



**SATARAID5™
Management Software
User's Guide**

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1 Welcome

Silicon Image's SATARAID5™ product consists of a Serial-ATA controller, RAID controller BIOS, RAID controller driver, and RAID Management Software. A Silicon Image controller provides the necessary hardware for SATARAID5. The SiI3114, SiI3124, and SiI3132 controllers support SATARAID5 components.

	SATA Gen	Host BUS	Channels	Description
SiI3114	I	PCI	4	A single-chip PCI to 4-port Serial ATA (SATA) Generation I host controller.
SiI3124-1	I	PCI-X / PCI	4	A single-chip PCI-X to 4-port Serial ATA (SATA) Generation I or II host controller that takes SATA performance and features to enterprise levels.
SiI3124-2	II			
SiI3132	II	PCI-Express	2	A single-chip, one-lane PCI Express to 2-port Serial ATA (SATA) Generation II host controller.

The SATARAID5 controller's BIOS provides boot-up support and a configuration interface. For AMD and x86 systems, the SATARAID5 BIOS identifies present "Legacy RAID" volumes that may be used to boot-up an operating system. The RAID controller BIOS also provides a basic, configuration interface that could be used before an operating system is installed. See [Additional BIOS RAID Main Menu Options](#) for BIOS configuration instructions and [Legacy Support Menu](#) for steps necessary to create a "Legacy RAID" volume using the RAID Management Software.

The SATARAID5 Management software allows RAID configuration and monitoring from the operating system. The Management software supports automatic rebuilds, rebuild task prioritization, and partial hard disk allocation to a RAID volume.

Silicon Image's SATARAID5 software enhances your data storage by combining advanced RAID features typically seen on high-end systems with low-cost and high-capacity Serial ATA drives. By using industry-standard SATA drives and Silicon Image Host Bus Adapters (HBAs), you can achieve extraordinarily low costs while remaining assured that your data is protected against hardware failure.

SATARAID5 also supports the latest SATA enhancements, including SATA-II Port Multiplier support, and up to 3 Gbit/sec transfer rates on SATA Gen 2 controllers.

SATARAID5 Features

Data Security

SATARAID5 provides our highest commitment to data security through the use of RAID architecture to back up and protect data. RAID levels 1, 5, and 10 provide data security. SATARAID5 supports sophisticated sparing support so that hardware failure risk can be minimized by automatically regenerating the failed disk's data on a backup disk. The software driver includes support for Self-Monitoring Analysis and Reporting Technology ("S.M.A.R.T.") to predict disk failures. Drives can be moved between controllers without losing data.

Data Performance

SATAR RAID5 can increase storage throughput by combining the throughput of multiple drives into a single volume. RAID levels 0, 5, and 10 support this ability.

Data Versatility

The driver supports Just a Bunch of Disks (JBOD) and Concatenated drives for applications that do not require increased security or performance.

Ease of Use

The SATARAID5 Manager GUI offers an easy-to-use utility to create and manage your storage. Creating and deleting volumes is possible without requiring a restart of the operating system. Rebuilds never require the data to be taken off-line.

2 Using the SATARAID5 Manager

This section explains how to use the SATARAID5 Manager graphical user interface (GUI) to create and manage RAID groups. Please install the SATARAID5 Manager software as explained in the *SATARAID5 Quick Installation Guide* for your computer's operating system before you perform these tasks. Refer to [Appendix A](#) for information about managing the Flash BIOS of the RAID controller on a Windows system.

Note: Be sure to download and install the latest Java Run-Time Environment for your system.

Launching the SATARAID5 Manager

The SATARAID5 Manager consists of a daemon and Java-based GUI applet. Depending on the operating system, the daemon runs as Windows Service or a script-launched background process responsible for monitoring of the local SATARAID5 driver.

Windows Systems

On a Windows system, the SATARAID5 Manager GUI shortcut is installed in the Windows **Startup** folder to be launched automatically whenever your system is rebooted. To manually start the SATARAID5 Manager, click the **Start** button, open the **SATARAID5 Manager** program group, and click on the **SATARAID5** icon.

Macintosh Systems

On a Macintosh system, the SATARAID5 Manager software is installed into the **Applications / Utilities / Silicon Image / SATARAID5** folder. You can launch it by navigating to that folder and double-clicking on the icon for the **SATARaid5.jar** file.

Linux Systems

On a Linux system the SATARAID5 Manager and daemon can be installed into any subdirectory. Before launching the SATARAID5 Manager, the driver must be installed and the daemon must be running in background. If you are using a bootable version of the SATARAID5 driver, it is already included in your Linux kernel. If you are not using a bootable version of the SATARAID5 driver, you must manually load the driver by typing the following command:

- `insmod si3XXXr5.ko` (where "3XXX" refers to your specific SATA controller chip)

Then, the daemon must be started. If the daemon has been incorporated into the startup scripts (typically included within the `/etc/rc` directory structure, it will start automatically when you boot your system. Otherwise, you must manually start the daemon in a background mode by typing the following command:

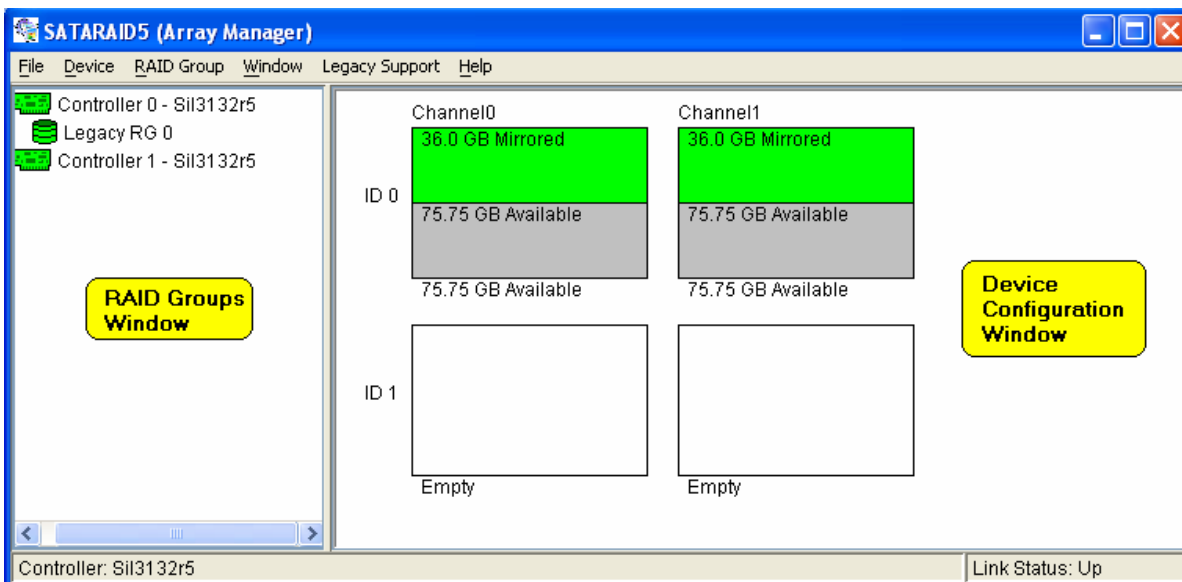
- `./SATARaid5ConfigServer &`

Finally, you can launch the SATARAID Manager by typing the following command:

- `java -jar SATARaid5Manager`

Note: The SATARAID5 Manager uses TCP port number "4242" for sending commands to the daemon and obtaining status. If a firewall is active on your system, be sure to enable access to that port number before launching the SATARAID5 Manager.

When you start the SATARAID5 Manager GUI, the following divided window appears.



Note: All of the **SATARAID5 Manager** screen illustrations are shown for Microsoft Windows. The outer frame and buttons may appear slightly different on other operating system platforms. The number of channels shown in this screen will vary according to the type of RAID controller that is installed in your system. The **Legacy Support** menu item is not available on Macintosh systems.

The left RAID Groups window identifies SATA host adapters and configured RAID groups. If more than one Silicon Image Host Bus Adapter is installed, you can switch between them by selecting any controller. This also displays the RAID Groups currently defined for each controller window. Select a RAID Group to display the segments associated with that volume in the Device Configuration window on the right. The Device Configuration window identifies all physical drives and their partitions. If the controller supports SATA-II Port Multipliers, there may be more than one device ID per SATA channel.

Throughout the Manager, different colors indicate the status of components as follows.

Color	Status
Green	Good. The component and all subcomponents are functioning correctly.
Yellow	Warning. The component, or at least one subcomponent, has failed or become unavailable and requires service.
Red	Failed. The component, or at least one subcomponent, has failed.
Gray	Unused.

Note: Throughout this manual, the term “**right-click**” refers to using the secondary button on your mouse to perform the indicated operation. On a Windows or Linux system, use the mouse button that you have defined to be the “right” button (which by default is on the right side of the mouse, unless you have changed the primary and secondary buttons using **Control Panel → Mouse** on Windows). On a Macintosh system, press and hold the **COMMAND (Apple)** button and click the mouse.

Creating RAID Groups

Redundant Array of Independent Disks (RAID) technology allows one or more disks to be combined into a logical volume, which provides greater performance and/or protection than standard disk drives. These volumes, known as RAID Groups, appear like regular disk drives to the operating system and can be partitioned, formatted and used just like any other disk. The RAID complexity is hidden within the driver.

Note: The maximum allowable size of a RAID group that can be created by the SATARAID5 Manager is 144,115,188,075,855,872 bytes (which represents 2^{48} bit addressability). However, some Linux platforms may limit the maximum size of a volume to 2TB, so the largest allowable size of a RAID group is 2,199,023,255,552 bytes.

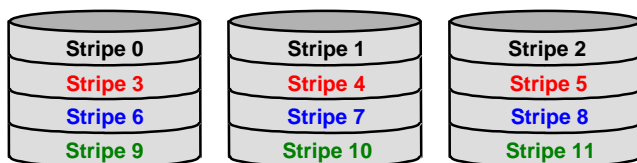
RAID Levels

There are several methods of combining disks, each with its own advantages and disadvantages. Each method is referred to as a RAID “level,” such as RAID 1 or RAID 5. The details of each level are summarized below and detailed in the following sections.

RAID Level	Advantages	Disadvantages
RAID 0	High performance, low cost.	No data protection.
RAID 1	Excellent data protection.	High cost.
RAID 5	Good data protection, good value.	Performance degradation on writes.
RAID 10	High performance, excellent data protection.	High cost.
Concatenated	Good performance, low cost, large volume size.	No data protection.
JBOD	Same as single disk.	Same as single disk.

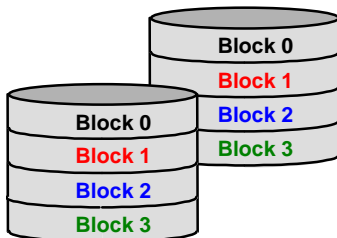
Disk Striping (RAID 0)

Striping is a performance-oriented, non-redundant data mapping technique. While Striping is discussed as a RAID Group type, it does not provide any fault tolerance. With modern SATA and ATA bus mastering technology, multiple I/O operations can be performed in parallel, enhancing data throughput. Striping arrays use multiple disks to form a larger virtual disk. The figure below illustrates a three-disk stripe set. Stripe one is written to disk one, stripe two to disk two, and so forth. RAID 0 sets can include two, three, four or five drives. If the sizes of the disk segments are different, the smallest disk segment will limit the overall size of the RAID Group.



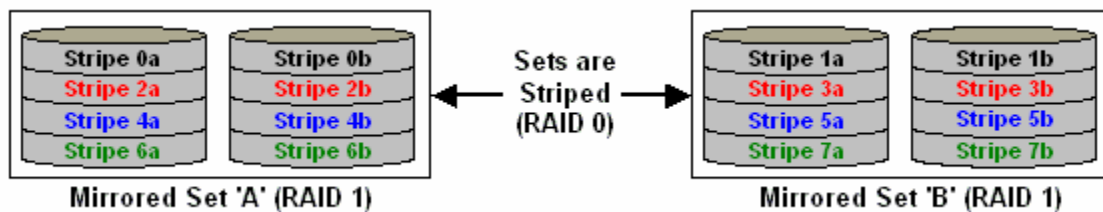
Disk Mirroring (RAID 1)

Disk mirroring creates an identical twin for a selected disk by having the data simultaneously written to two disks. This redundancy provides instantaneous protection from a single disk failure. If a read failure occurs on one drive, the system reads the data from the other drive. RAID 1 sets are typically comprised of two drives, and a third drive can be allocated as a spare in case one of the drives in the set fails. Additional drives can be configured as part of a mirrored set, but without much added benefit. If the sizes of the disk segments are different, the smallest disk segment will limit the overall size of the RAID Group.



Disk Mirroring and Striping (RAID 10)

RAID 10 combines the features of both RAID 0 and RAID 1. Performance is provided through the use of Striping (RAID 0), while adding the fault tolerance of Mirroring (RAID 1). The implementation of RAID 10 requires four drives. The drives are assigned as two sets of mirrored pairs.



The data is written to RAID Group A, which is mirrored (RAID 1) and provides data redundancy. Alternating blocks of data are then striped across another RAID 1 mirrored set, shown as Set B in the figure above. This provides improved speed.

Under certain circumstances, a RAID 10 set can sustain multiple simultaneous drive failures.

Parity RAID (RAID 5)

Parity RAID, or RAID 5, adds fault tolerance to Disk Striping by including parity information with the data. Parity RAID dedicates the equivalent of one disk for storing parity stripes. The data and parity information is arranged on the disk array so that parity is written to different disks. There are at least 3 members to a Parity RAID set. The following example illustrates how the parity is rotated from disk to disk.

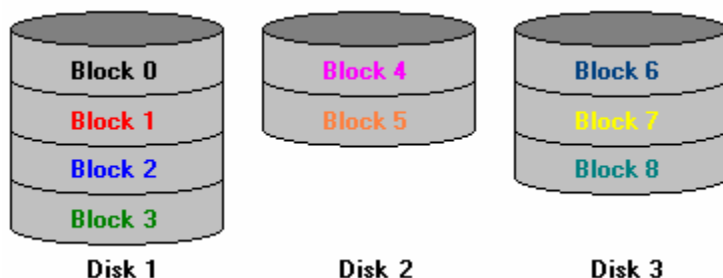


Parity RAID uses less capacity for protection and is the preferred method to reduce the cost per megabyte for larger installations. Mirroring requires 100% increase in capacity to protect the data whereas the above example using three hard drives only requires a 50% increase. The additional required capacity decreases as the number of disks in the group increases (i.e., 33% for four drives or 25% for five drives).

In exchange for low overhead necessary to implement protection, Parity RAID degrades performance for all write operations. The parity calculations for Parity RAID may result in write performance that is somewhat slower than the write performance to a single disk.

Concatenated

The Concatenated mode combines multiple disks or segments of disks into a single large volume. It does not provide any data protection or performance improvement but can be useful for utilizing leftover space on disks. Concatenation allows the segments that make up the volume to be of different sizes.



Just a Bunch of Disks (JBOD)

The JBOD is a virtual disk that can either be an entire disk drive or a segment of a single disk drive. JBOD is the Contiguous configuration option when [creating RAID Groups](#) (or sets) in the SATARAID5 Manager utility.

RAID Volume Status

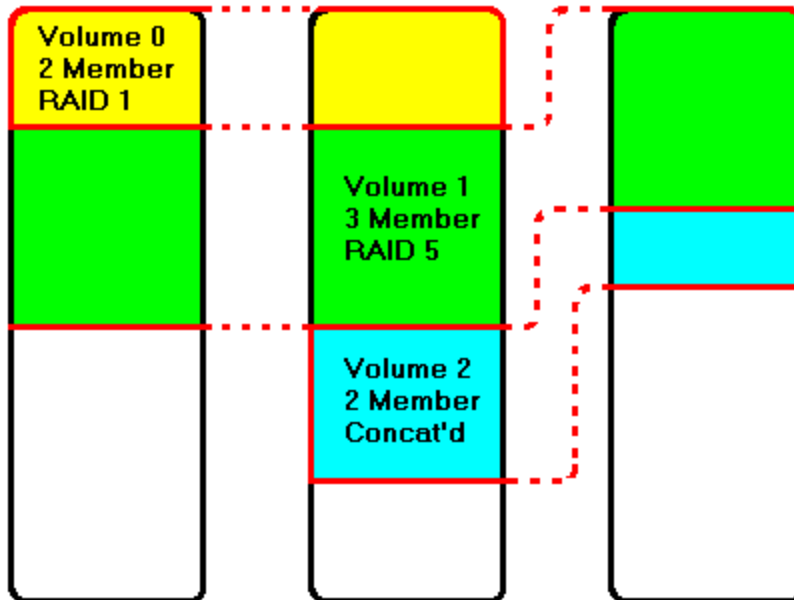
A RAID volume can be in any one of the following statuses.

Status	Meaning
Good	All disks are currently functioning as normal.
Reduced	For RAID levels that provide data protection, one or more disks have failed but the data is still available via the RAID algorithms. The failed disk should be replaced as soon as possible to avoid loss of data.
Rebuilding	A failed disk drive has been replaced and the data is being regenerated on the replacement disk. When complete, the RAID Group will return to Good status.
Resynchronizing	An error has occurred and requires that the RAID algorithms be regenerated on this RAID Group. When complete, the RAID Group will return to Good status.
Failed	One or more disks have failed and RAID algorithms can no longer regenerate the data. The minimum number of failures required to reach this state depends on the RAID level: <ul style="list-style-type: none"> RAID 0, Concatenated, JBOD/Contiguous: Single-disk failure. RAID 1, 5, 10: Two-disk failure.

For increased versatility, the SATARAID5 software allows individual disks to be divided into smaller segments that can then be combined into different volumes. As an example, if a user has one set of data that must be protected at all costs, another set of data that should be protected at reasonable cost, and another set that needs no protection at all, the user can divide three disks into segments as shown in [Figure 1](#).

- The yellow segments define the high-security volume.
- The green segments represent the middle-security volume.
- The light blue segments represent the unprotected volume.

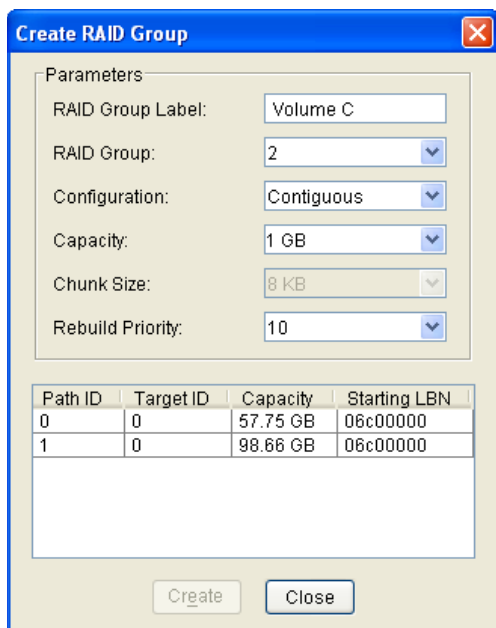
Figure 1 Dividing disks into segments



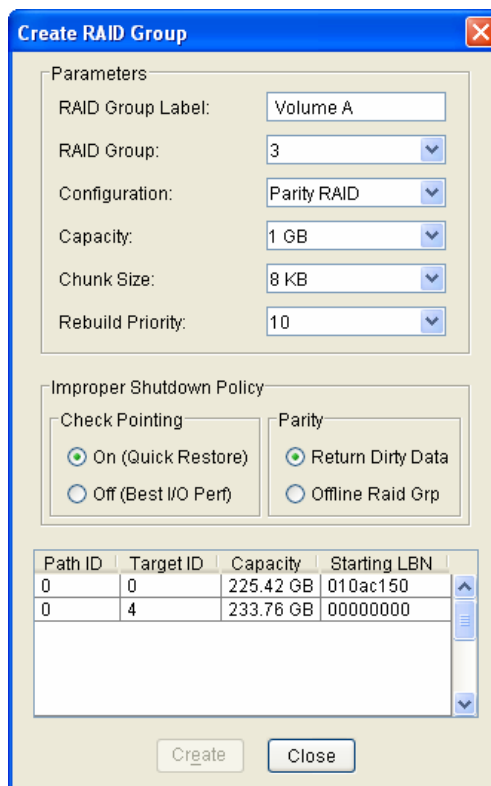
Creating a RAID Group

1. Select **Create RAID Group** from the RAID Group menu or right-click a controller in the RAID Groups window and select **Create RAID Group** from the pop-up menu.

Note: Throughout this manual, the term “**right-click**” refers to using the secondary button on your mouse to perform the indicated operation. On a Windows or Linux system, use the mouse button that you have defined to be the “right” button (which by default is on the right side of the mouse, unless you have changed the primary and secondary buttons using **Control Panel → Mouse** on Windows). On a Macintosh system, press and hold the COMMAND (Apple) button and click the mouse.



Create RAID Group dialog
(for Contiguous, Concatenated and Striped configurations)



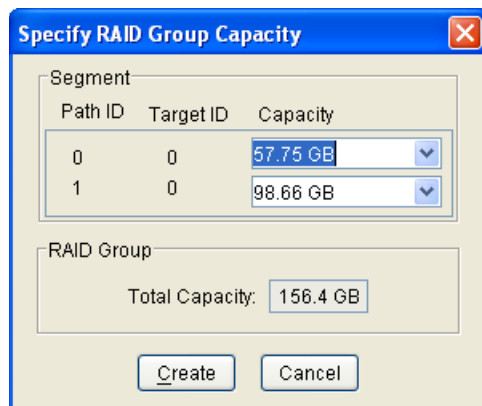
Create RAID Group dialog
(for Mirrored, Mirrored/Striped and Parity RAID configurations)

2. Enter values in all fields and click **Create** to create the RAID Group.

Field	Definition
RAID Group Label	Enter an identifiable name for the RAID group. This value can be any string (up to 8 characters including blank spaces) to help users identify this volume.
RAID Group	Select a Group ID from the available ID list. The maximum number of RAID Groups per controller is 8, so Group ID can be any number between 0 and 7, inclusive.
Configuration	Select which RAID level is to be used to configure these members: <ul style="list-style-type: none"> • Contiguous (for virtual disk or JBOD). • Concatenated (for multiple concatenated segments). • Striped (for RAID 0) • Mirrored (for RAID 1) • Mirrored Striped (for RAID 10) • Parity RAID (for RAID 5)
Capacity	Select a value to define the total usable capacity of the RAID Group or manually enter the volume size in gigabytes (GB). Selecting MAX will create the largest RAID set possible with the drive(s) selected.
Chunk Size	Select a value to define the chunk size (stripe size) for performance tuning. In general, large stripe sizes are best for large files that are accessed sequentially (for example, media streaming files) and smaller sizes are better for randomly accessed data like databases. This parameter is not used for Contiguous (JBOD), Concatenated, and Mirrored configurations.

Field	Definition
Rebuild Priority	Select a value to identify how quickly the controller should rebuild data on a disk after a hardware failure. A value of 1 is the lowest priority and will take the longest to rebuild. A value of 10 is the highest priority and will rebuild the fastest, but may require more CPU resources, which might affect the computer's performance. This parameter is not used for Contiguous (JBOD), Concatenated, and Striped configurations.
Check Pointing	Click the radio button to toggle the state of the Check Pointing feature. When Check Pointing is enabled, restoring data is very fast after an unexpected power loss, although normal performance may be slightly reduced. When Check Pointing is disabled, normal performance is improved, but restores can take a long time to complete. This selection is only available when the selected RAID configuration is Mirrored, Mirrored Striped or Parity RAID, and the “ Advanced RAID Features ” checkbox in the Configuration/Advanced Options dialog box is checked.
Parity	Click the radio button to toggle the state of rebuild ability without taking the volume off-line. This selection is only available when the selected RAID configuration is Parity RAID and the “ Advanced RAID Features ” checkbox in the Configuration/Advanced Options dialog box is checked.
Devices	Select the RAID member devices from the available device segment grid. Up to five members can be selected for Contiguous, Concatenated, Mirrored, Striped or Parity RAID modes (although Mirrored RAID Groups will typically contain only two members). Exactly four members must be selected for Mirrored Striped mode.

- If you selected Concatenated in the Configuration field, enter values for individual segment sizes for each disk and click **Create** to create the RAID Group.



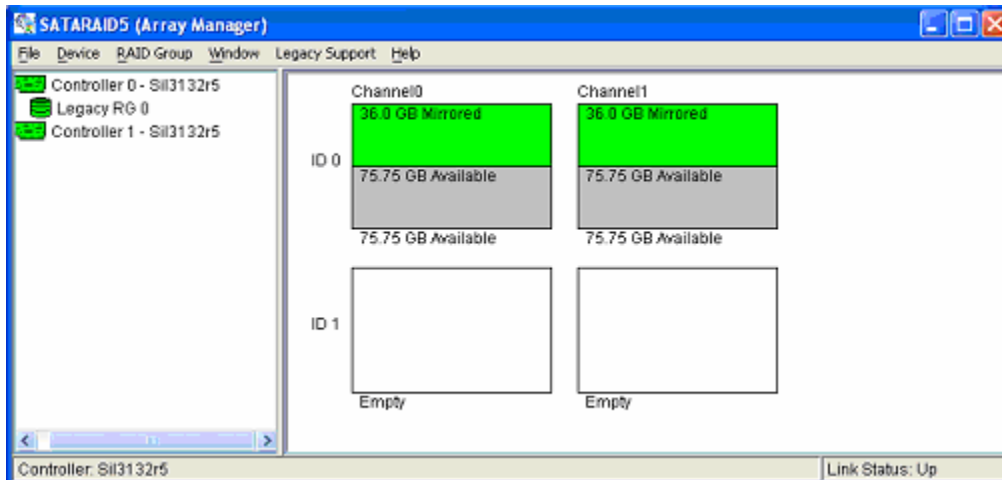
- When you are finished, press **Cancel** to close the Create RAID Group dialog box.

Note: Depending on the manufacturer and capacity of the hard drives that you are using, a small amount of the total disk capacity (less than the amount of one chunk size) may not be available, especially if you have selected one of the larger chunk sizes.

- Refer to [Chapter 4, Allocating Partitions](#) for information about how to define partitions and volumes for the RAID Groups you created.

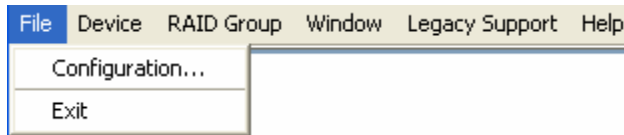
Additional SATARAID5 Manager Menu Options

This section documents the options available in the SATARAID5 Manager menus.



Note: All of the **SATARAID5 Manager** screen illustrations are shown for Microsoft Windows. The frame and buttons may appear slightly different on other operating system platforms. The number of channels shown in this screen will vary according to the type of RAID controller that is installed in your system. The Legacy Support menu item is not available on Macintosh systems.

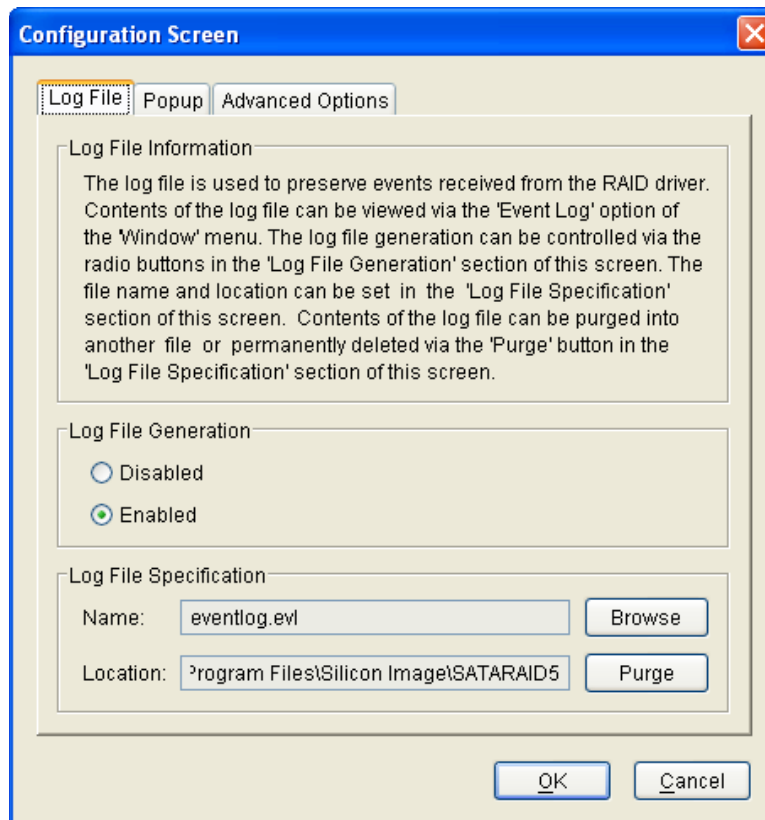
File Menu Options



Configuration

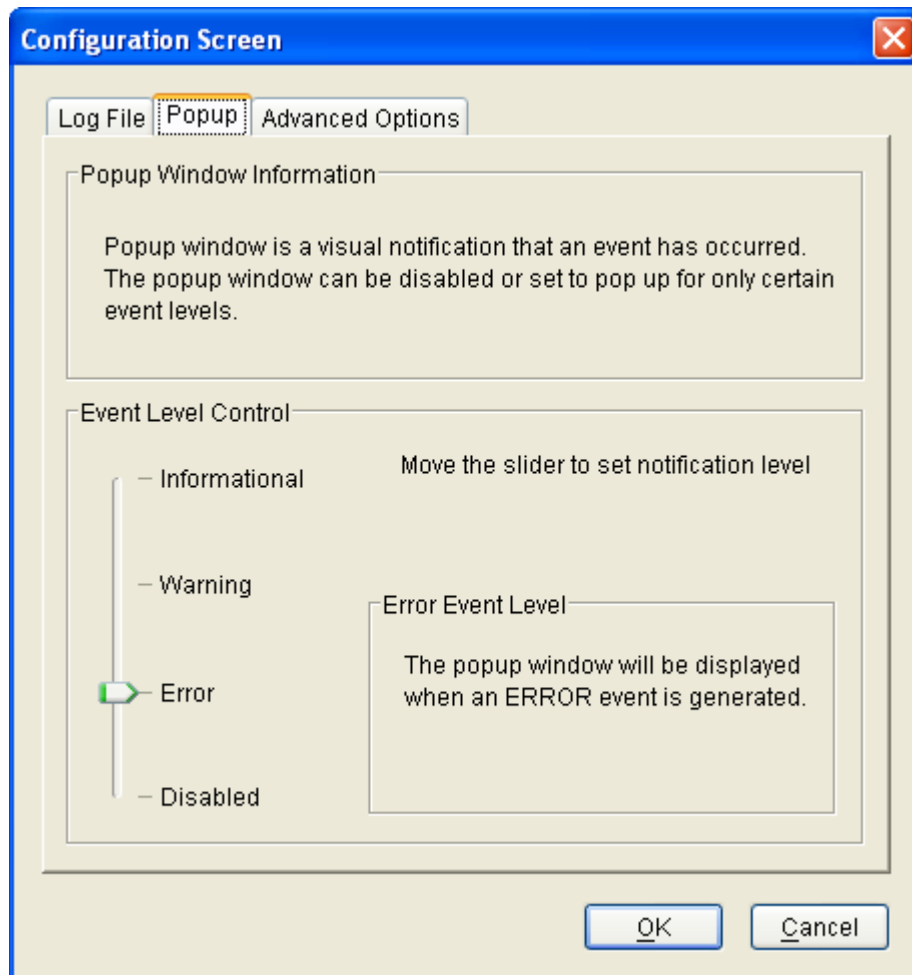
This menu option displays a tabbed dialog box to customize the settings for the Log File location and name, Popup notification messages, and Advanced Options:

- The **Log File** tab allows you to define the location and name of the log file. The log file is used to store event information received from all Silicon Image RAID drivers. The log file is a text file and can be viewed with any text viewer (such as “**Notepad**” on Windows platforms) or with the Event Log window of the SATARAID5 Manager.



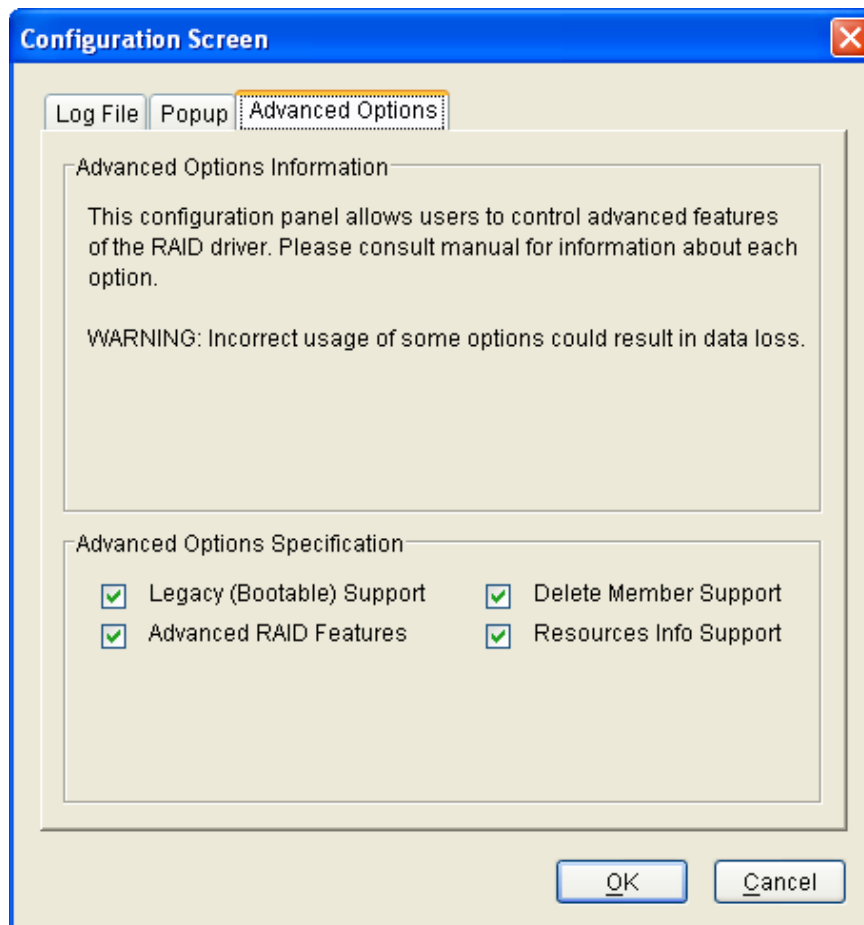
To specify whether the Log File is generated, click on either the **Disabled** or **Enabled** radio button. If Log File generation is enabled, you can click the **Browse** button to specify the file name and location of the Log File. You can also use the **Purge** button to delete the contents of the Log File.

- The **Popup** tab allows you to define the type of events to trigger notification messages in popup windows. Use the slider control to select an event level. Select:
 - Informational to display Informational, Warning, and Error events in a popup window.
 - Warning to display Warning and Error events in a popup window.
 - Error to display Error events in a popup window.
 - Disabled to turn off popup notification messages.



- The **Advanced Options** tab allows you to enable the following advanced features.

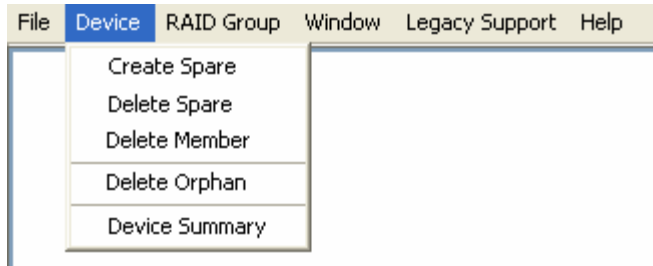
Feature	Explanation
Legacy (Bootable) Support	Enables the Legacy Support menu to support RAID functions for legacy RAID groups (available on Windows and Linux platforms only). See Legacy Support menu options .
Delete Member Support	Enables the Delete Member option on the Device menu to delete a member from RAID 1 (Mirrored), RAID 5 (Parity RAID), and RAID 10 (Striped and Mirrored) groups. See Delete Member menu option .
Advanced RAID Features	Enables the selection of an Improper Shutdown Policy (including Check-Pointing and Dirty Parity handling) in the Create RAID Group dialog box when the selected RAID Group type is a fault-tolerant configuration (Mirrored, Mirrored/Striped and Parity RAID). This feature is not supported for Legacy RAID groups.
Resources Info Support	Enables the Resources option on the Window menu for debugging purposes. See Resources menu option .



Exit

This menu option terminates the SATARAID5 Manager GUI.

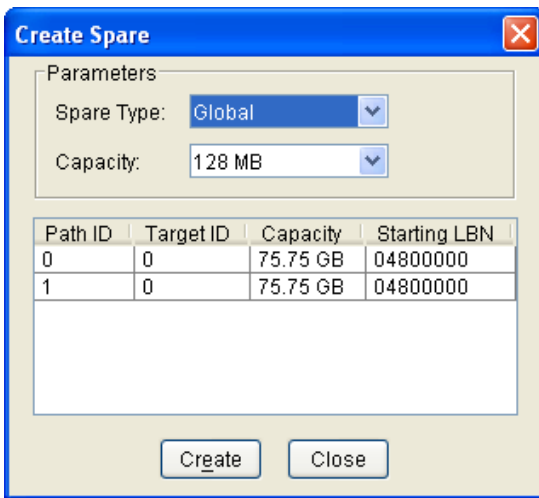
Device Menu Options



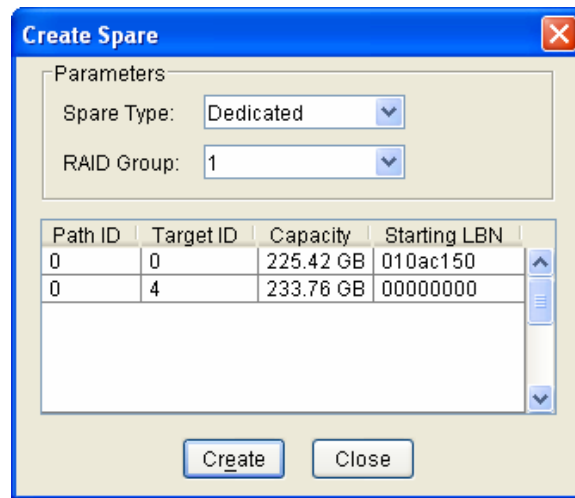
Create Spare

This menu option displays a dialog box to create a spare disk drive. Enter values for the following parameters.

Parameter	Description
Spare Type	Choose one of: <ul style="list-style-type: none"> Global if the spare drive is for all RAID groups in the system. Dedicated if the spare drive is dedicated to a specified RAID group.
Capacity	If you selected Global for the Spare Type, select from a list of spare drive sizes. Options include sizes from 128 MB to 100 GB, plus MAX.
RAID Group	If you selected Dedicated for the Spare Type, select the RAID group to which this spare drive is dedicated.
Device Segment	Select one device segment from the available device segment grid (Global Spare Type only).



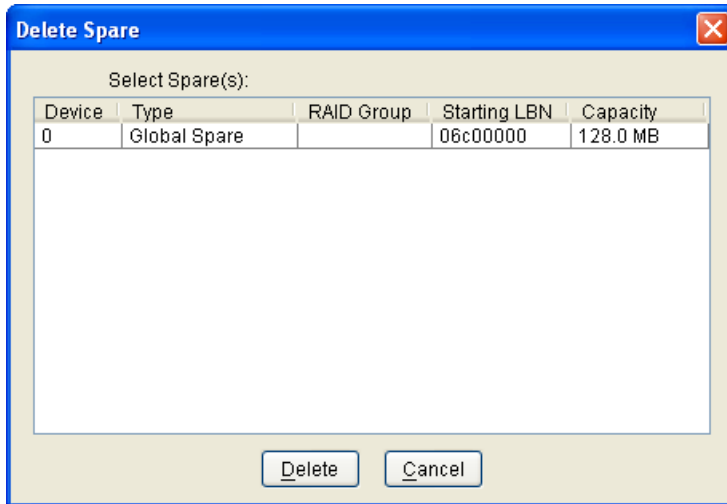
Create Spare dialog
(Global Spare Type)



Create Spare dialog
(Dedicated Spare Type)

Delete Spare

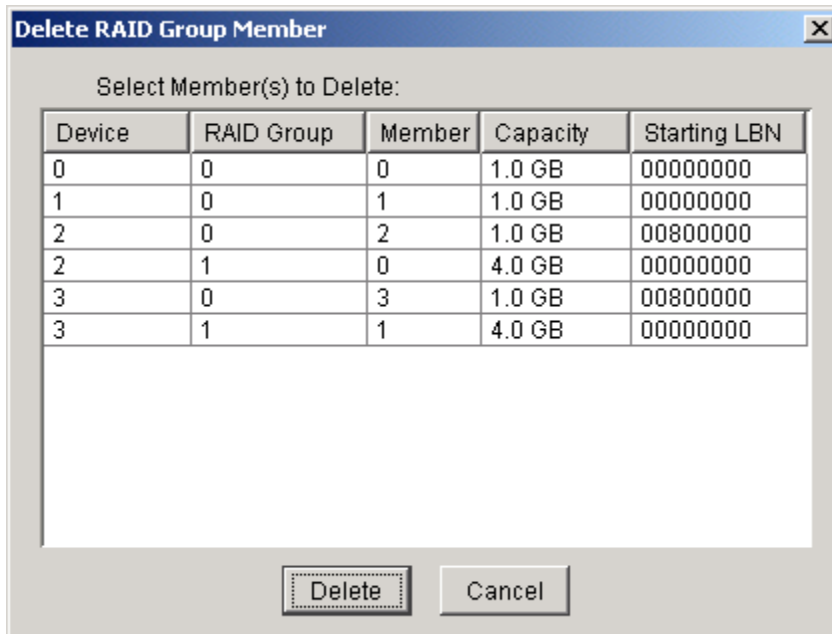
This menu option displays a dialog box to select (highlight) one or more spare drives to delete.



Delete Member

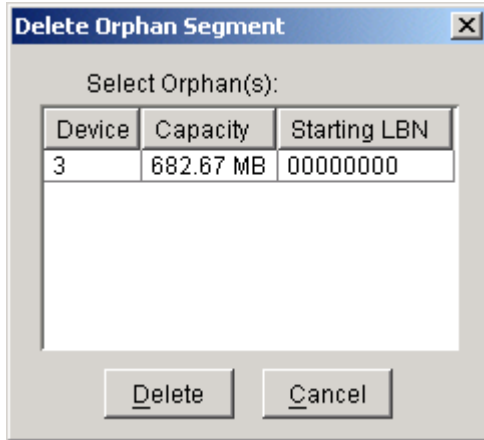
This menu option displays a dialog box to select (highlight) RAID group members to delete. Because RAID 0 is not fault tolerant, RAID 0 members are not shown in the list.

Note: Deleting members will demote the RAID group to a non-fault-tolerant RAID group.



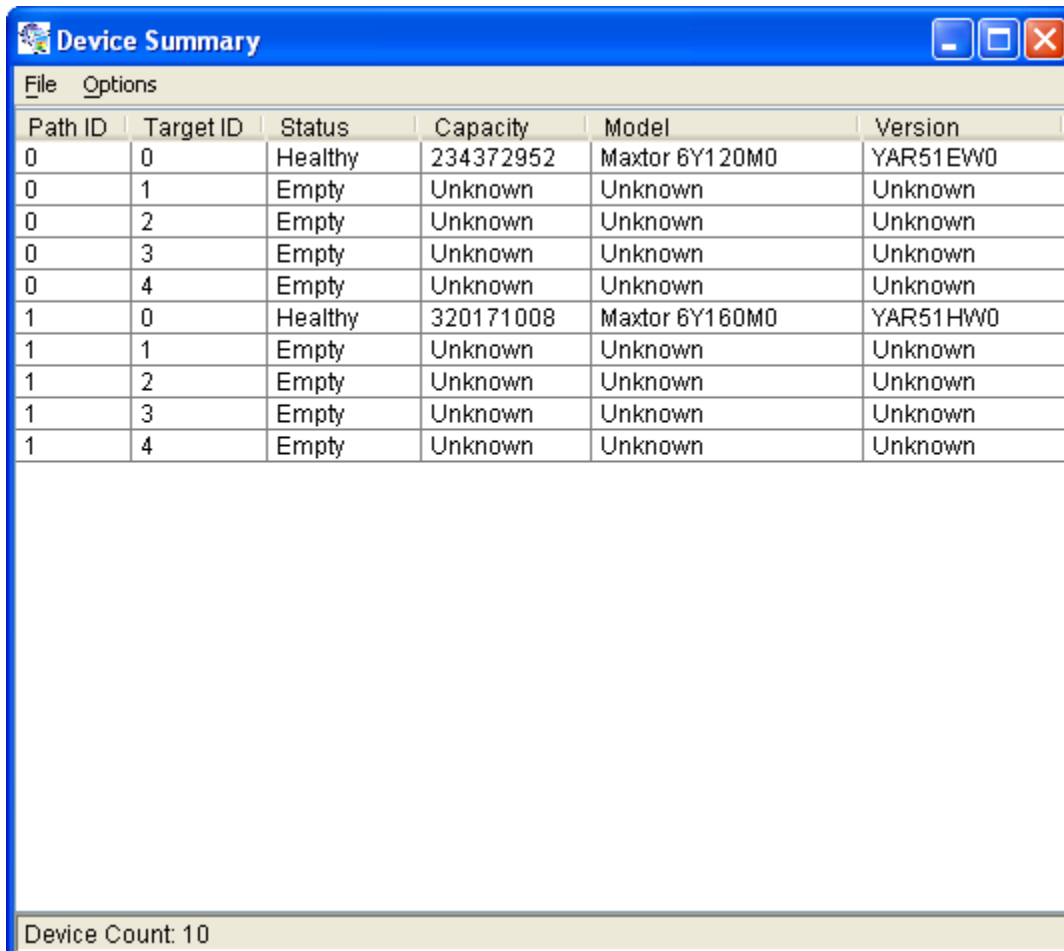
Delete Orphan

This menu option displays a dialog box to select (highlight) orphan segments to delete. An orphan segment is part of a RAID group that cannot access other segments within the same RAID group. When a member of a RAID group fails in a severe manner (such as a loss of power or a complete hard disk failure), it becomes an orphan.



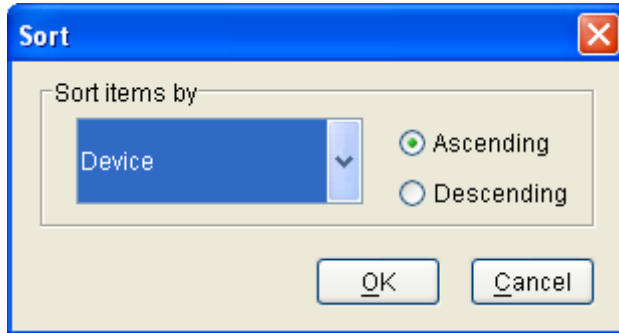
Device Summary

This menu option displays the Device Summary window to show all physical devices' segments.

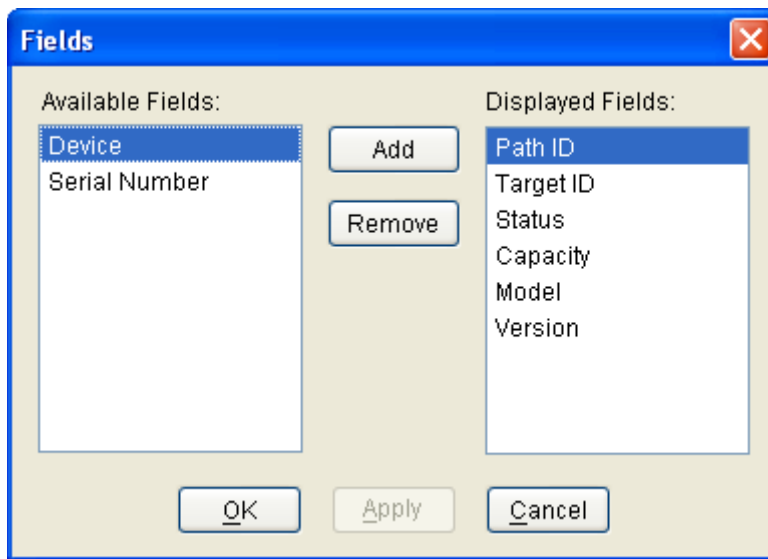


The Device Summary window has its own menu bar.

- File > Exit closes the Device Summary window.
- Options > Sorting displays a dialog box to sort the rows based on the selected field.



- Options > Fields displays a dialog box to choose which fields will be shown in the Device Summary window.



RAID Group Menu Options

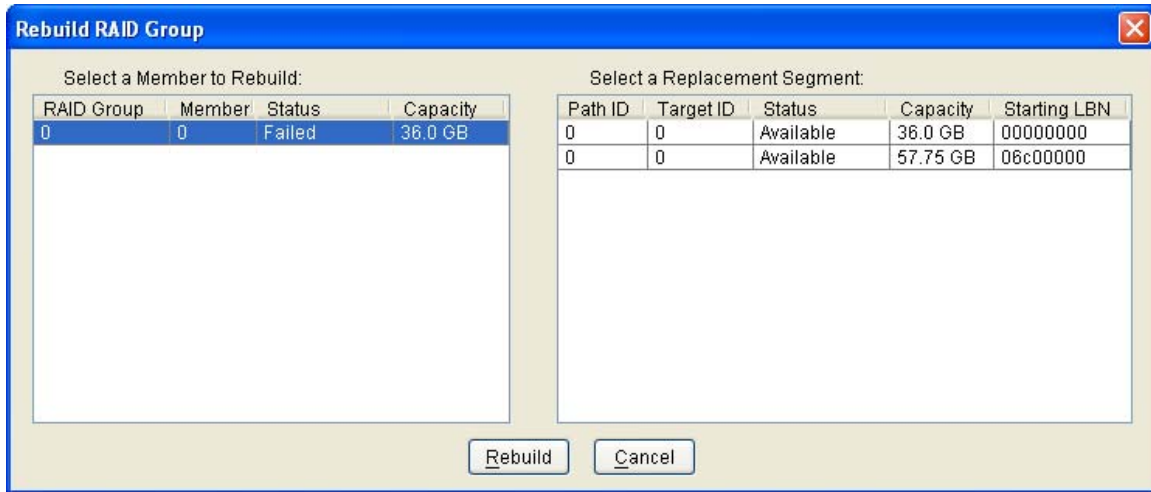


Create RAID Group

This primary menu option is described in [Creating a RAID Group](#).

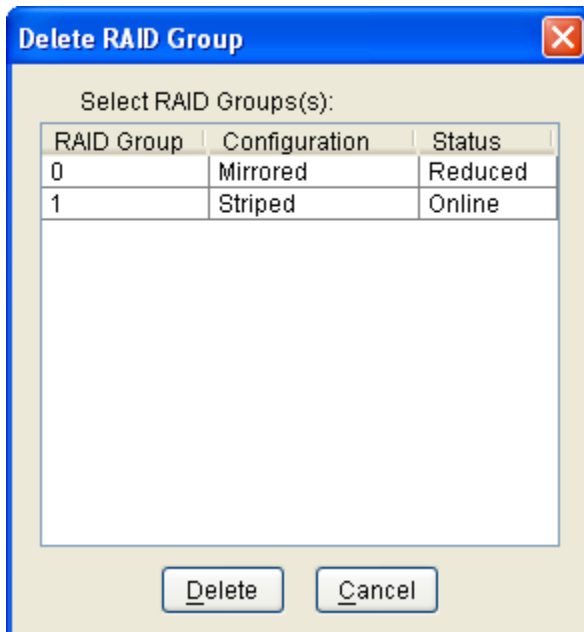
Rebuild RAID Group

This menu option displays a dialog box to choose a replacement segment to rebuild a reduced RAID group.



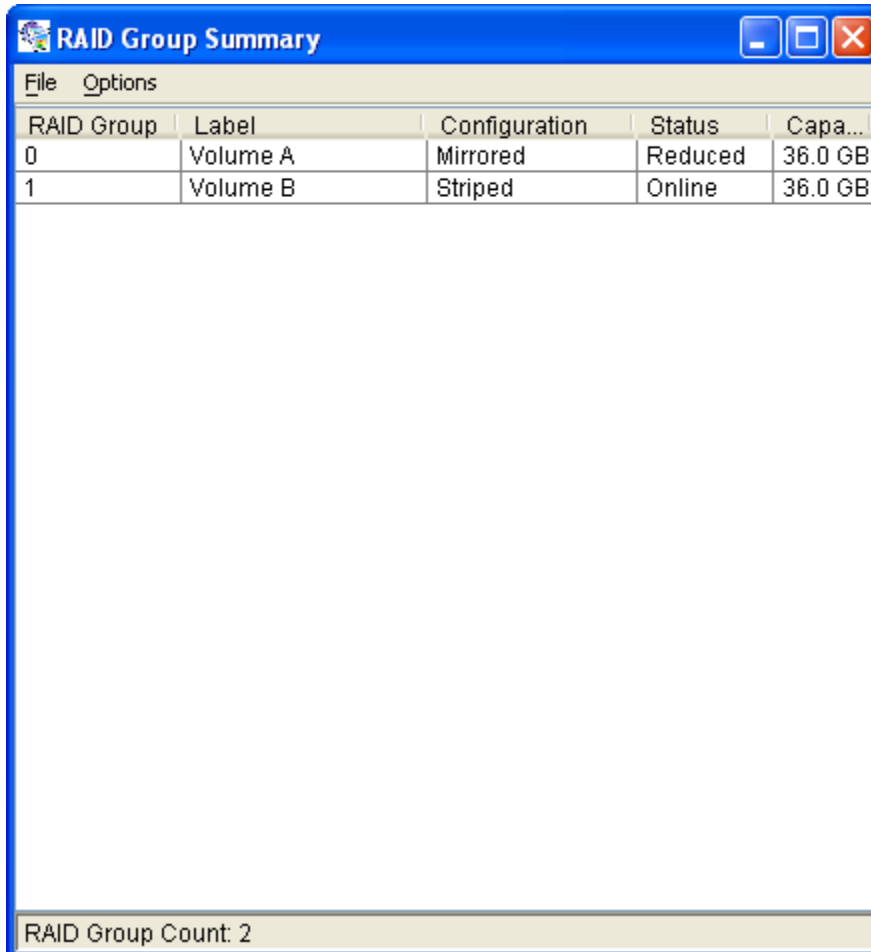
Delete RAID Group

This menu option displays a dialog box to select (highlight) RAID groups to delete.



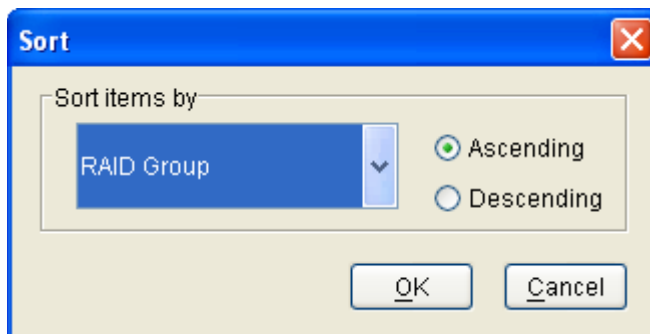
RAID Group Summary

This menu option displays a dialog box to show the group ID, label, configuration, and status for all RAID groups.

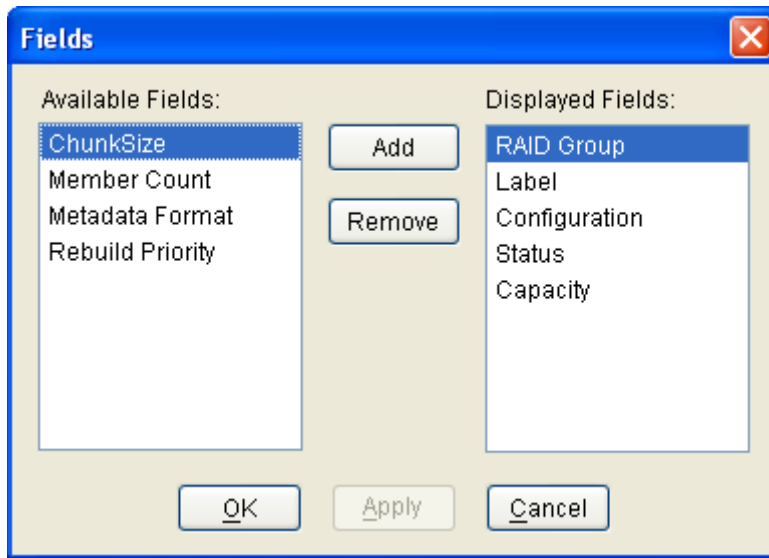


The RAID Group Summary window has its own menu bar.

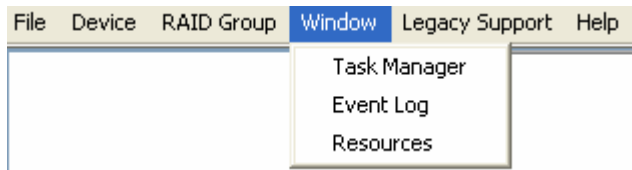
- File > Exit closes the RAID Group Summary window.
- Options > Sorting displays a dialog box to sort items in the RAID Group list.



- Options > Fields displays a dialog box to choose which fields will be shown in the RAID Group Summary window.

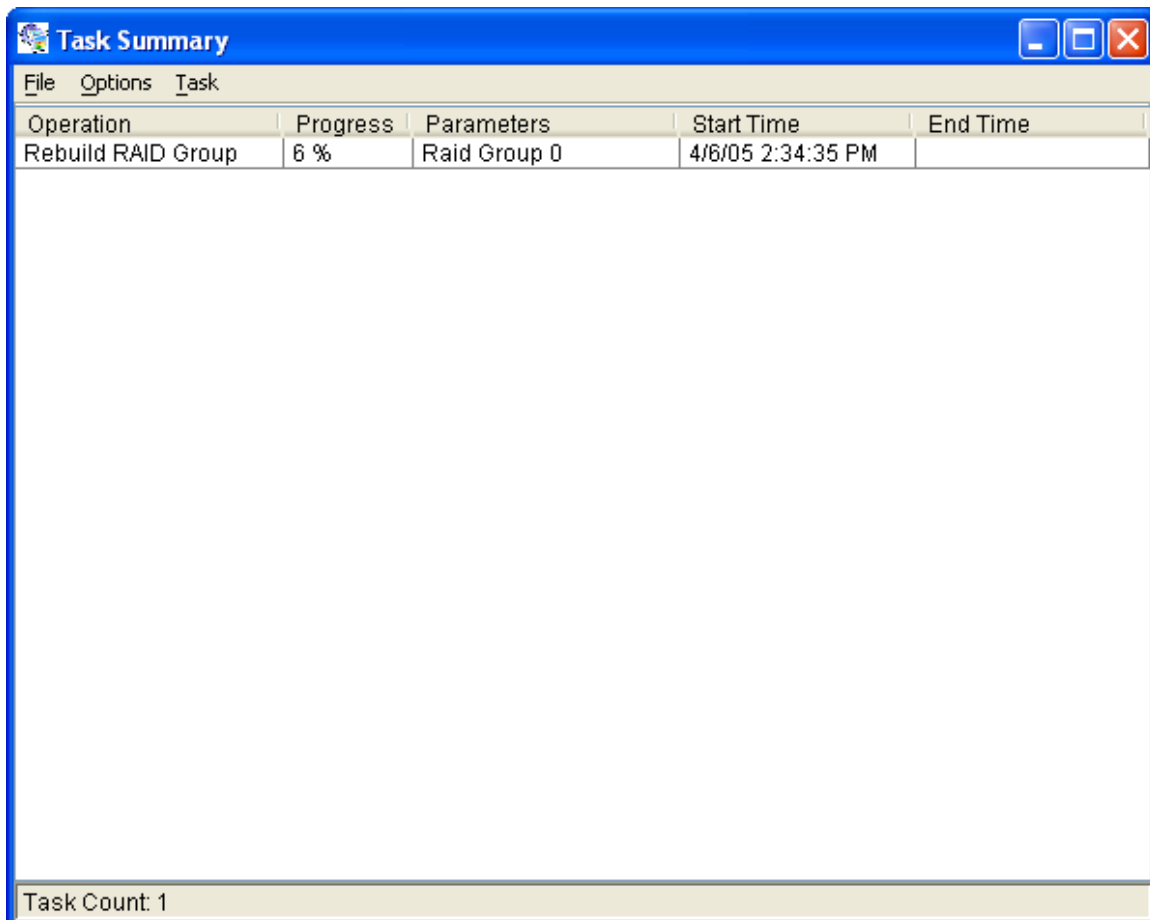


Window Menu Options



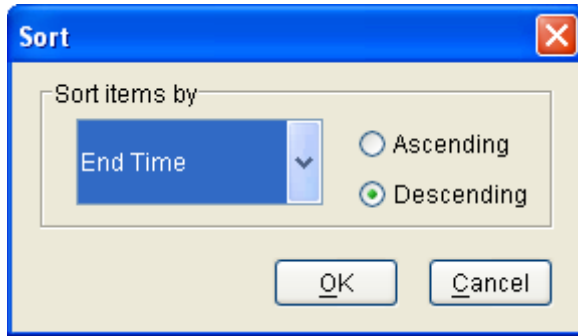
Task Manager

This menu option displays the Task Manager window, which lists all RAID and disk management tasks that have been started or finished. You can set the priority any RAID and disk management operations, such as RAID group creation, rebuild, and test.

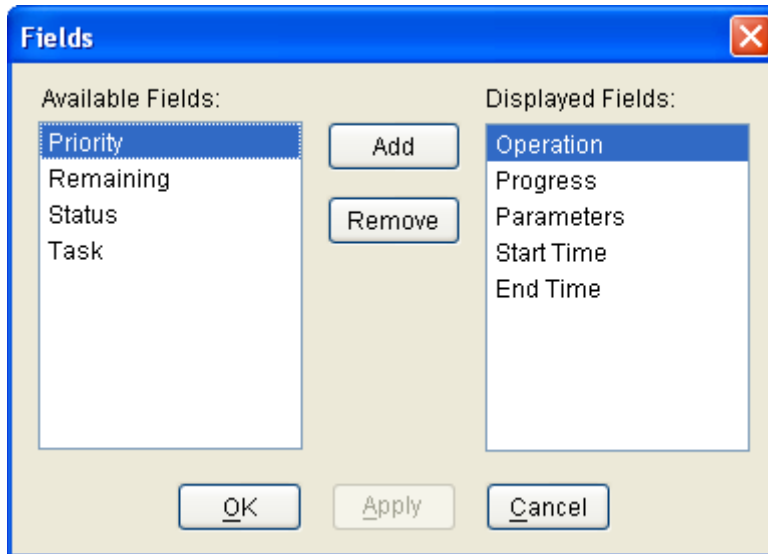


The Task Manager window has its own menu bar.

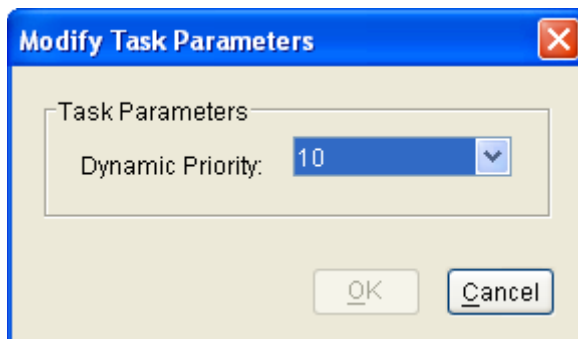
- File > Open will be activated in a future release.
- File > Save will be activated in a future release.
- File > Print will be activated in a future release.
- File > Exit closes the Task manager window.
- Options > Sorting displays a dialog box to sort items in the task list.



- Options > Fields displays a dialog box to choose which fields will be shown in the task list.

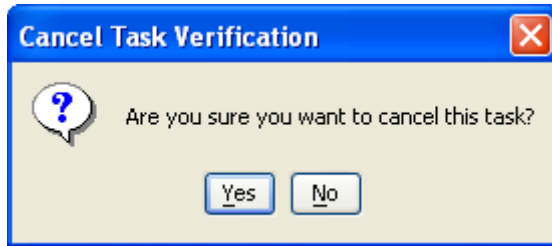


- Task > Modify lets you modify parameters of the selected task items. The following is an example of changing rebuild priority for a rebuild task.

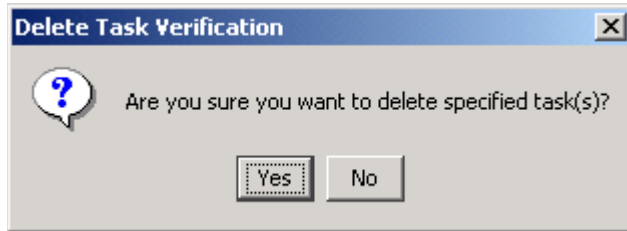


- Task > Suspend lets you suspend the selected task items.
- Task > Resume lets you resume previously suspended task items.

- Task > Cancel lets you cancel the selected tasks, after confirming the cancellation. This option does not permanently delete the tasks.

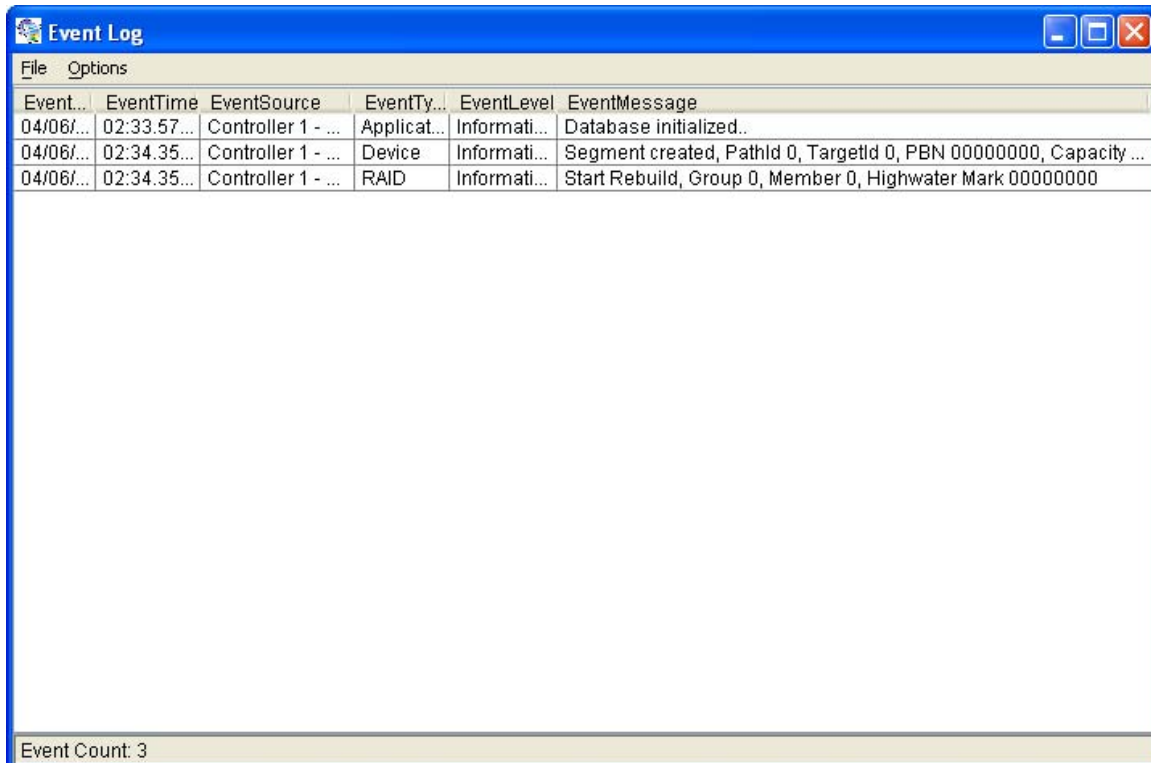


- Task > Delete lets you delete the selected tasks, after confirming the deletion.



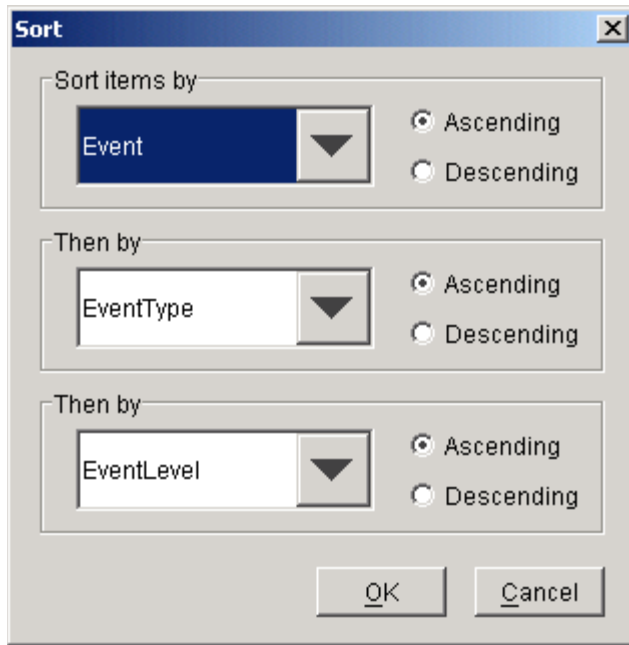
Event Log

This menu option displays the Event Log window, which lists SATA device-related events that occur while the SATARAID5 software is running.

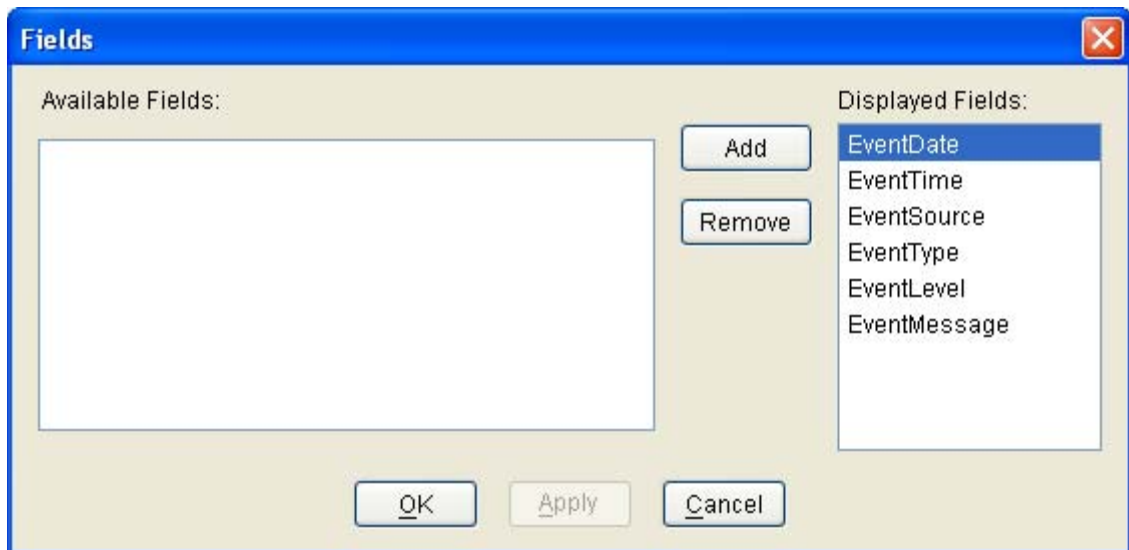


The Event Log window has its own menu bar.

- File > Exit closes the Event Log window.
- Options > Sorting displays a dialog box to choose up to three fields to sort items in the Event Log window.

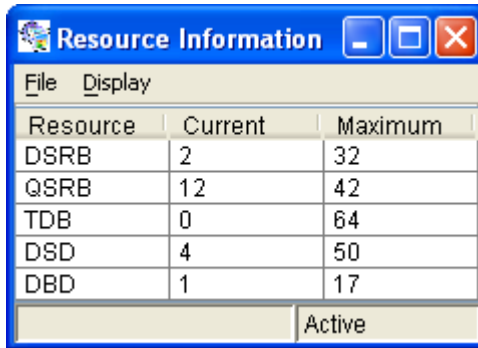


- Options > Fields displays a dialog box to choose which fields will be shown in the Event Log window.



Resources

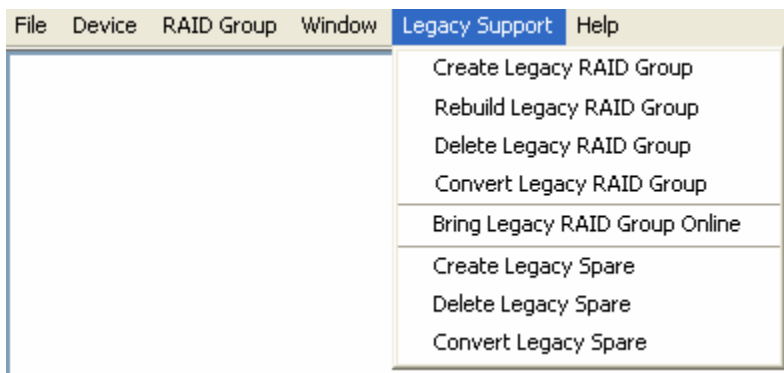
This menu option displays the Resource Information window. This feature is for debugging purpose only.



Resource	Current	Maximum
DSRB	2	32
QSRB	12	42
TDB	0	64
DSD	4	50
DBD	1	17

Active

Legacy Support Menu



On Windows and Linux platforms, you can create and manage Legacy RAID sets and JBOD using the SATARAID5 GUI or the [BIOS RAID utility](#). Previous RAID drivers that do not support RAID 5 functionality are known as “Legacy” drivers and are being replaced with the SATARAID5 software. Legacy RAID volumes are supported by the SATARAID5 software and have the following benefits:

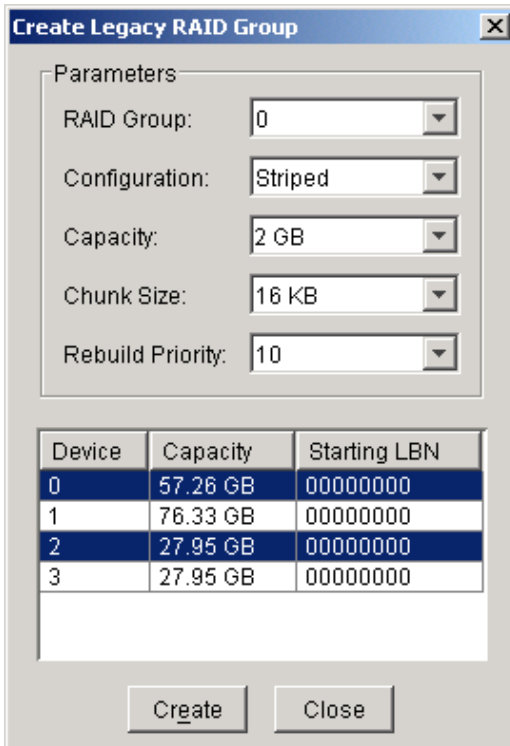
- Legacy volumes can be used as boot devices.
- Legacy volumes can be created and managed by the BIOS menu during system boot.
- Legacy RAID 0 and 10 volumes support a stripe size of 4K.

Note: *Legacy Support is not available on Macintosh platforms, and that menu item does not appear.*

Create Legacy RAID Group

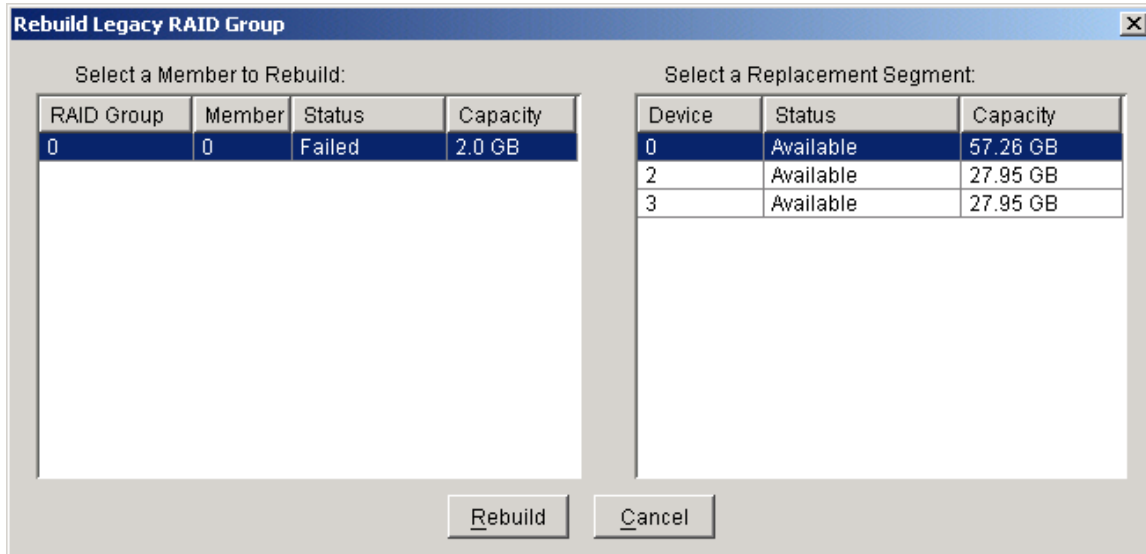
This menu option is disabled if new RAID groups exist. If enabled, this menu option displays a dialog box to create a legacy RAID group. Enter values for the following parameters.

Parameter	Description
RAID Group	Select a group ID from the available ID list. The maximum number of Legacy RAID Groups is limited to the number of hard drives that are connected to the RAID controller.
Configuration	Select one of: <ul style="list-style-type: none"> • <u>Striped</u> (for RAID 0) • <u>Mirrored</u> (for RAID 1) • <u>Mirrored Striped</u> (for RAID 10) • <u>Parity RAID</u> (for RAID 5)
Capacity	Select from a list of RAID group sizes. Options include sizes from 256 MB to 100 GB, plus MAX.
Chunk Size	Select a value from the available list to define the chunk size (stripe size) for performance tuning: 8, 16, 32, 64, 128 (KB). Mirrored (RAID 1) does not require a chunk size.
Rebuild Priority	Select a value to identify how quickly the controller should rebuild data on a disk after a hardware failure. A value of 1 is the lowest priority and will take the longest to rebuild. A value of 10 is the highest priority and will rebuild the fastest, but may require more CPU resources, which might affect the computer's performance. Striped (RAID 0) does not use this value.
Devices	Select RAID member devices from the available device segment grid.



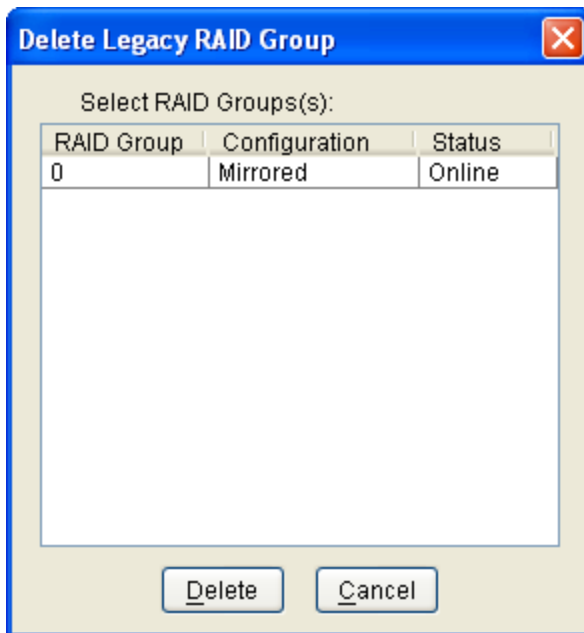
Rebuild Legacy RAID Group

This menu option displays a dialog box to choose a replacement segment to rebuild a non-fault tolerant legacy RAID group.



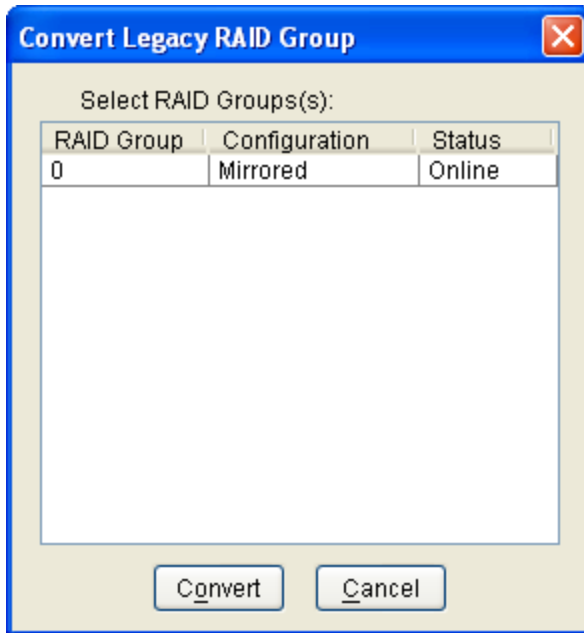
Delete Legacy RAID Group

This menu option displays a dialog box to select (highlight) legacy RAID groups to delete. This option is disabled if no legacy RAID groups exist.



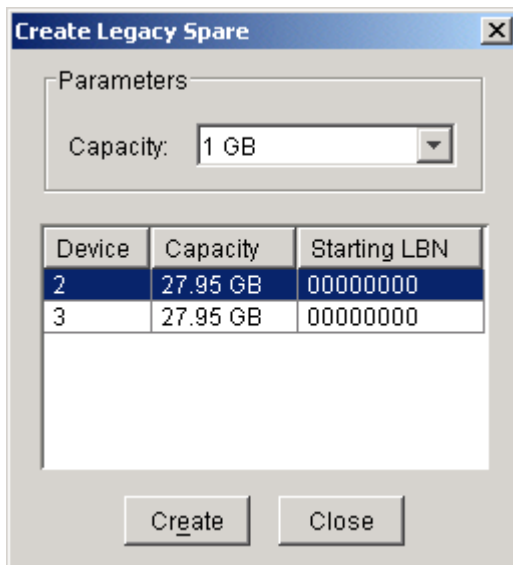
Convert Legacy RAID Group

This menu option displays a dialog box to select (highlight) legacy RAID groups to convert to new RAID groups of the same RAID type (configuration). This option is disabled if no legacy RAID groups exist.



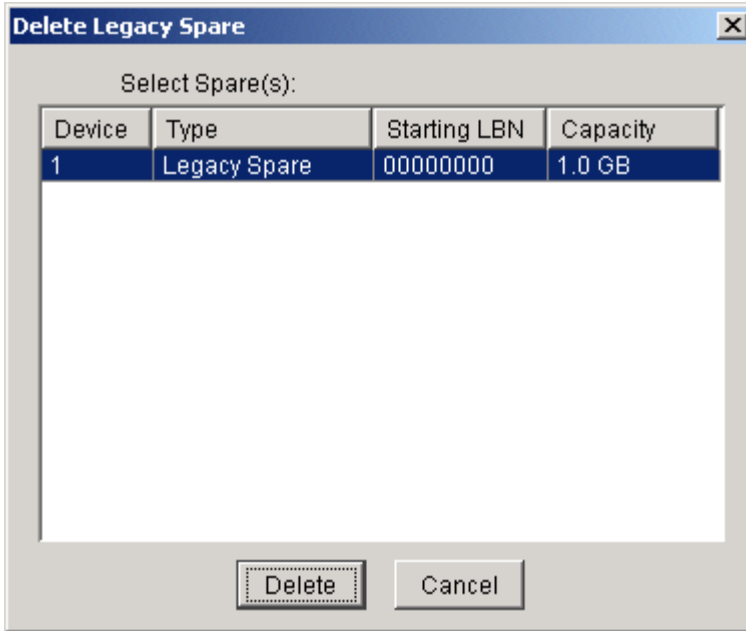
Create Legacy Spare

This menu option displays a dialog box to create a legacy spare drive. This option is disabled if new RAID groups exist.



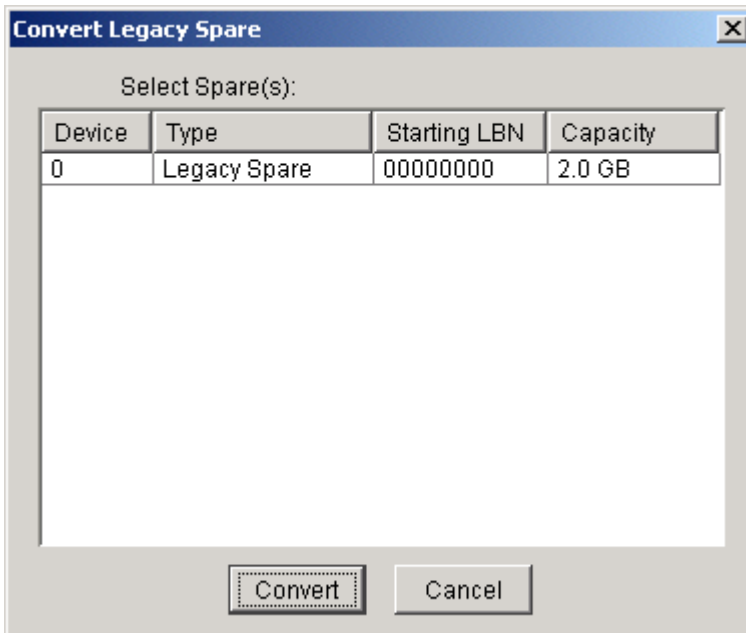
Delete Legacy Spare

This menu option displays a dialog box to select (highlight) a legacy spare drive to delete. This option is disabled if no legacy spare drives exist.

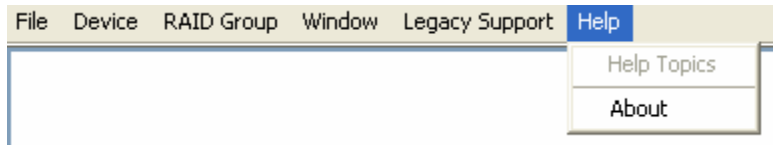


Convert Legacy Spare

This menu option displays a dialog box to select (highlight) legacy spare drives to convert to new spare drives. This option is disabled if no legacy spare drives exist.



Help Menu Options

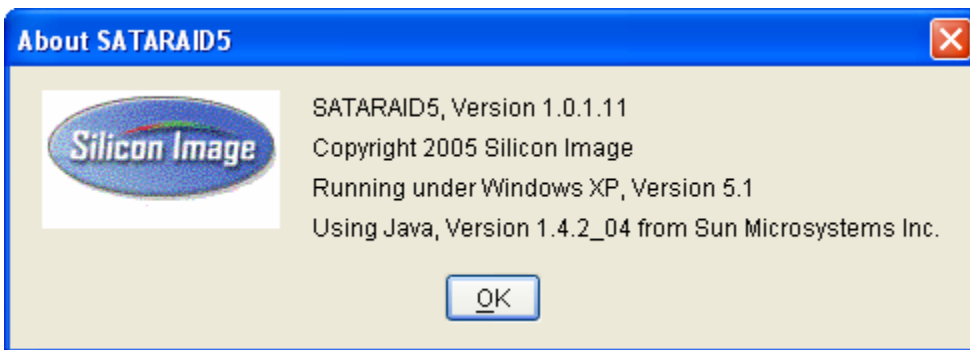


Help Topics

This menu option will be activated in a future release.

About

This menu option displays information about the SATARAID5 software, including its version, operating system and Java Run-Time Environment version.



3 Managing Legacy RAID Groups with the BIOS RAID Utility

On Windows and Linux platforms, you can create and manage legacy RAID sets and JBOD using the BIOS RAID utility or the [SATARAID5 GUI](#). You can create and manage new RAID groups only from the SATARAID5 Manager GUI.

Utility Overview

During the system boot-up process and before the Operating System loads, the following message appears for about 5 seconds. Press CTRL+S or the F4 key to enter the BIOS RAID utility.

```
SiI 3132 SATARaid BIOS Version 7.1.05
Copyright (C) 1997-2005 Silicon Image, Inc.

Press <Ctrl+S> or F4 to enter RAID utility
0 Maxtor 6Y160M0 152 GB
1 ST380013AS 74 GB

SiI Raid1 set Maxtor 6Y160M0
ST380013AS
```

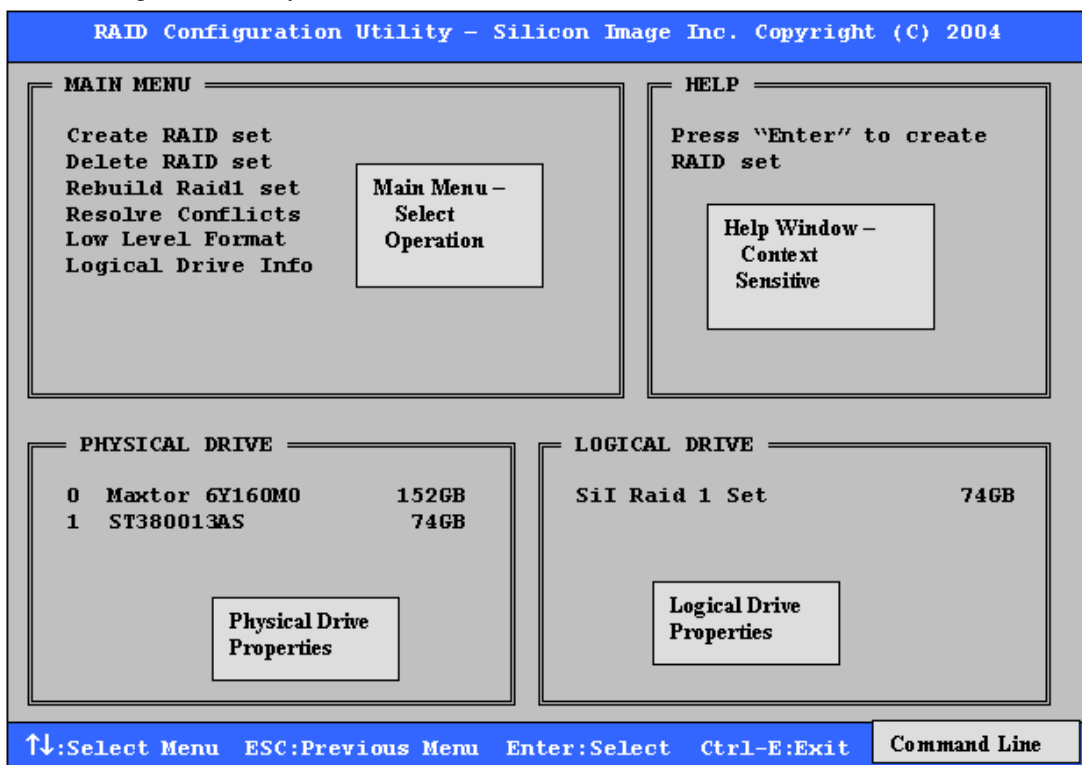
If you are prompted whether to enable large disk support, respond **Y** so that you can create RAID groups on large disks that the BIOS RAID utility detected.

```
Your computer has a disk larger than 512 MB. This version of windows
includes improved support for large disks, resulting in more efficient
use of disk space on large drives, and allowing disks over 2 GB to be
formatted as a single drive.

IMPORTANT: If you enable large disk support and create any new drives on this
disk, you will not be able to access the new drive(s) using other operating
systems, including some versions of windows 95 and windows NT, as well as
earlier versions of windows and MS-DOS. In addition, disk utilities that
were not designed explicitly for the FAT32 file system will not be able
to work with this disk. If you need to access this disk with other operating
systems or older disk utilities, do not enable large drive support.

Do you wish to enable large disk support (Y/N).....? [Y]
```

The RAID Configuration Utility screen is divided into four main sections and a command line.



- The Main Menu section in the upper left lists actions to be performed. Select:
 - Create RAID Group to create a new legacy RAID Set or allocate legacy spare drives.
 - Delete RAID Group to delete a legacy RAID Set or de-allocate a legacy spare drive.
 - Rebuild RAID 1 Set to initiate the rebuild of a RAID 1 set after replacing a drive in the Group.
 - Resolve Conflicts to find the member drives of a disrupted RAID set and restore the Set to proper operation. Do this after moving physical drives.
 - Low Level Format to wipe the data from a single drive. Do not format drives assigned to Sets or allocated as spares.
 - Logical Drive Info to show the current configuration of each RAID set, allocated spare, and unallocated physical drive attached to the SATA host adapter.
- The Help section in the upper right displays context-sensitive help and status messages.
- The Physical Drive section in the lower left displays the model number and capacities of the drives physically attached to the SATA host adapter.
- The Logical Drive section in the lower right displays all logical drives connected to the controller.
 - RAID sets and JBOD drives reported to the system BIOS are listed at the top of this section.
 - Spare drives, reserved drives, conflict drives, and invalid drives not reported to the system BIOS are listed at the bottom of this section.
- The Command Line at the bottom of the screen lists the currently active command keys. Use:
 - Up and Down arrows to select a menu option or action.
 - ESC to go to the previous menu.
 - Enter to select the highlighted choice.
 - Ctrl-E to exit the utility.
 Other keys may be active depending upon the currently selected action.

Reserved Logical Drives and RAID Set Sizes

When you create a RAID set, spare drive, or JBOD on a physical drive, the BIOS RAID utility saves metadata for the configuration in a reserved area of the physical drive. That metadata is not deleted when a RAID set or drive is deleted. After a set or drive is deleted, the BIOS RAID utility recognizes the physical drive as a reserved logical drive and does not report the drive to the system BIOS.

When creating a RAID set, spare drive, or JBOD, one creation parameter is the size of the set or drive. You can accept the default size or you can use the ↑ and ↓ keys to change the size.

- If the physical drive has not yet been used to create a RAID set or drive, the BIOS RAID utility shows the full size of the physical drive as the default size.
- If the physical drive has previously been used, the utility shows the size that was saved in the reserved area of the physical drive.

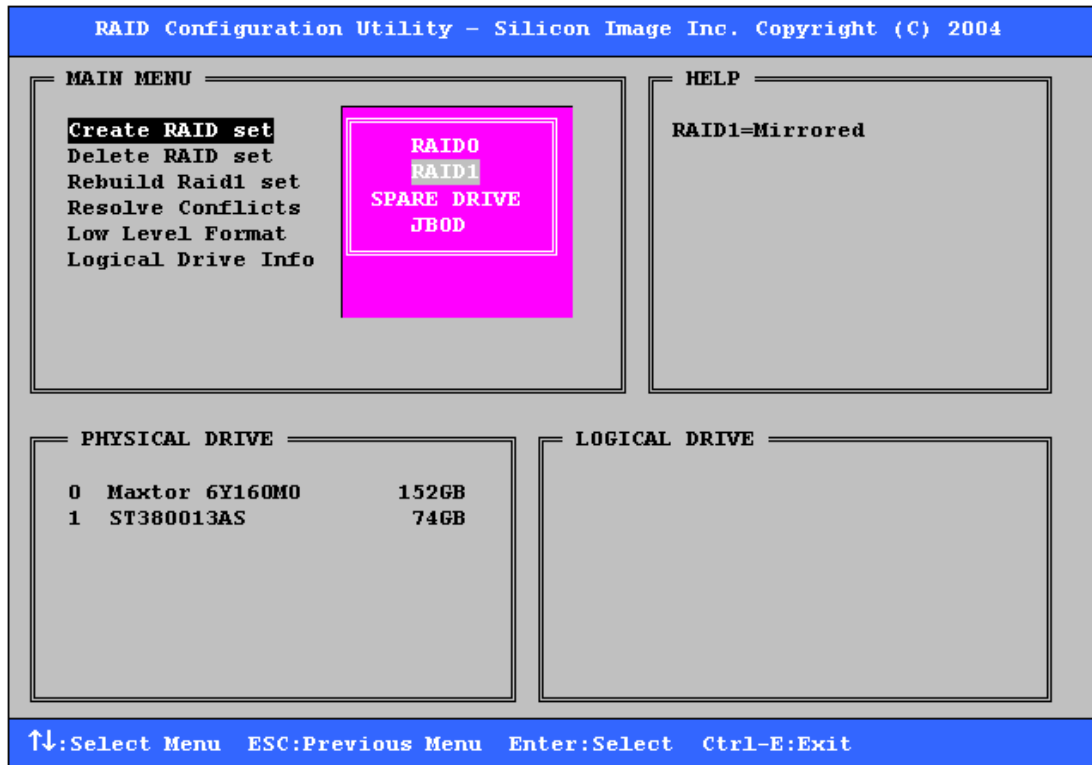
When you increase the default size (using the ↑ key), the utility displays a warning message in the Help section of the RAID Configuration Utility screen and waits for you to confirm the size increase before changing the default size.

Creating RAID Groups (Sets)

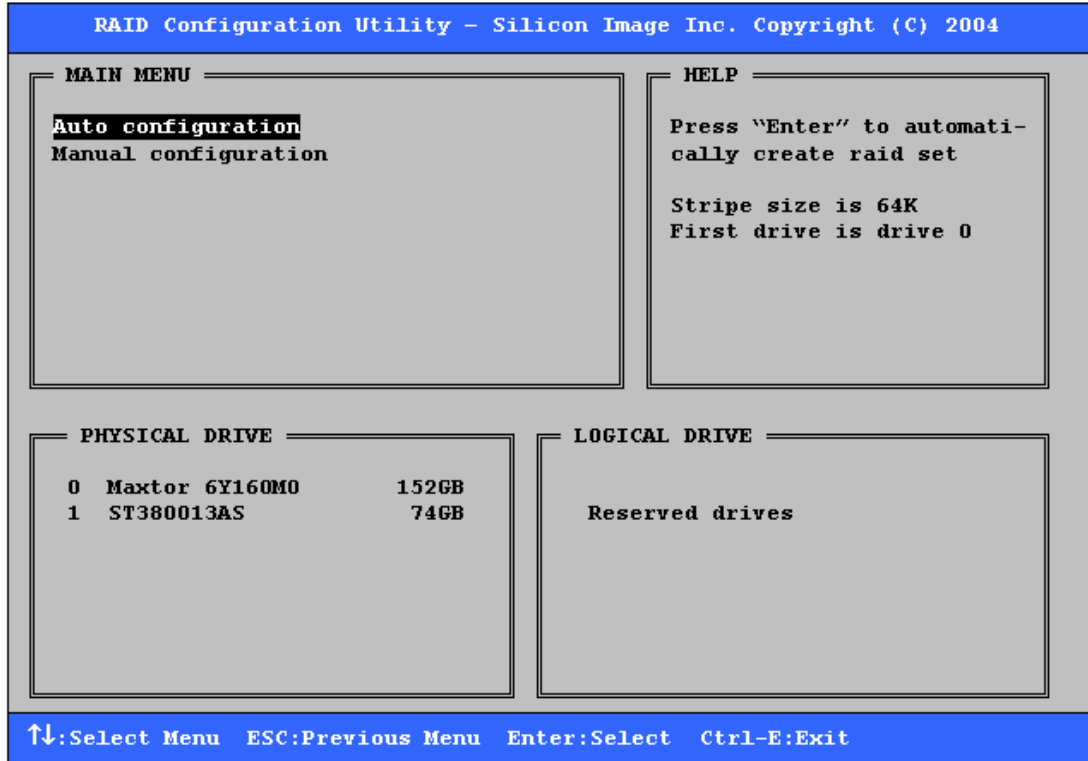
Select from RAID0, RAID1, and JBOD configurations when creating a new RAID group. Select a RAID level based on factors such as performance, data security, and number of drives available. Consider the long-term role of the system and plan the data storage strategy appropriately.

1. Select **Create RAID set** from the Main Menu section of the RAID Configuration Utility screen.
2. Select [RAID0](#) (Striped) or [RAID1](#) (Mirrored) and press **Enter**.

Note: Procedures to create a JBOD configuration or a spare drive for a RAID1 set are documented separately. See [Creating a JBOD Configuration](#) and [Creating a Spare Drive for a RAID1 Group](#).



3. Select **Auto configuration** or **Manual configuration** of the RAID Set and press **Enter**.
 - If you select **Auto configuration**, the BIOS RAID utility selects RAID member drives automatically and sets the chunk (stripe) size for striped sets to 64KB.
 - If you select **Manual configuration**, select the chunk size for Striped Sets or select the Source and Target drives for mirrored sets.



4. Select the size of the RAID set with the ↑ and ↓ keys and press **Enter**.

```
RAID Configuration Utility - Silicon Image Inc. Copyright (C) 2004

MAIN MENU
Auto configuration
Manual configuration

Please input the raid size: 55 GB

HELP
Press "Enter" to select
the RaidSize

↑:increment 1GB raid size
↓:decrement 1GB raid size

PHYSICAL DRIVE
0 Maxtor 6Y160M0 152GB
1 ST380013AS 74GB

LOGICAL DRIVE
Reserved drives

↑↓:Select Menu ESC:Previous Menu Enter:Select Ctrl-E:Exit
```

5. When the **Are You Sure?** confirmation prompt appears, respond **Y** to complete the RAID Set configuration.

Note: If you have excess capacity left on the hard drives after creating a RAID set in the BIOS RAID utility, you can later go to the SATARAID5 Manager GUI to create additional logical drives that fully utilize the capacity of all hard drives.

Creating a JBOD Configuration

The BIOS RAID utility does not report non-RAID drives to the system BIOS. If a non-RAID boot drive or data drive is desired, create a [JBOD](#) so the BIOS RAID utility will report the drive to the system BIOS.

1. Select **Create RAID set** from the Main Menu section of the RAID Configuration Utility screen.
2. Select **JBOD** and press **Enter**.
3. Select **JBOD drive** from the Physical Drive list and press **Enter**.
4. Select the size of the JBOD drive with the ↑ and ↓ keys and press **Enter**.
5. When the **Are You Sure?** confirmation prompt appears, respond **Y** to complete the JBOD configuration.

Creating a Spare Drive for a RAID1 Group

If a RAID 1 set exists, you can create a spare drive for the set. The spare drive can then be allocated to the RAID 1 set if a drive in the RAID 1 set fails.

1. Select **Create RAID set** from the Main Menu section of the RAID Configuration Utility screen.
2. Select **Spare Drive** and press **Enter**.
3. Select a spare drive from the Physical Drive list and press **Enter**.
4. Select the size of the spare drive with the ↑ and ↓ keys and press **Enter**.
5. When the **Are You Sure?** confirmation prompt appears, respond **Y** to complete the spare drive creation.

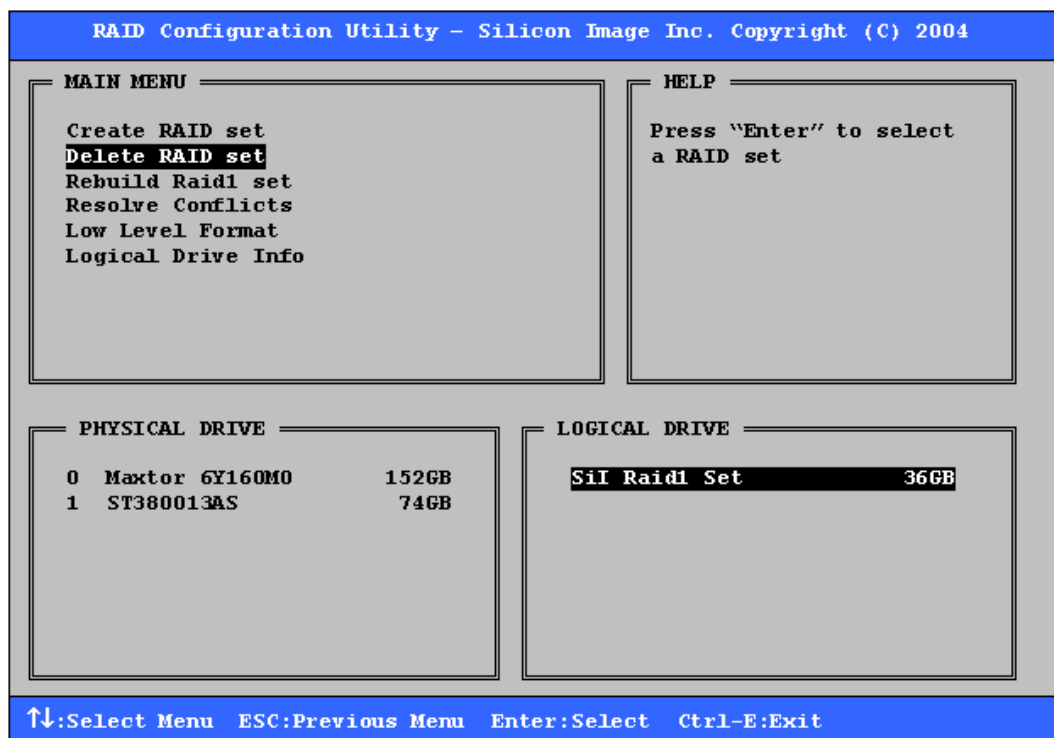
Additional BIOS RAID Main Menu Options

This section documents additional actions you can perform by selecting menu options in the Main Menu section of the RAID Configuration Utility screen.

Delete RAID Set

Use the Delete RAID set menu option to remove a RAID set, spare drive, or JBOD.

1. Select **Delete RAID set** from the Main Menu section of the RAID Configuration Utility screen.
2. Select the item to delete from the Logical Drive list and press **Enter**.



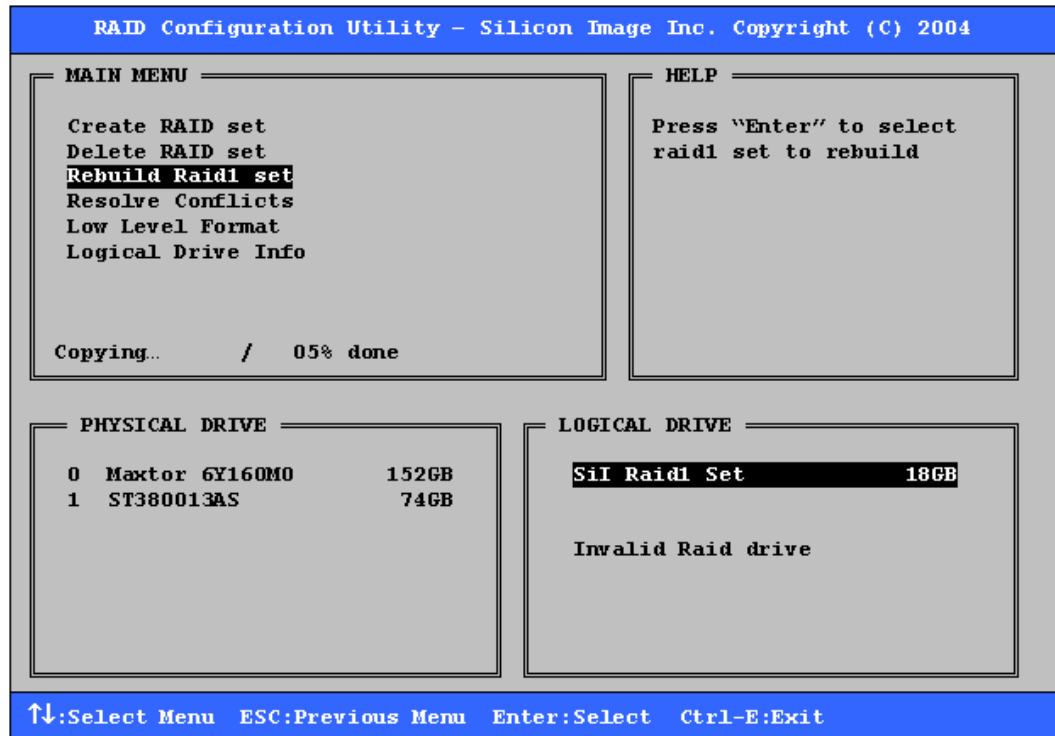
3. When the **Are You Sure?** confirmation prompt appears, respond **Y** to delete the selected RAID set, spare drive, or JBOD.

The screen then displays a selection of logical drives from which to create a new RAID set.

Rebuild RAID1 Set

Rebuilding a RAID1 set copies data from an existing drive to a replacement drive that has been installed in a RAID1 set. Take this action if any member of the RAID1 set fails.

1. Select **Rebuild Raid1 set** from the Main Menu section of the RAID Configuration Utility screen.
2. Select the RAID1 set to rebuild from the Logical Drive list and press **Enter**.



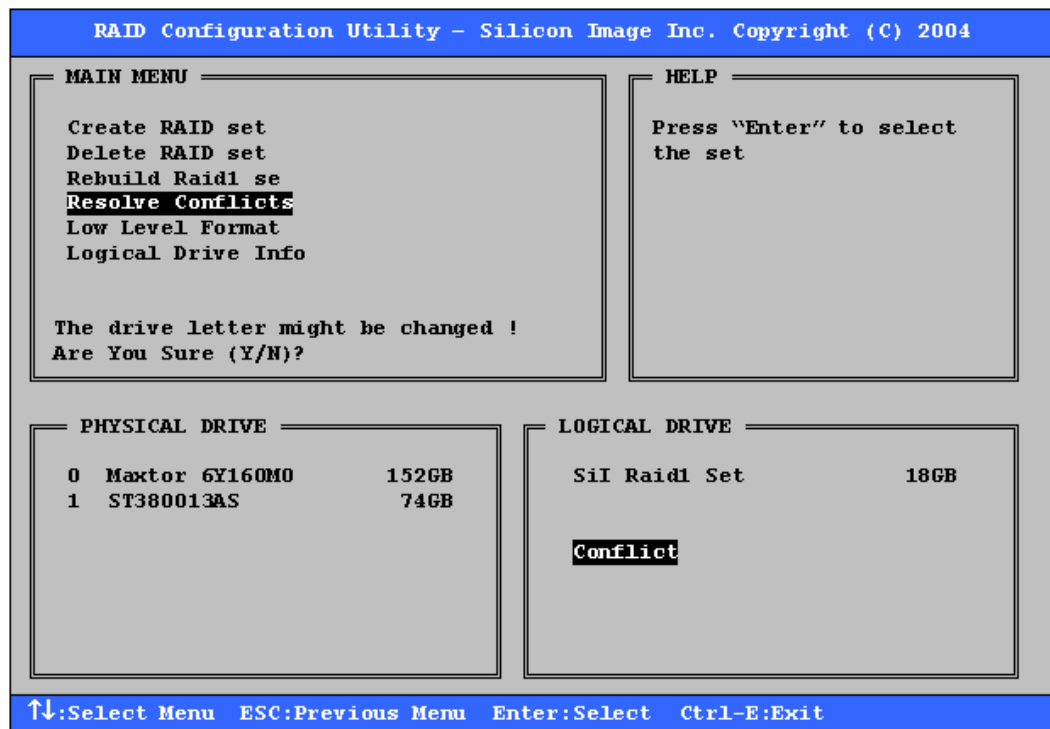
3. When the **Are You Sure?** confirmation prompt appears, respond **Y** to rebuild the RAID1 set. The set is rebuilt. A progress indicator appears in the Main Menu section during the rebuild.

Resolve Conflicts

When a RAID set is created, metadata of drive-connection information, including the channel on the host adapter to which it is connected, is written to the disk. If a newly installed replacement disk was previously part of a RAID set or was used in another system, the replacement disk may have conflicting drive-connection metadata. This prohibits the RAID set from being created or rebuilt.

In order for the RAID set to function properly, use the Resolve Conflicts menu option to write new metadata with the correct drive-connection information to the replacement disk.

1. Select **Resolve Conflicts** from the Main Menu section of the RAID Configuration Utility screen.
2. Select the **Conflict** entry in the Logical Drive section and press **Enter**.



Some conflict resolutions may result in changing the drive letter assignment. For example, the RAID set may have been drive D, and after the conflict resolution, it becomes drive E. To maintain the same drive lettering, the SATA cables connected to the drives may need to be swapped, or in the case of a SATA-based removable drive unit, the order of the drives within the chassis may need to be changed.

3. When the **Are You Sure?** confirmation prompt appears, respond **Y** to resolve the conflict. The conflict is resolved and the RAID Set appears in the Logical Drive section.

Low Level Format

The Low Level Format menu option displays a pop-up menu with the following actions:

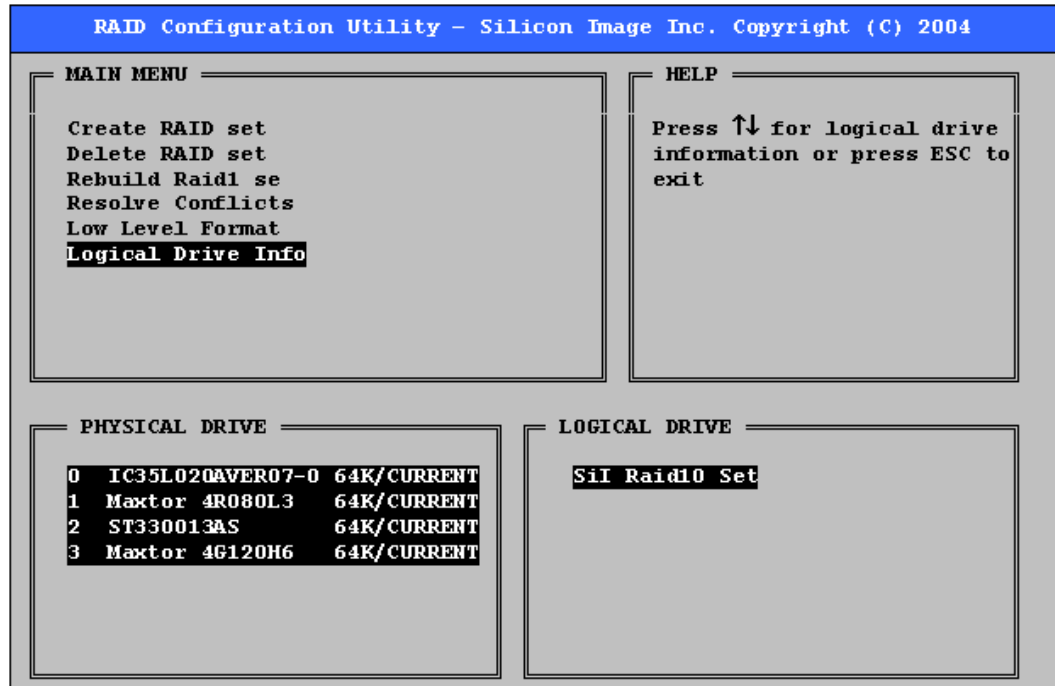
- Format 1st Part(ition), which removes the first Silicon Image partition on the disk.
- Secure Format, which formats the entire disk.
- Quick Format, which removes the first Silicon Image partition on the disk plus the last 1GB that contains the Silicon Image meta-data describing partitions.

Note: The Low Level Format actions are typically not required, because formatting the drive under Windows is sufficient to prepare the drive for use.

Logical Drive Info

The Logical Drive Info menu option displays the assignment of physical drives within a logical set (RAID set, RAID 1 spare, or unassigned).

- Use the up and down arrow keys to scroll between the drives in the Logical Drive list.
- Press the ESC key when you are finished viewing logical drive information.



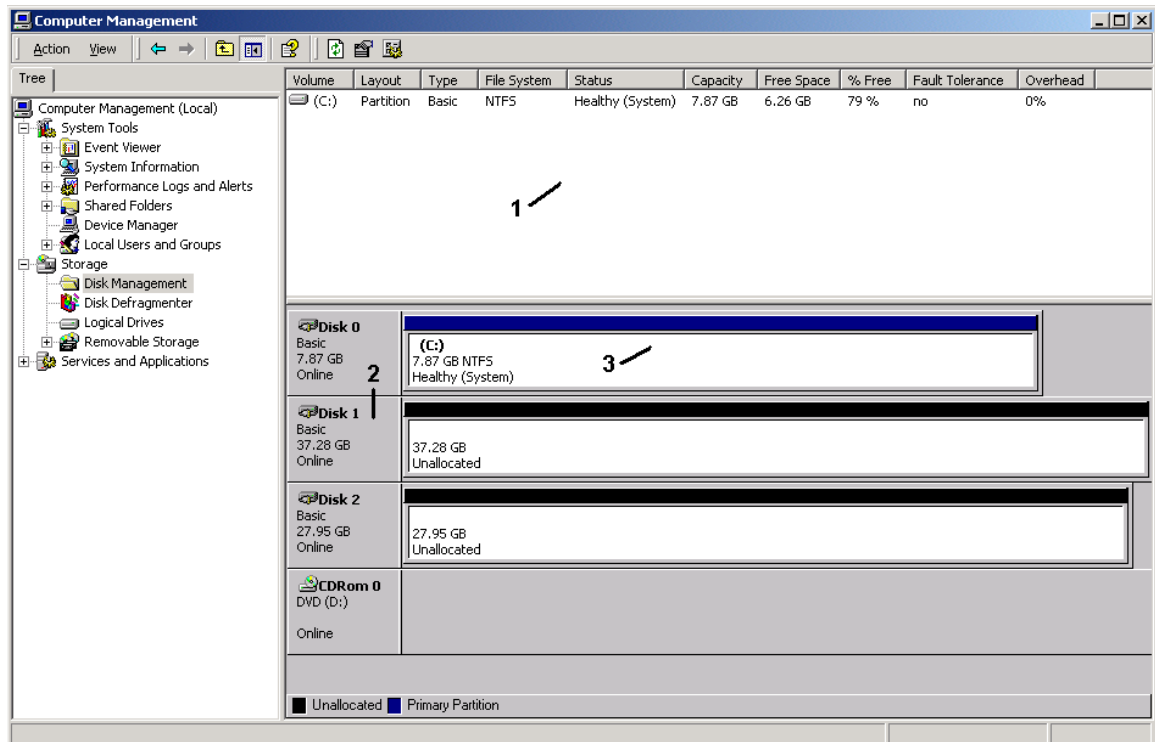
4 Allocating Partitions

After you create RAID groups using the [SATARAID5 Manager](#) or [BIOS Utility](#), define partitions on the RAID group and format them for use.

Define a Partition on MS-Windows

Use the Disk Management utility that is part of the XP, 2000, and Windows Server 2003 operating systems to define and format partitions on a Microsoft Windows host computer.

1. From the Start button in the Windows taskbar, select Control Panel > Administrative Tools > Computer Management.
2. Select **Disk Management** in the Storage section of the utility to display a list of available disks.



The Disk Management utility has three main sections to the right of the navigation tree:

- System listing of all formatted and available disks/RAID Groups (labeled 1 in the image).
- Report of physical connections for disks/RAID Groups (labeled 2 in the image). Every disk should display **Basic**, a **Disk Size** value (available disk space is reported here), and **Online**. Instead of **Basic**, a disk may be marked **Unknown**, **Dynamic**, or **Not Initialized**.

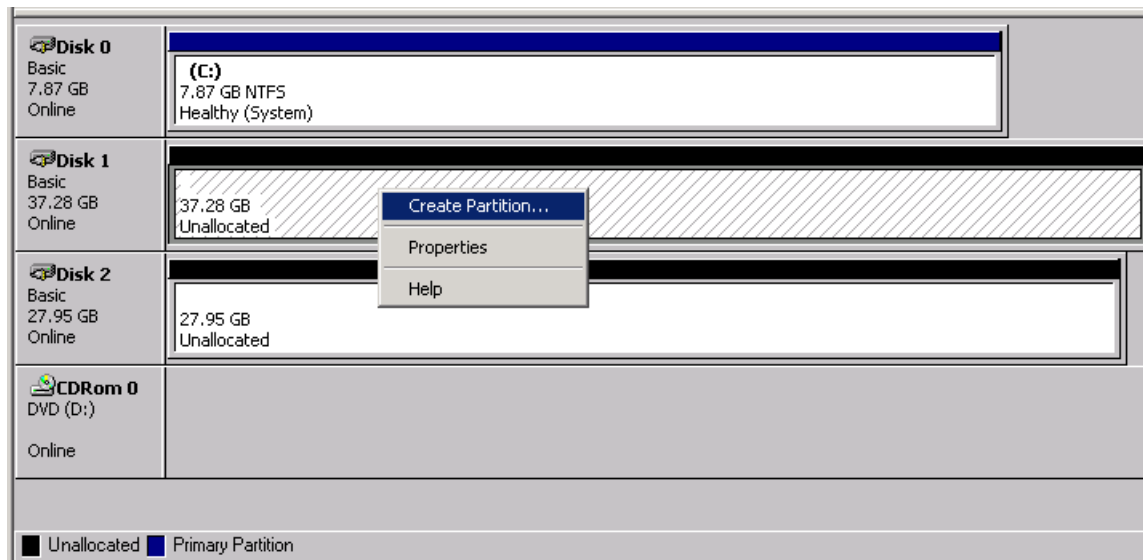
If a disk is marked **Unknown**, right-click the disk icon and select **Write Signature**. A window opens with the disk in question (all Unknown disks may appear in this window). Make sure the box next to each disk is checked and click OK. The disk should now be marked as a Basic disk.

If a disk is marked **Dynamic**, right-click the disk icon, and select **Revert to Basic Disk**. Within seconds, the disk should be marked as a Basic disk.

If a disk is marked **Not Initialized**, right-click the disk icon, and select **Initialize Disk**. An additional dialog box appears allowing you to select which disks to initialize. Uncheck the Config Disk item and click **OK**. Within seconds, the selected disk(s) should be marked as a Basic disk.

- Report of partition status, disk letter, and volume name (labeled 3 in the image). The order in which the drives are listed corresponds to the order the RAID sets appear in the BIOS. The first Unallocated Partition represents Set 1, and so on. In this example, there are two disks with unallocated partitions.

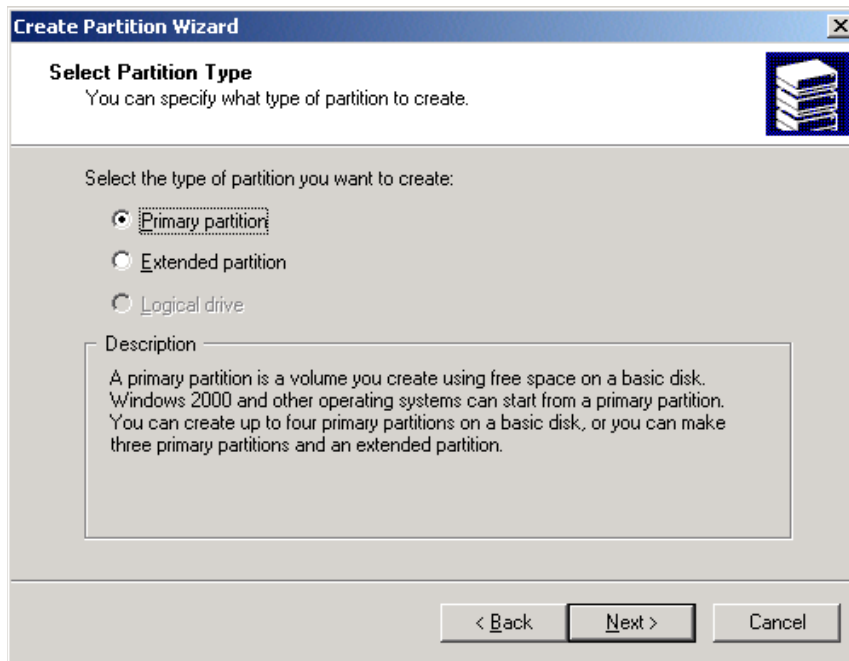
3. Right-click the partition of the first disk to allocate and select **Create Partition** from the pop-up menu.



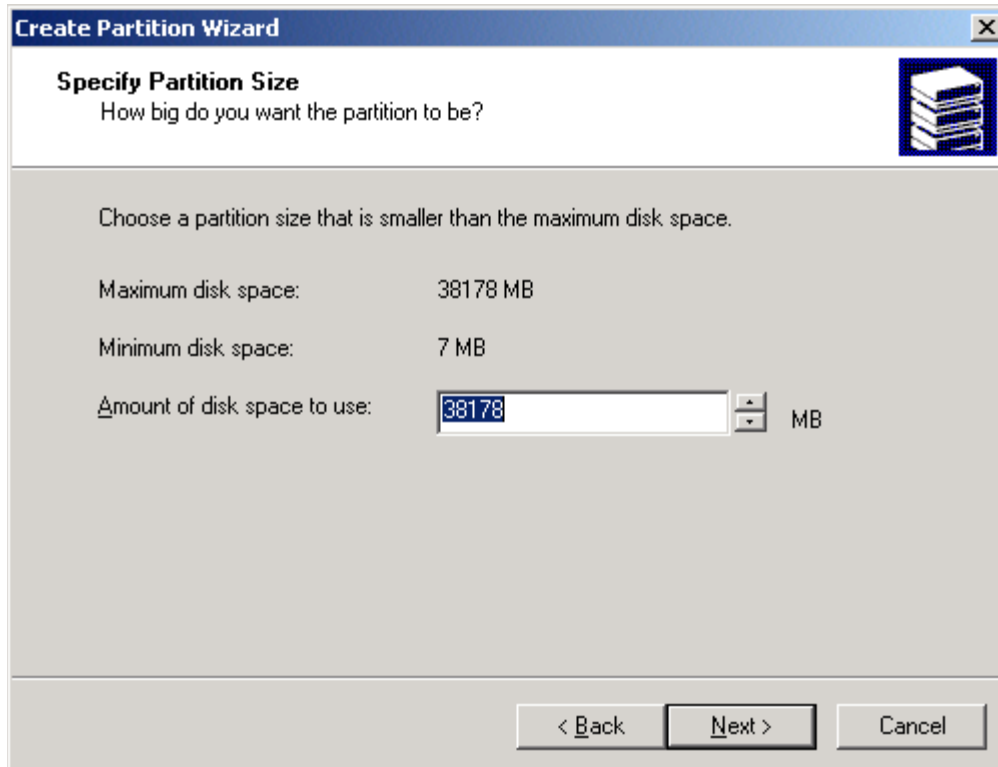
4. Click **Next** to acknowledge the introductory window to the Create Partition Wizard.

Note: If an external storage enclosure (such as the SV2000) is connected to the external SATA ports of the RAID controller, one or more additional disk devices may appear with a name of **“Config Disk SCSI Disk Device”** and a red indicator to show that it is not available. This is normal behavior for Windows, and those disk items should be ignored.

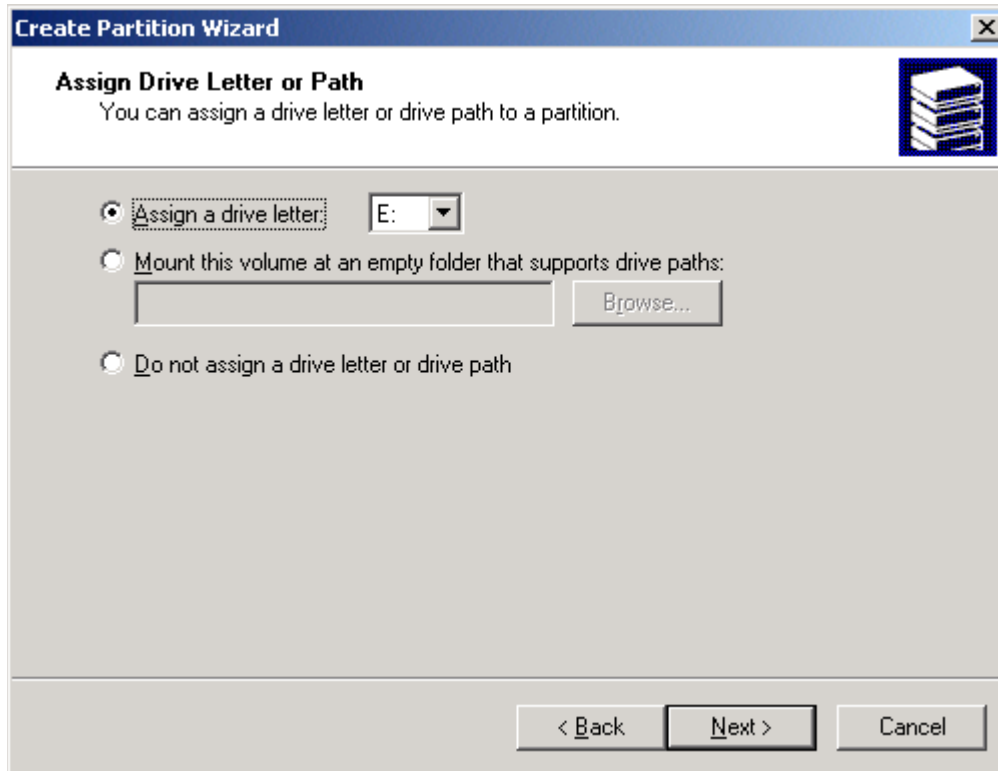
5. Select **Primary partition** and click **Next**.



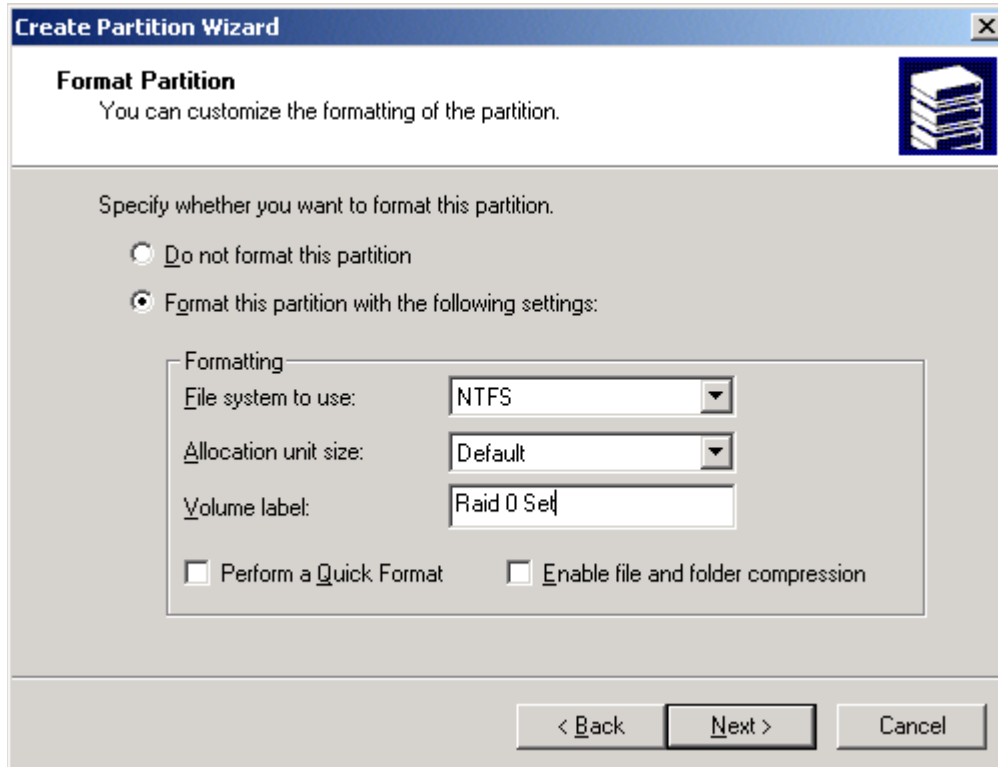
6. Click **Next** to accept the designated partition size. Because this example is a Striped RAID set with two disk drives, the size of the partition is approximately twice the size of the smallest disk drive.



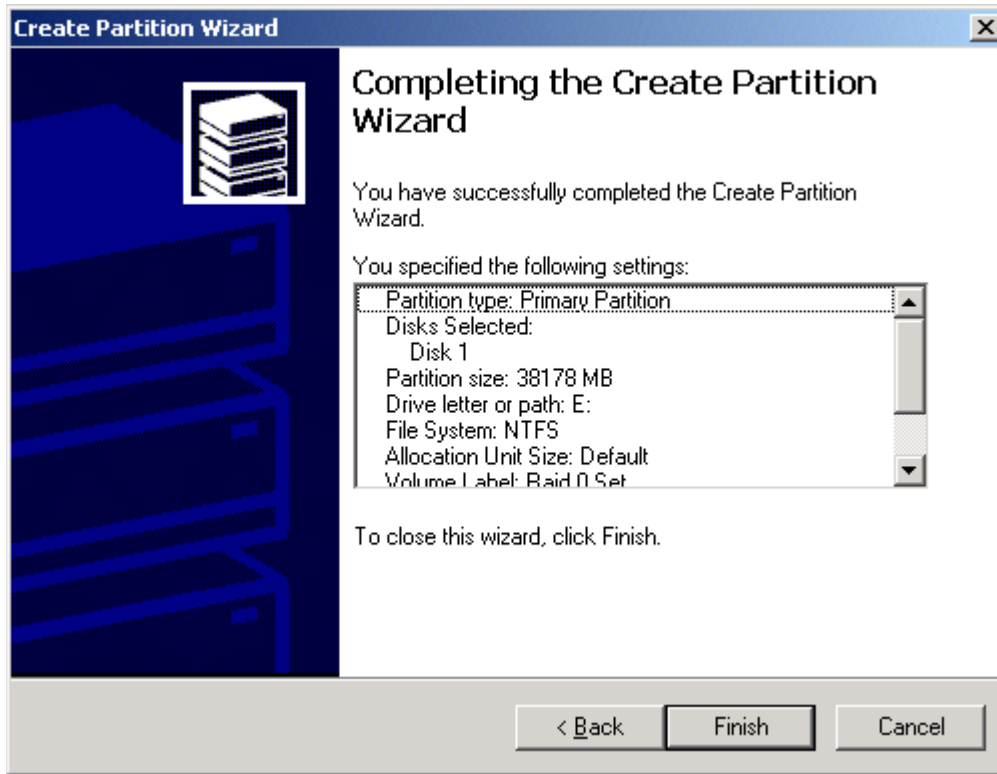
- Accept the default drive letter assigned to the partition or select a different drive letter if desired. Click **Next**.



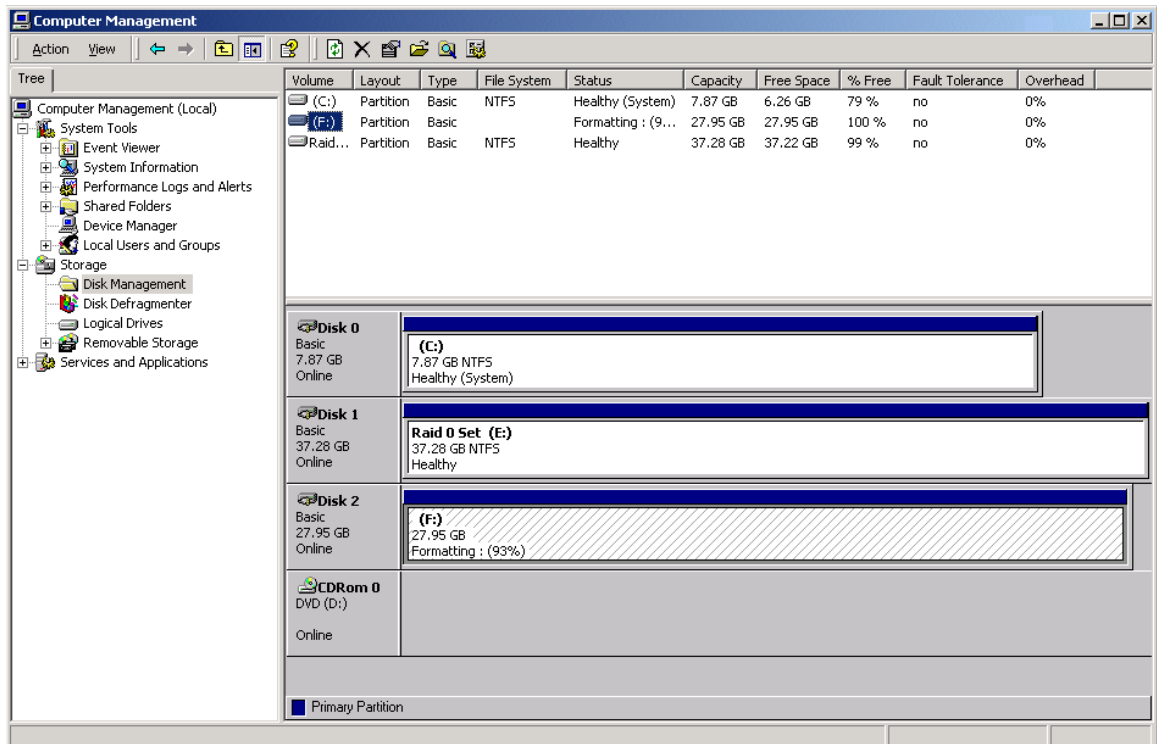
- Make sure the **Format this partition with the following settings** radio button is selected. Keep the default of NTFS for the file system and Default for the allocation unit size. Enter a meaningful volume label (name), such as STRIPED SET, FINANCIAL, CRITICAL, and so on. Click **Next**.



- Verify the selections are correct and click **Finish**.



The status of the newly created partition changes to **Formatting** and the percentage complete is displayed. Depending upon the size of the partition, the format process may take several minutes. When complete, the status changes to **Healthy** and the name and drive letter are updated. The partitioned disk appears in the System Listing section with all of its pertinent information as well.



- Repeat this procedure to partition other disks.

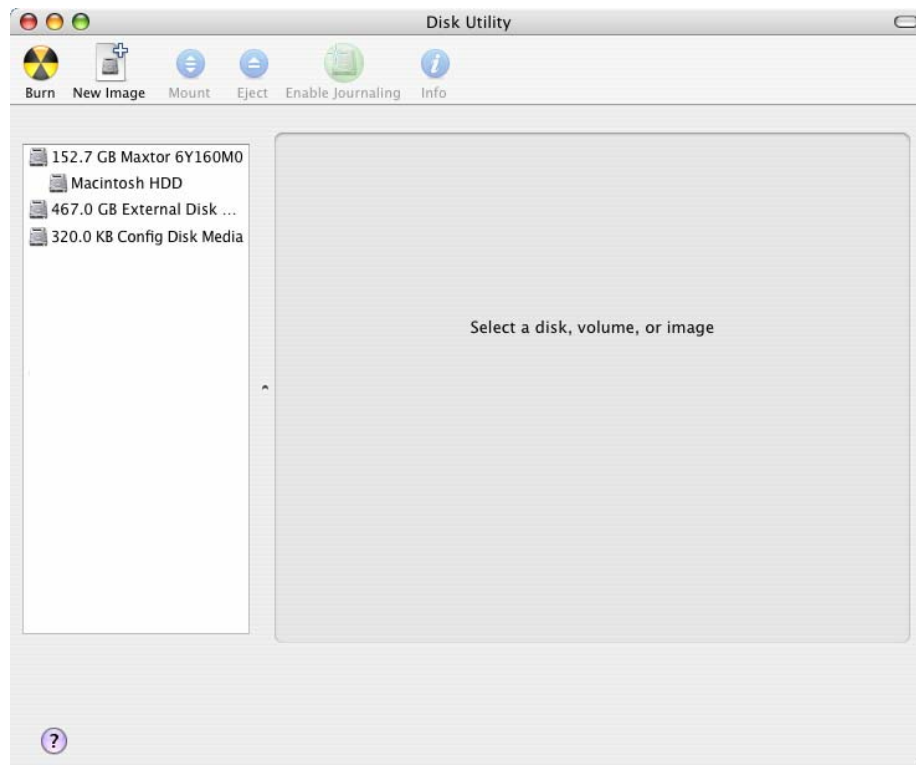
11. When you are finished, close the Data Management utility by clicking the **X** in the top right corner of the window.

The new disks are now available for use.

Define a Volume on Mac OS X

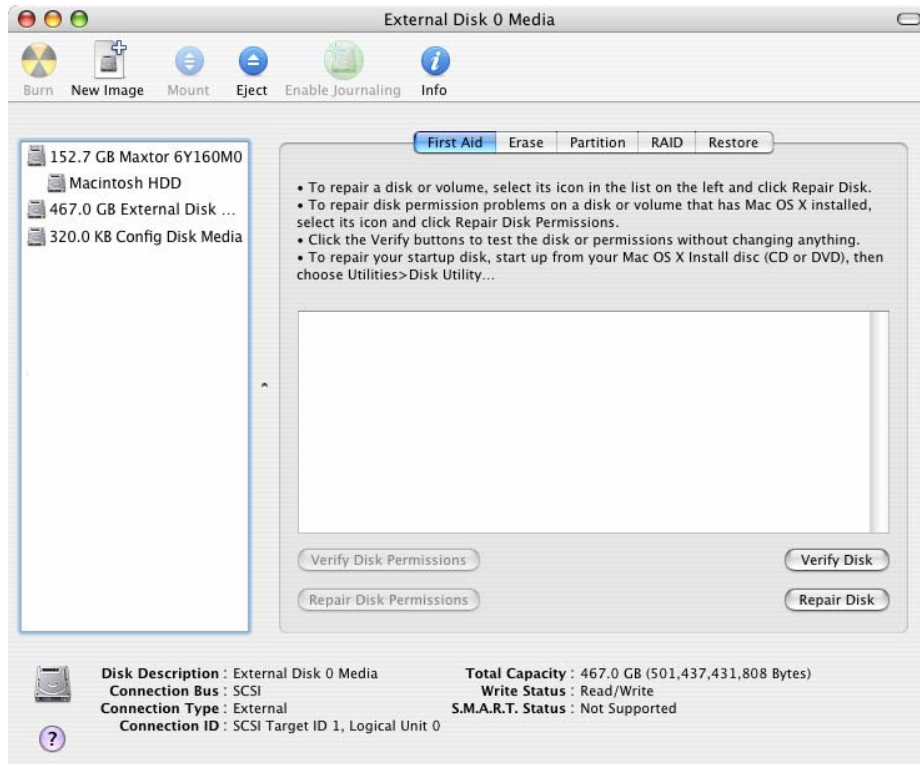
After using the SATARAID5 Manager to create one or more RAID Groups, you can use the **Disk Utility** to define and format volumes on a Mac OS X computer system.

1. If you have not previously launched the Disk Utility, click on the **Finder** icon in the task bar, then click on **Applications** from the navigation menu to open the **Applications** folder. In the **Applications** folder, click on **Utilities** to open the Utilities folder. In the **Utilities** folder, click and drag the **Disk Utility** icon to task bar.
2. Click on the **Disk Utility** icon in the Task Bar. The following dialog appears:

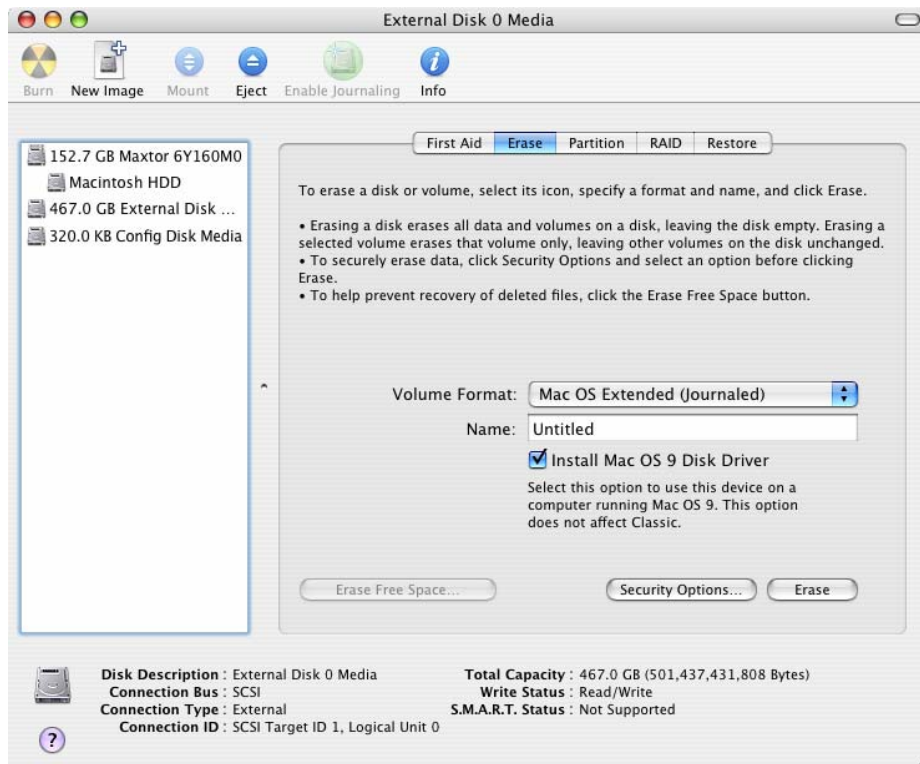


3. In addition to your system's hard disk, the RAID Groups that you previously created appear in the list. Click on the RAID Group you wish to format. The following dialog appears:

Note: Do not click on the **Config Drive** item in that list.



4. Click on the “**Erase**” item along the top menu bar. The following dialog appears:



5. Select the type of **Volume Format** from the drop-down list in the middle of the page and enter a volume name in place of **Untitled** (in this example, the name “**my volume**” is entered). Finally, click on the **Erase** button. The following confirmation dialog appears:



- To proceed with the formatting operation, click on the **Erase** button. After the volume is formatted, an icon for the volume will appear on your desktop, and you can begin using that volume.



- When you are finished creating volumes, close the **Disk Utility**.

Define a Volume/Partition on Linux

Reload the SATARAID5 driver to show the newly created SATARAID5 volume. The SATARAID5 driver will show the resulting volume as a block device with prefix “sd”, /dev/sdx (where x is a, b, c, etc.).

You can then use the **fdisk** command to partition the volume and the **mkfs** command to format the partitions and create a file system on each partition. You can then **mount** the files system as required.

Note: If an external storage enclosure (such as the SV2000) is connected to the external SATA ports of the RAID controller, one or more additional disk devices may appear with a name of “**Config Disk SCSI Disk Device**”. This is normal behavior, and those disk items should be ignored.

Appendix A Managing the BIOS

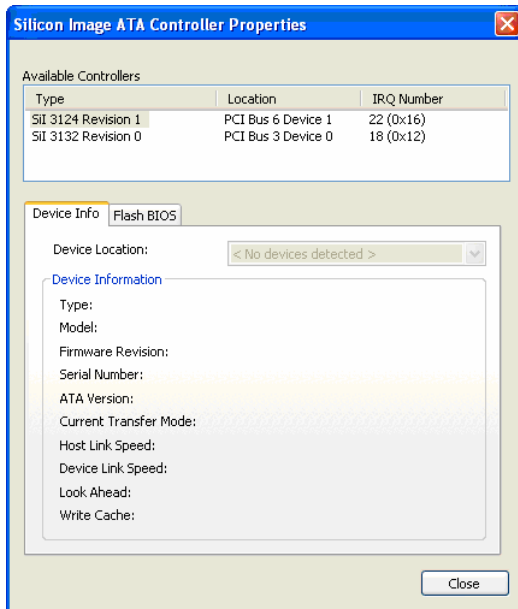
When the SATARAID5 driver software is installed on a Windows system, a Control Panel applet is also installed that allows you to update and view information about the RAID controller hardware and its Flash BIOS. You can access the Flash BIOS information using either of the methods described below.

Third-party motherboard and host bus adapter manufacturers provide product-level qualification. Before you upgrade, please verify support for BIOS or driver updates with the product vendor or manufacturer.

Note: The information displayed will vary depending on the number and type of RAID controllers that are installed on your system.

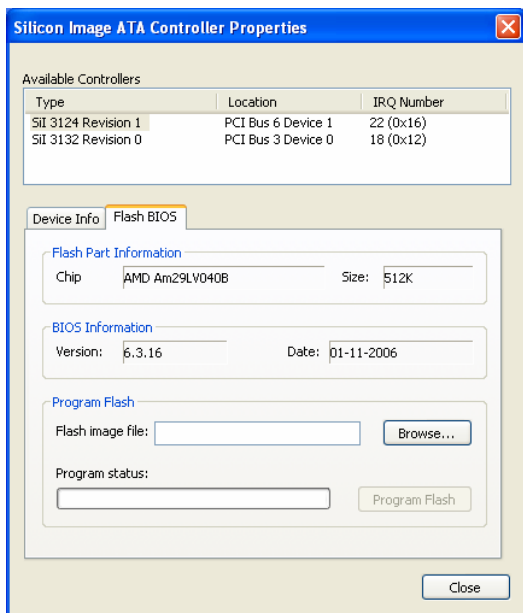
Control Panel Method

To view the Device Information for each of the RAID controllers that are installed in your system, click on **Start → Control Panel → Silicon Image ATA Controllers** to display the following dialog box:



The upper section of this dialog box lists the RAID controllers that are installed in your system, including the PCI bus slot in which each controller is installed. You can click on each controller in the list to show the detailed device information (if available).

Click on the **Flash BIOS** tab to display the following dialog box:

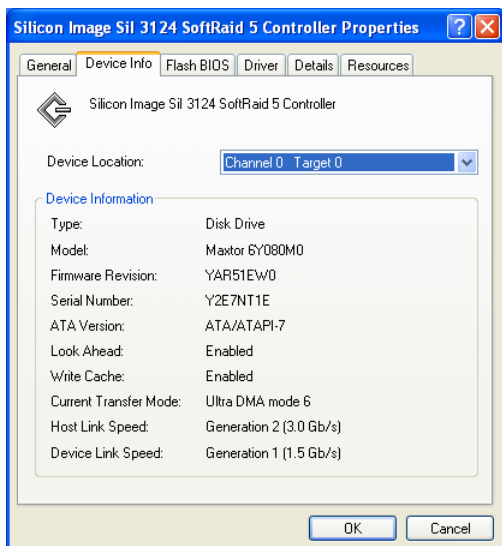


This dialog box displays information about the current Flash BIOS and allows you to download an updated Flash BIOS version onto the RAID controller. To download a new Flash BIOS version, enter the filename or click on the **Browse...** button to navigate to it, and then click on the **Program Flash** button. The progress bar will show the download status. Do not interrupt the download before it completes.

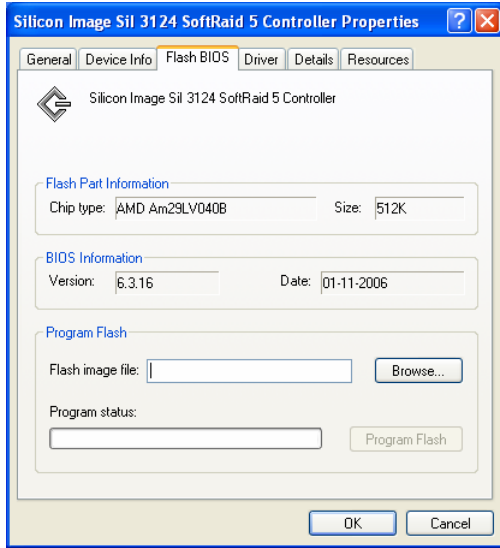
Note: If your RAID controller is embedded on your system’s motherboard, the **Flash BIOS** tab may not appear. If it does appear, the Flash Chip type, Flash Size, BIOS version and BIOS date will appear as **“Unknown”**. Any BIOS updates should be obtained from your motherboard vendor.

Device Manager Method

To view the Device Information for each of the RAID controllers that are installed in your system, click on **Start** and right-click on **My Computer**, then select **Manage** → **Device Manager** and expand the **SCSI and RAID Controllers** item. Right-click on the RAID controller you want to view, and click on **Properties** to display the following dialog box:



Click on the **Flash BIOS** tab to display the following dialog box:



This dialog box displays information about the current Flash BIOS and allows you to download an updated Flash BIOS version onto the RAID controller. To download a new Flash BIOS version, enter the filename or click on the **Browse...** button to navigate to it, and then click on the **Program Flash** button. The progress bar will show the download status. Do not interrupt the download before it completes.

Note: If your RAID controller is embedded on your system's motherboard, the **Flash BIOS** tab may not appear. If it does appear, the Flash Chip type, Flash Size, BIOS version and BIOS date will appear as "**Unknown**". Any BIOS updates should be obtained from your motherboard vendor.
