_file -q lun={all | lun_dsf}
```

```
sasmgr [-h] clear_stat -D device_file

sasmgr [-h] clear_stat -D device_file -q all

sasmgr [-h] clear_stat -D device_file -q phy={all | phy_id}

sasmgr [-h] clear_stat -D device_file -q phy_in_port={all | phy_id}

sasmgr [-h] clear_stat -D device_file -q target={all | sasaddr}

sasmgr [-h][-f] delete -D device_file -q raid -q raid_vol={rvol_id |
   all}

sasmgr [-h][-f] delete -D device_file -q raid -q spare

sasmgr [-h][-f] disable -D device_file

sasmgr [-h][-f] download -D device_file -q downloadfile=filename -q
   enc_bay=enc:bay

sasmgr [-h] enable -D device_file

sasmgr [-h] get_info -D device_file

sasmgr [-h] get_info -D device_file -q lun={all | lun_dsf}

sasmgr [-h][-N] get_info -D device_file -q lun=all

sasmgr [-h][-v] get_info -D device_file -q lun={all | lun_dsf} -q
   lun_locate

sasmgr [-h][-v][-N] get_info -D device_file -q lun=all -q lun_locate

sasmgr [-h] get_info -D device_file -q pci_id

sasmgr [-h] get_info -D device_file -q phy={all | phy_id}

sasmgr [-h] get_info -D device_file -q phy_in_port={all | phy_id}

sasmgr [-h][-N] get_info -D device_file -q raid

sasmgr [-h] get_info -D device_file -q reg={all | offset} [-q
   reg_type={ pci_config | mmio }]

sasmgr [-h] get_info -D device_file -q smp=file_name

sasmgr [-h] get_info -D device_file -q smp_addr

sasmgr [-h] get_info -D device_file -q target={all | sasaddr}

sasmgr [-h] get_info -D device_file -q vpd

sasmgr [-h] get_stat -D device_file

sasmgr [-h] get_stat -D device_file -q phy={all | phy_id}

sasmgr [-h] get_stat -D device_file -q phy_in_port={all | phy_id}

sasmgr [-h] get_stat -D device_file -q target={all | sasaddr}

sasmgr [-h][-f] replace_tgt -D device_file -q old_dev=lun_dsf -q
   new_tgt_hwpath=new_hw_path

sasmgr [-h][-f] reset -D device_file
```

```
sasmgr [-h] set_attr -D device_file -q lun=lun_dsf -q locate_led={on |
   off}

sasmgr [-h][-f] set_attr -D device_file -q raid -q raid_vol=rvol_id -q
   state=vol_state

sasmgr [-h][-f] set_attr -D device_file -q raid -q raid_vol=rvol_id -q
   rebuild_rate=rebuild_rate
```

A `-N` option has been added to the `sasmgr` utility for HP-UX 11i v3. For example:

```
sasmgr -N get_info -D /dev/sasd0 -q raid
```

When this option is specified for some commands, it enables you to specify the persistent device file as input to a qualifier. For some commands, when this option is specified, the output will display persistent device file information.

If the `-N` option is not specified, `sasmgr` will accept and display only legacy device file information. This provides backward compatibility with previous versions of HP-UX. For more information on persistent device files in HP-UX 11i v3, see the `intro(7)` manpage.

The sasmgr Command Set

A command is defined by a set of qualifiers. Attributes are specified with the -q option. All keywords are case-sensitive. The following commands are recognized by `sasmgr`.

`add` One of the following sets of qualifiers must be specified with the add command:

- `raid`
- `level`
- `enc_bay`
- `size`
- `rebuild_rate`

Use this set of qualifiers to create a RAID volume with the specified RAID level, volume size and physical disks. The value specified for the `level` qualifier determines the RAID level for the volume. For example, `-q level=1` specifies that a RAID 1 volume should be created. If the physical disks in a RAID volume are different sizes, then some disk space will be wasted. Volume expansion is not supported; once a volume has been created, its size cannot be increased. If the `size` qualifier is not specified, then the volume is created with a maximum possible size based on the size of the physical disks specified. If the `rebuild_rate` qualifier is not specified, then the default rebuild rate of 20% will be used for the volume. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning and executes the command. This command requires superuser privileges. See "Security Restrictions" (page 67).

- `raid`
- `spare`
- `enc_bay`

Use this set of qualifiers to add a global spare disk. The global spare disk is used whenever a physical disk in any RAID volume on the controller fails. The size of the disk specified should be greater than the size of at least one of the physical disks in the volume. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and continues executing the command. This command requires superuser privileges. See "Security Restrictions" (page 67).

`bdr`

The following qualifier must be specified with the `bdr` command:

- `lun` - Resets the specified target device. **This is a destructive operation.** If the `-f` option is not specified with this command, `sasmgr` displays a warning message before continuing. Otherwise, it suppresses the warning message and executes the command.

`clear_stat`

When the `clear_stat` command is run without qualifiers, it clears statistics of the controller represented by `device_file`. The following qualifiers may be specified with the `clear_stat` command:

- `all` - Clears all statistics for the controller, all PHYs, all ports, and all targets.
- `phy` - Clears statistics for all PHYs or a specific PHY.
- `phy_in_port` - Clears statistics for a port to which the specified PHY belongs to or clears statistics for all ports.
- `target` - Clears statistics for a specific target or all targets.

`delete`

One of the following sets of qualifiers must be specified with the delete command:

- `raid`
- `raid_vol`

Use this set of qualifiers to delete the RAID volume given by the volume ID. (Use the `get_info` command with the raid qualifier to obtain the volume ID.) If a volume ID of `all` is specified, then all RAID volumes will be deleted. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and continues executing the command. This command requires superuser privileges. See "Security Restrictions" (page 67).

- `raid`
- `spare`

Use this set of qualifiers to delete the controller spare disk. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and continues executing the command. This command requires superuser privileges. See "Security Restrictions" (page 67).

`disable`

Disables the controller. This is a destructive operation. The controller will go offline, all current I/Os will be aborted, and new I/Os will fail. An `enable` operation must be performed in order to bring the controller back online. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and executes the command.

`download`

The following qualifiers must be specified with the download command:

- `downloadfile`
- `enc_bay`

Updates the firmware on a SAS disk. The command will update disk firmware for regular physical disks, as well as those that are part of a RAID volume. The `downloadfile` qualifier takes the name of the file containing the new disk firmware. The `enc_bay` qualifier takes the enclosure and bay of the disk for which the firmware update is to be done. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and continues executing the command.

`enable` Enables the controller and brings it back online. This command causes the driver to initialize the controller. Use this command to bring the controller back online after using the `disable` command.

`get_info` When the `get_info` command is run without qualifiers, it returns information about the controller represented by `device_file`. The following qualifiers may be specified with the `get_info` command:

- `lun` - Shows hardware path and SAS address information for a specific LUN or all LUNs. If the `-N` option and the `-q lun=all` qualifier are specified with this command, then it displays persistent device file information.
- `lun_locate` - Shows LUN location information for the LUN specified with the LUN qualifier. If the `-N` option and the `-q lun=all` qualifier are specified with this command, then it displays persistent device file information with the LUN location information.
- `pci_id` - Shows PCI ID information for the controller.
- `phy` - Shows information about all PHYs or a specific PHY.
- `phy_in_port` - Shows information about a port to which the specified PHY belongs or provides information about all ports.
- `raid` - Shows RAID configuration information for the controller. If the `-N` option is specified with this command, then it displays persistent device file information.
- `reg` - Displays the contents of a specific PCI config space or MMIO register or all PCI config spaces or MMIO registers. PCI config space or MMIO register type is specified with the reg_type qualifier. If `reg_type` is not specified, then the command assumes a default register type of MMIO.
- `smp_addr` - Shows the SMP initiator SAS address to send SMP requests.
- `target` - Shows information about a specific target or all targets.
- `vpd` - Shows vital product data information for the controller.

`get_stat` When the `get_stat` command is run without qualifiers, it shows statistics about the controller represented by `device_file`. The following qualifiers may be specified with the `get_stat` command:

- `phy` - Shows statistics for all PHYs or a specific PHY.
- `phy_in_port` - Shows statistics for a port to which the specified PHY belongs to or provides statistics for all ports.
- `target`- Shows statistics for a specific target or all targets.

`replace_tgt` The following qualifiers must be specified with the `replace_tgt` command:

- `old_dev`
- `new_tgt_hwpath`

Allows the `lun_dsf` specified with `old_dev` to be associated with a new SAS target, which is specified with the `new_tgt_hwpath` qualifier. The `lun_dsf` must be the legacy device file and the `new_hw_path` must be the legacy hardware path.

This command is typically intended for replacing a bad drive. This operation must not be used while there are outstanding I/O requests to the `lun_dsf` or to any LUNs under the `new_hw_path`. If the `-f` option is not specified, `sasmgr` displays a warning message before proceeding. Otherwise, it suppresses the warning message and executes the command.

NOTE: This command does not allow a persistent device file or the new style hardware path to be specified with the `old_dev` and `new_tgt_hwpath` qualifiers. For persistent device files, please use the `io_redirect_dsf` command. See the `io_redirect_dsf(1M)` manpage for more information.

`reset` Resets the controller and performs a complete re-initialization. This is a destructive operation. Some I/Os may be aborted by this command. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and executes the command.

`set_attr` The following qualifiers must be specified with the `set_attr` command:

- `lun`
- `locate_led`

Turns the locate LED for the specified LUN on or off. If it is a RAID device LUN, then this command turns the LOCATE LED for all the physical disks that are part of the RAID volume on or off.

- `raid`
- `state`
- `raid_vol`

Use this set of qualifiers to change the state of the volume based on the value specified by the `state` qualifier and the volume specified by `raid_vol`. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and executes the command.

- `raid`
- `raid_vol`
- `rebuild_rate`

Use this set of qualifiers to change the rebuild rate of the volume specified by `raid_vol` based on the rate specified by the `rebuild_rate`. If the `-f` option is not specified, `sasmgr` displays a warning message before continuing the command. Otherwise, it suppresses the warning message and executes the command.

Using sasmgr: Common Command Examples

This section contains examples of `sasmgr` commands which are useful when troubleshooting problems with the Host Bus Adapter.

Displaying General Statistics and Information

The following command will display all PHY statistics of the controller with the device file /dev/sasd0:

```
# sasmgr get_info -D /dev/sasd0 -q phy=all

Tue Dec 12 02:44:31 2006

Info for PHY ID                                 : 0
PHY Health                                      : UP
Port SAS Address                                : 0x500605b00016f700
Attached SAS Address                            : 0x500000e0126926d2
Current Link Rate                               : 3 Gbps
Max Link Rate                                   : 3 Gbps
```

```
Info for PHY ID                                    : 1
PHY Health                                         : UP
Port SAS Address                                   : 0x500605b00016f701
Attached SAS Address                               : 0x500000e012691cb2
Current Link Rate                                  : 3 Gbps
Max Link Rate                                      : 3 Gbps

Info for PHY ID                                    : 2
PHY Health                                         : UP
Port SAS Address                                   : 0x500605b00016f702
Attached SAS Address                               : 0x500000e012691ee2
Current Link Rate                                  : 3 Gbps
Max Link Rate                                      : 3 Gbps

Info for PHY ID                                    : 3
PHY Health                                         : UP
Port SAS Address                                   : 0x500605b00016f703
Attached SAS Address                               : 0x500000e01268e312
Current Link Rate                                  : 3 Gbps
Max Link Rate                                      : 3 Gbps

Info for PHY ID                                    : 4
PHY Health                                         : UP
Port SAS Address                                   : 0x500605b00016f704
Attached SAS Address                               : 0x500000e01263fcc2
Current Link Rate                                  : 3 Gbps
Max Link Rate                                      : 3 Gbps

Info for PHY ID                                    : 5
PHY Health                                         : DOWN
Port SAS Address                                   : 0x0
Attached SAS Address                               : 0x0
Current Link Rate                                  : 1.5 Gbps
Max Link Rate                                      : 1.5 Gbps

Info for PHY ID                                    : 6
PHY Health                                         : DOWN
Port SAS Address                                   : 0x0
Attached SAS Address                               : 0x0
Current Link Rate                                  : 1.5 Gbps
Max Link Rate                                      : 1.5 Gbps

Info for PHY ID                                    : 7
PHY Health                                         : UP
Port SAS Address                                   : 0x500605b00016f707
Attached SAS Address                               : 0x500000e01122d7d2
Current Link Rate                                  : 3 Gbps
Max Link Rate                                      : 3 Gbps
```

The following command will display all RAID volume information for the controller with the device file dev/sasd0:

```
# sasmgr get_info -D /dev/sasd0 -q raid

Tue Dec 12 02:45:03 2006

---------- PHYSICAL DRIVES ----------
LUN dsf              SAS Address          Enclosure    Bay      Size(MB)

/dev/rdsk/c1t2d0     0x500000e012691cb2     1            3      70007
/dev/rdsk/c1t3d0     0x500000e0126926d2     1            4      70007
/dev/rdsk/c1t4d0     0x500000e01122d7d2     1            5      34732
/dev/rdsk/c1t7d0     0x500000e01263fcc2     1            8      34732

---------- LOGICAL DRIVE 4 ----------

Raid Level                                        : RAID 1
```

```
Volume sas address                                  : 0x611d224fa01c82
Device Special File                                 : /dev/rdsk/c1t10d0
Raid State                                          : OPTIMAL
Raid Status Flag                                    : ENABLED
Raid Size                                           : 34000
Rebuild Rate                                        : 20.00 %
Rebuild Progress                                    : 100.00 %

Participating Physical Drive(s) :

SAS Address         Enc    Bay    Size(MB)      Type            State

0x500000e01268e312   1      1     70007         SECONDARY       ONLINE
0x500000e012691ee2   1      2     70007         PRIMARY         ONLINE
```

The following command will display the status, driver and firmware version of the controller with the device file /dev/sasd0:

```
# sasmgr get_info -D /dev/sasd0

Driver Name                                         : sasd
Bundle Version                                      : B.11.23.03
Product Number                                      : 399490-001
Hardware Path                                       : 0/4/1/0
Health of HBA                                       : ONLINE
PCI Vendor ID                                       : 0x1000
PCI Device ID                                       : 0x0054
PCI Subsystem Vendor ID                             : 0x3228
PCI Subsystem ID                                    : 0x103c
PCI Revision ID                                     : 0x0000
Max. PHYs supported                                 : 8
Max. IO size                                        : 1048576

**********************************************************************
*****               HBA Specific information                     *****
**********************************************************************
HBA state                                           : READY
Driver firmware dump available                      : NO
Driver firmware dump timestamp                      : N/A
Firmware Revision                                   : 1.16.0.0
```

Display the device file assignments for the controller with the device file /dev/sasd0:

```
# sasmgr get_info -D /dev/sasd0 -q lun=all
LUN dsf              Hardware Path                  SAS Address
-------------------------------------------------------------------
/dev/rdsk/c1t10d0    0/4/1/0.0.0.10.0               0x611d224fa01c82
/dev/rdsk/c1t2d0     0/4/1/0.0.0.2.0                0x500000e012691cb2
/dev/rdsk/c1t3d0     0/4/1/0.0.0.3.0                0x500000e0126926d2
/dev/rdsk/c1t4d0     0/4/1/0.0.0.4.0                0x500000e01122d7d2
/dev/rdsk/c1t7d0     0/4/1/0.0.0.7.0                0x500000e01263fcc2
```

Displaying Information About Error Conditions

The following command will display usage and error statistics for the controller with the device file /dev/sasd0:

```
# sasmgr get_stat -D /dev/sasd0

Tue Dec 12 02:57:44 2006

General HBA statistics
No. of times HBA came online                        : 1
Time at which HBA went to online state              : Mon Dec 11 19:57:29
No. of times HBA went offline                       : 0
Time at which HBA went to offline state             : N/A
No. of times HBA went to transient state            : 1
Time at which HBA went to transient state           : Mon Dec 11 19:57:08
No. of times enable was issued by ioctl             : 0
```

```
No. of times disable was issued by ioctl          : 0
No. of times reset was issued by ioctl            : 0

ULM IO/TM Statistics
NOTE: IO/TM stats are derived from target stats.
NOTE: Clearing target stats affects IO/TM stats.
No. of High priority IOs from SCSI layer          : 0
No. of IOs from SCSI layer succeeded              : 71121
No. of IOs from SCSI layer failed                 : 102
No. of IOs from SCSI layer                        : 71218
No. of IOs from SCSI layer succeeded              : 71121
No. of IOs from SCSI layer failed                 : 102
No. of IOs from SCSI layer timedout on active q   : 0
No. of IOs from SCSI layer implicitly aborted     : 0
No. of TMs from SCSI layer                        : 0
No. of TMs from SCSI layer succeeded              : 0
No. of TMs from SCSI layer failed                 : 0
No. of TMs from SCSI layer timedout on active q   : 0

OLAR Statistics
No. of times HBA went to suspended state          : 0
Time at which HBA was suspended                   : N/A
No. of times HBA resumed                          : 0
No. of times HBA resume failed                    : 0
No. of times PCI errors were encountered          : 0

Seconds since last statistics were reset         : 25236

**************************************************************************
*****              HBA Specific information                          *****
**************************************************************************
No. of times Force dump was issued by ioctl       : 0
No. of times Save dump was issued by ioctl        : 0
Timestamp of last Fatal Error                     : N/A
No. of fatal errors while in fatal state          : 0
No. of fatal errors from IO/TM                    : 0
No. of fatal errors from HAL                      : 0

ISR Statistics
No. of Interrupts received                        : 80420
No. of Interrupts one interval ago                : 80418

IO Statistics

NOTE: IO stats are derived from target stats.

NOTE: Clearing target stats affects IO stats.
No. of IOs posted to HAL                          : 71223
No. of IOs timed-out on ccb_send_list             : 0
No. of IOs aborted on ccb_send_list               : 0
No. of IOs timed-out on iotm_res_wait_q           : 0
No. of IOs aborted on iotm_res_wait_q             : 0
No. of IOs failed because target was dead         : 0
No. of IOs queued because target was transient    : 0
No. of IOs that could not get a SM                : 0
No. of IOs that could not be posted to HAL        : 0
No. of times DMA setup for an IO failed           : 0
No. of IO overruns                                : 0
No. of IO underruns                               : 868
No. of IO data length mismatch                    : 0

TM Statistics

NOTE: TM stats are derived from target stats.
```

```
NOTE: Clearing target stats affects TM stats.
No. of TMs posted to HAL                          : 0
No. of TMs aborted on ccb_send_list               : 0
No. of TMs timed-out on iotm_res_wait_q           : 0
No. of TMs aborted on iotm_res_wait_q             : 0
No. of TMs implicitly aborted                     : 0
No. of times TM could not get SM                  : 0
No. of TMs failed because target was dead         : 0
No. of TMs queued because target was transient    : 0
No. of TMs failed because chip was dead           : 0
No. of times TM could not be posted to HAL        : 0

HAL Statistics
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 0
PHY online event received count                   : 1
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 0
PHY online event received count                   : 1
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 0
PHY online event received count                   : 1
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 0
PHY online event received count                   : 1
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 1
PHY online event received count                   : 0
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 1
PHY online event received count                   : 0
PHY stale data count                              : 0
PHY data read again count                         : 0
PHY Page 0 offline count                          : 0
PHY offline event received count                  : 0
PHY online event received count                   : 1
Diag mode fail count                              : 0
Target not in cache count                         : 0
Bad IOC state count                               : 0
Chip transition fail count                        : 0
Doorbell interrupt timeout count                  : 0
Doorbell response timeout count                   : 0
HAL resource allocation retry count               : 0
Flash f/w update count                            : 0
No resource to ACK count                          : 0
No resource to process Device event count         : 0
No resource to process PHY event count            : 0
Reply frame bounds error count                    : 0
```

```
Reply frame offset error count                      : 0
Stale tag count                                     : 0
Context Reply for non-IO count                      : 0
Tag bounds check fail count                         : 0
Heart Beat bad reply status count                   : 0
Internal reply bad status count                     : 0
Bad device page 0 status count                      : 0
Internal request timeout count                      : 0
No resource for heartbeat count                     : 0
Discovery error. Loop detected                      : 0
Discovery error. Unaddressed device found           : 0
Discovery error. Duplicate SAS address found        : 0
Discovery error. Expander error                     : 0
Discovery error. SMP timeout                        : 0
Discovery error. Expander route table OOF entries   : 0
Discovery error. Non-existing route table indices   : 0
Discovery error. SMP function failed                : 0
Discovery error. SMP CRC error                      : 0
Discovery error. XLE subtractive found              : 0
Discovery error. Table to Table                     : 0
Discovery error. XLE paths found                    : 0
Discovery error. Max no. of SATA targets reached    : 0
No. of Unknown Events received                      : 0

Probe Statistics
No. of ioscans                                      : 1
No. of ioscan failures                              : 0
No. of times Chip went offline of ioscans           : 0
No. of times Chip went to Trans state               : 20
No. of HAL query successes                          : 0
No. of HAL query failures                           : 0
No. of times times HAL returned busy                : 0
No. of times memory allocation failed               : 0
No. of devices that timed out                       : 0
No. of times Target opens was sent                  : 5
No. of times open failed                            : 0
No. of times close was sent                         : 5
No. of open attempts                                : 0
No. of times Inquiry was sent                       : 5
No. of times Inquiry failed                         : 0
No. of times Report LUN was sent                    : 0
No. of times Report LUNs failed                     : 0

Target Statistics
No. of Domain discoveries done                      : 2
No. of Implicit discoveries done                    : 0
```

You can use the following command to trace the origin of a disk problem. The following command will display PHY status and history for the controller with the device file /dev/sasd0. In this example, the field “No. of times PHY went Down” indicates failures on PHY 5 and PHY 6, and the field “Time PHY went Down” lists the time that the problem occurred:

```
# sasmgr get_stat -D /dev/sasd0 -q phy=all

Tue Dec 12 03:00:02 2006

Statistics for PHY ID                               : 0
No. of times PHY came UP                            : 1
Time PHY came UP                                    : Wed Dec 31 19:00:00
No. of times PHY went Down                          : 0
Time PHY went Down                                  : N/A
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 1
No. of times PHY came UP                            : 1
```

```
Time PHY came UP                                    : Wed Dec 31 19:00:00
No. of times PHY went Down                          : 0
Time PHY went Down                                  : N/A
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 2
No. of times PHY came UP                            : 1
Time PHY came UP                                    : Wed Dec 31 19:00:00
No. of times PHY went Down                          : 0
Time PHY went Down                                  : N/A
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 3
No. of times PHY came UP                            : 1
Time PHY came UP                                    : Wed Dec 31 19:00:00
No. of times PHY went Down                          : 0
Time PHY went Down                                  : N/A
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 4
No. of times PHY came UP                            : 1
Time PHY came UP                                    : Wed Dec 31 19:00:00
No. of times PHY went Down                          : 0
Time PHY went Down                                  : N/A
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 5
No. of times PHY came UP                            : 0
Time PHY came UP                                    : N/A
No. of times PHY went Down                          : 1
Time PHY went Down                                  : Wed Dec 31 19:00:00
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 6
No. of times PHY came UP                            : 0
Time PHY came UP                                    : N/A
No. of times PHY went Down                          : 1
Time PHY went Down                                  : Wed Dec 31 19:00:00
Seconds since PHY statistics was last cleared       : 1165910402

Statistics for PHY ID                               : 7
No. of times PHY came UP                            : 1
Time PHY came UP                                    : Wed Dec 31 19:00:00
No. of times PHY went Down                          : 0
Time PHY went Down                                  : N/A
Seconds since PHY statistics was last cleared       : 1165910402

**********************************************************************
*****              HBA Specific information                      *****
**********************************************************************
Statistics for PHY ID                               : 0
No. of Invalid Dwords                               : 0
No. of Running Parity Errors                        : 0
No. of Loss Dword Syncs                             : 0
No. of PHY Reset Problems encountered               : 0

Statistics for PHY ID                               : 1
No. of Invalid Dwords                               : 0
No. of Running Parity Errors                        : 0
No. of Loss Dword Syncs                             : 0
No. of PHY Reset Problems encountered               : 0

Statistics for PHY ID                               : 2
No. of Invalid Dwords                               : 0
No. of Running Parity Errors                        : 0
```

```
No. of Loss Dword Syncs                          : 0
No. of PHY Reset Problems encountered            : 0

Statistics for PHY ID                            : 3
No. of Invalid Dwords                            : 0
No. of Running Parity Errors                     : 0
No. of Loss Dword Syncs                          : 0
No. of PHY Reset Problems encountered            : 0

Statistics for PHY ID                            : 4
No. of Invalid Dwords                            : 0
No. of Running Parity Errors                     : 0
No. of Loss Dword Syncs                          : 0
No. of PHY Reset Problems encountered            : 0

Statistics for PHY ID                            : 5
No. of Invalid Dwords                            : 0
No. of Running Parity Errors                     : 0
No. of Loss Dword Syncs                          : 0
No. of PHY Reset Problems encountered            : 0

Statistics for PHY ID                            : 6
No. of Invalid Dwords                            : 0
No. of Running Parity Errors                     : 0
No. of Loss Dword Syncs                          : 0
No. of PHY Reset Problems encountered            : 0

Statistics for PHY ID                            : 7
No. of Invalid Dwords                            : 0
No. of Running Parity Errors                     : 0
No. of Loss Dword Syncs                          : 0
No. of PHY Reset Problems encountered            : 0
```

Deleting the Spare Disk

To delete the Global Hot Spare disk from the controller with the device file /dev/sasd0:

```
# sasmgr delete -D /dev/sasd0 -q raid -q spare

WARNING: This is a DESTRUCTIVE operation.
This might result in failure of current I/O requests.
Do you want to continue ?(y/n) [n]...y
Spare drive is deleted successfully.
```

Performing Other Common Operations

Clear statistics for a port with PHY ID 1 of the controller with the device file /dev/sasd0:

```
sasmgr clear_stat -D /dev/sasd0 -q phy_in_port=1
```

Forcefully issue disable request to the controller with the device file /dev/sasd0:

```
sasmgr -f disable -D /dev/sasd0
```

Add a RAID volume with size 34000 (MB), level 1 (RAID1), and enc_bay 1:4,1:5 to the controller with the device file /dev/sasd0:

```
sasmgr add -D /dev/sasd0 -q raid -q level=1 -q size=34000 -q enc_bay=1:4,1:5
```

Add a spare disk to the controller with the device file /dev/sasd0:

```
sasmgr add -D /dev/sasd0 -q raid -q spare -q enc_bay=1:8
```

Delete a RAID volume with volume ID 4 to the controller with the device file /dev/sasd0:

```
sasmgr delete -D /dev/sasd0 -q raid -q raid_vol=4
```

Delete the HBA Spare on the controller with the device file /dev/sasd0:

```
sasmgr delete -D /dev/sasd0 -q raid -q spare
```

Replacing a Disk Online Using sasmgr replace_tgt or io_redirect_dsf

When you replace a disk, a new Device Special File (DSF) is created for the replacement disk; this can cause data restoration or recovery operations to fail. To avoid this situation, perform an online replacement of the failed disk:

- **For HP-UX 11i v2**, perform an online replacement of the failed disk using the `sasmgr` command with the `replace_tgt` qualifier. This enables you to remap the DSF of the failed disk to the replacement disk.
- **For HP-UX 11i v3**, the `sasmgr replace_tgt` command can be used with legacy DSFs, but it does not support the persistent DSF format. The `<lun_dsf>` specified with the `old_dev` qualifier and the `<new_hw_path>` specified with the `new_tgt_hwpath` qualifier must still use the legacy device file and the legacy hardware path.

  To perform the equivalent operation on HP-UX 11i v3 using a persistent DSF, you must use the new `io_redirect_dsf(1M)` command. For more details, see the `io_redirect_dsf(1M)` manpage. To view the manpage, enter this command: `man 1m io_redirect_dsf`

⚠ **WARNING!** If you shut down a server to replace a failed disk offline, the DSF of the failed disk will not be visible in `ioscan` when the server restarts. The DSF is required by the `replace_tgt` command to rebuild the array with the new disk.

Before you shut down the server, run `ioscan` and make note of the DSF information for the failed disk.

WARNING! The `sasmgr replace_tgt` and `io_redirect_dsf(1M)` commands must only be used between identical device types: an IR volume must be replaced by an IR volume, and a non-IR volume must be replaced by a non-IR volume. If you use these commands to remap DSFs for different device types, data loss can occur.

To replace a disk online, follow these steps:

1. Use `ioscan -fnkC disk` to display the list of disk devices, and note the DSF of the failed disk:

```
# ioscan -fnkC disk
Class        I  H/W Path        Driver         S/W State   H/W Type     Descripn
===========================================================================
disk         0  0/0/2/1.0.16.0.0  sdisk          CLAIMED     DEVICE       TEAC N
                              /dev/dsk/c0t0d0   /dev/rdsk/c0t0d0
disk         1  0/4/1/0.0.0.0.0   sdisk          CLAIMED     DEVICE       HP   4
                              /dev/dsk/c3t0d0   /dev/rdsk/c3t0d0
disk         3  0/4/1/0.0.0.2.0   sdisk          NO_HW       DEVICE       HP   4
                              /dev/dsk/c3t2d0   /dev/rdsk/c3t2d0
disk         4  0/4/1/0.0.0.3.0   sdisk          CLAIMED     DEVICE       HP   4
                              /dev/dsk/c3t3d0   /dev/rdsk/c3t3d0
disk         5  0/4/1/0.0.0.4.0   sdisk          CLAIMED     DEVICE       HP   4
                              /dev/dsk/c3t4d0   /dev/rdsk/c3t4d0
disk         6  0/4/1/0.0.0.5.0   sdisk          CLAIMED     DEVICE       HP   e
                              /dev/dsk/c3t5d0     /dev/rdsk/c3t5d0
                              /dev/dsk/c3t5d0s1   /dev/rdsk/c3t5d0s1
                              /dev/dsk/c3t5d0s2   /dev/rdsk/c3t5d0s2
                                 /dev/dsk/c3t5d0s3     /dev/rdsk/c3t5d0s
```

   When the disk is removed, or if it has completely failed, the S/W state will change to `NO_HW`. In this example, the failed disk is `/dev/dsk/c3t2d0` and its hardware path is `0/4/1/0.0.0.2.0`.

2. Replace the disk. A new device path and device files are assigned to the replacement disk.
3. Use `ioscan -fnC disk` to display the list of disk devices, and make note of the hardware path of the replacement disk:

```
# ioscan -fnC disk
Class        I  H/W Path        Driver         S/W State   H/W Type     Descripn
```

```
================================================================================
disk         0  0/0/2/1.0.16.0.0  sdisk          CLAIMED     DEVICE       TEAC N
                                /dev/dsk/c0t0d0   /dev/rdsk/c0t0d0
disk         1  0/4/1/0.0.0.0.0   sdisk          CLAIMED     DEVICE       HP   4
                                /dev/dsk/c3t0d0   /dev/rdsk/c3t0d0
disk         2  0/4/1/0.0.0.1.0   sdisk          CLAIMED     DEVICE       HP   4
disk         3  0/4/1/0.0.0.2.0   sdisk          NO_HW       DEVICE       HP   4
                                /dev/dsk/c3t2d0   /dev/rdsk/c3t2d0
disk         4  0/4/1/0.0.0.3.0   sdisk          CLAIMED     DEVICE       HP   4
                                /dev/dsk/c3t3d0   /dev/rdsk/c3t3d0
disk         5  0/4/1/0.0.0.4.0   sdisk          CLAIMED     DEVICE       HP   4
                                /dev/dsk/c3t4d0   /dev/rdsk/c3t4d0
disk         6  0/4/1/0.0.0.5.0   sdisk          CLAIMED     DEVICE       HP   e
                                /dev/dsk/c3t5d0     /dev/rdsk/c3t5d0
                                /dev/dsk/c3t5d0s1   /dev/rdsk/c3t5d0s1
                                /dev/dsk/c3t5d0s2   /dev/rdsk/c3t5d0s2
                                /dev/dsk/c3t5d0s3   /dev/rdsk/c3t5d0s
```

In this example, the hardware path of the new disk is `0/4/1/0.0.0.1.0`.

4. Reassign the original device file to the new I/O path using `sasmgr` with the `replace_tgt` qualifier:

```
# sasmgr replace_tgt -D /dev/sasd0 -q old_tgt=/dev/dsk/c3t2d0 -q new_tgt_hwpath=0/4/1/0.0.0.1.0

WARNING: This is a DESTRUCTIVE operation.
This might result in failure of current I/O requests.
Do you want to continue ?(y/n) [n]...y
LUN has been replaced with new Target.
```

NOTE: To perform the equivalent operation using a persistent DSF, you must use the new `io_redirect_dsf(1M)` command. For more details, see the `io_redirect_dsf(1M)` manpage. To view the manpage, enter this command: `man 1m io_redirect_dsf`

NOTE: The `sasmgr replace_tgt` and `io_redirect_dsf(1M)` commands only work on devices that have the S/W state `NO_HW` or `CLAIMED`.

---

5. The S/W state is swapped. Use `ioscan` to verify that you can access the disk using the original device file:

```
# ioscan -fnC disk
Class        I  H/W Path        Driver         S/W State   H/W Type     Descripn
================================================================================
disk         0  0/0/2/1.0.16.0.0  sdisk          CLAIMED     DEVICE       TEAC   DV-28E-N
                              /dev/dsk/c0t0d0   /dev/rdsk/c0t0d0
disk         1  0/4/1/0.0.0.0.0   sdisk          CLAIMED     DEVICE       HP   DG072A8B54
                              /dev/dsk/c3t0d0   /dev/rdsk/c3t0d0
disk         2  0/4/1/0.0.0.1.0   sdisk          NO_HW       DEVICE       HP   DG072A8B54
disk         3  0/4/1/0.0.0.2.0   sdisk          CLAIMED     DEVICE       HP   DG072A8B54
                              /dev/dsk/c3t2d0   /dev/rdsk/c3t2d0
disk         4  0/4/1/0.0.0.3.0   sdisk          CLAIMED     DEVICE       HP   DG072A8B54
                              /dev/dsk/c3t3d0   /dev/rdsk/c3t3d0
disk         5  0/4/1/0.0.0.4.0   sdisk          CLAIMED     DEVICE       HP   DG072A8B54
                              /dev/dsk/c3t4d0   /dev/rdsk/c3t4d0
disk         6  0/4/1/0.0.0.5.0   sdisk          CLAIMED     DEVICE       HP   HP   IR Volume
                              /dev/dsk/c3t5d0     /dev/rdsk/c3t5d0
                              /dev/dsk/c3t5d0s1   /dev/rdsk/c3t5d0s1
                              /dev/dsk/c3t5d0s2   /dev/rdsk/c3t5d0s2
                              /dev/dsk/c3t5d0s3   /dev/rdsk/c3t5d0s3
```

Recommendations

Updating Physical Disk Firmware

HP recommends that you consider the following when you update the firmware of physical disks attached to the HP 8 Internal Port SAS Controller with `sasmgr(1M)`:

- If you are updating the firmware on more than one disk, do not issue multiple disk firmware download commands on the same command line. Use individual commands for each disk that is to be updated.
- If the disk firmware download to a disk that is part of a RAID volume fails or is terminated, the controller must be reset using the `sasmgr(1M) reset` command:

  `sasmgr -f reset -D /dev/sasd`*`X`*

  (where *X* is the instance of the SAS controller).

For example:

```
# sasmgr -f reset -D /dev/sasd0
Device (/dev/sasd0) has been RESET.
```

Replacing Physical Disks

HP recommends that you consider the following when you replace spare physical disks in a RAID volume controlled by the HP 8 Internal Port SAS Controller:

- Before replacing a spare disk, delete it first using `sasmgr(1M)`:

  `sasmgr delete -D /dev/sasd`*`X`* `-q raid -q spare`

  (where *X* is the instance of the SAS controller).

  After the disk is replaced, use `sasmgr(1M)` to configure the new disk as spare:

  `sasmgr add -D /dev/sasd`*`X`* `-q raid -q spare -q enc_bay=<`*`enc`*`>:<`*`bay`*`>`

  (where *X* is the instance of the SAS controller and `<`*`enc`*`>:<`*`bay`*`>` is the location of the disk to be configured as spare).
- By default, RAID volumes are created with Auto-Configure enabled. If you replace a physical disk which is part of a RAID volume, a re-sync will start automatically and all data on the new disk will be lost. Do not insert a replacement disk unless you are sure that any existing data has been backed up.

Update to the Latest Drivers and Firmware

Several important changes and updates have been released since the introduction of the HP 8 Internal Port SAS Controller. HP recommends that you update to the latest version of the CommonIO and SerialSCSI-00 bundles. For more information, see the latest *HP CommonIO Release Notes* and *HP SerialSCSI-00 (sasd) Mass Storage Driver Release Notes*, at:

http://docs.hp.com/en/netcom.html

Security Restrictions

`sasmgr` requires either superuser privilege or DEVOPS, DACREAD, and DACWRITE privileges for RAID configurations.

A Electrostatic Discharge

This appendix discusses ways to prevent damage to your system due to Electrostatic Discharge (ESD). This appendix addresses the following topics:

Handling Parts

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

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact; transport and store products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when handling a static-sensitive component or assembly.

Grounding

Use the following grounding methods when handling or installing electrostatic-sensitive parts:

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

B Specifications

HP 8 Internal Port SAS Controller Specifications

Table B-1 HP 8 Internal Port PCI-X SAS Controller Physical Specifications

Dimensions (excluding bracket)	16.8 x 6.4 x 1.6 cm (6.6 x 2.5 x 0.6 in)
Data Transfer Method	64-bit wide, PCI-X 133 MHz (1 GB/s maximum bandwidth)
PCI Bus Speed	PCI-X-133 and 3.3 volt PCI compatibility only
PCI Compatibility	PCI-X and 3.3 volt PCI compatibility only

Table B-2 HP 8 Internal Port SAS Controller General Specifications (PCI-X and Embedded)

Disk Drive and Enclosure Protocol Support	3 Gb/s SAS (Serial Attached SCSI)
Architecture	64-bit
SAS Connectors	2 internal SFF8484 x4 Wide SAS Connectors 12 Gb/s per x4 Wide SAS Port (4 x 3 Gbps)
Simultaneous Drive Transfer Ports	2 x4 Wide SAS Connectors
Port Transfer Rate	12 Gb/s per x4 Wide SAS Port (4 x 3 Gb/s)
Software-Upgradeable Firmware	Yes (4MB flashable ROM)
Maximum Capacity	1.168TB (8 x 146GB SAS Drives)
Memory Addressing	64-bit, supporting servers with memory greater than 4 GB
Logical Drives Supported	Up to 2 Logical Volumes per RAID 1 array Up to 10 disks total in all RAID volumes
RAID Support	RAID 1 (Mirroring)