SATA Host Controller
User Manual

Revision 1.01
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INTRODUCTION

This section gives a brief introduction on the RAID-related background knowledge and a brief introduction on VIA SATA RAID Host Controller. For users wishing to install their VIA SATA RAID driver and RAID software, proceed to **Driver and RAID Software Installation** section.

RAID Basics

RAID (Redundant Array of Independent Disks) is a method of combining two or more hard disk drives into one logical unit. The advantage of an Array is to provide better performance or data fault tolerance. Fault tolerance is achieved through data redundant operation, where if one drives fails, a mirrored copy of the data can be found on another drive. This can prevent data loss if the operating system fails or hangs. The individual disk drives in an array are called "members". The configuration information of each member is recorded in the "reserved sector" that identifies the drive as a member. All disk members in a formed disk array are recognized as a single physical drive to the operating system.

Hard disk drives can be combined together through a few different methods. The different methods are referred to as different RAID levels. Different RAID levels represent different performance levels, security levels and implementation costs. The RAID levels which the VIA VT6420 SATA RAID Host Controller supports are RAID 0, 1, and JBOD. The table below briefly introduced these RAID levels.

RAID Level	No. of Drives	Capacity	Benefits
RAID 0 (Striping)	2 to 4	Number drives * Smallest size	Highest performance without data protection
RAID 1 (Mirroring)	2	Smallest size	Data protection
JBOD (Spanning)	2 to 4	Sum of All drives	No data protection and performance improving, but disk capacity fully used.

RAID 0 (Striping)

RAID 0 reads and writes sectors of data interleaved between multiple drives. If any disk member fails, it affects the entire array. The disk array data capacity is equal to the number of drive members times the capacity of the smallest member. The striping block size can be set from 4KB to 64KB. RAID 0 does not support fault tolerance.

RAID 1 (Mirroring)

RAID 1 writes duplicate data onto a pair of drives and reads both sets of data in parallel. If one of the mirrored drives suffers a mechanical failure or does not respond, the remaining drive will continue to function. Due to redundancy, the drive capacity of the array is the capacity of the smallest drive. Under a RAID 1 setup, an extra drive called the "spare drive" can be attached. Such a drive will be activated to replace a failed drive that is part of a mirrored array. Due to the fault tolerance, if any RAID 1 drive fails, data access will not be affected as long as there are other working drives in the array.

JBOD (Spanning)

A spanning disk array is equal to the sum of the all drives when the drives used are having different capacities. Spanning stores data onto a drive until it is full, then proceeds to store files onto the next drive in the array. When any disk member fails, the failure affects the entire array. JBOD is not really a RAID and does not support fault tolerance.

Key Features

The VIA SATA RAID solution uses the VT6420 chip as a RAID controller, which is a 2-channel SATA and 1-channel ATA133 solution. The RAID software is a Windows-based software utility with graphical user interface that provides an easy-operating tool to configure and manage disk drives or disk arrays connected to the VT6420 controller. Listed below are the main features and benefits of VIA SATA RAID:

1. Support two SATA + two PATA or four SATA hard disk drives.
2. Only SATA supports RAID.
3. Supports ATA 133 high performance hard disk drive.
4. Supports hard disk drive larger than 137 GB (48-bits LBA).
5. Dual independent ATA channels and maximum connection of four hard disk drives allowed.
6. Supports Ultra DMA mode 6/5/4/3/2/1/0, DMA mode 2/1/0, and PIO mode 4/3/2/1/0.
7. Supports PCI Plug and Play. PCI interrupt sharing and coexists with mainboard IDE controller.
8. Supports IDE bus master operation.
9. Supports RAID 0, 1, and JBOD.
10. 4 KB to 64 KB striping block size support.
11. Bootable disk or disk array support.
12. Windows-based RAID configure and management software tool. (Compatible with BIOS)
13. Real-time monitoring of device status and error alarm with popup message box and beeping.
14. Supports hot-swap failed disk drive in RAID 1 array.
15. Mirroring automatic background rebuilds support.
16. ATA SMART function support.
17. Microsoft Windows 98, Me, NT4.0, 2000, XP operating systems support.
18. Event log for easy troubleshooting.
19. On-line help for easy operation for RAID software.

INSTALLING THE HARD DRIVES

The VT6420 SATA controller provides the following two configurations:

1. Two SATA + Two PATA Configuration:

VT6420 supports two "Master" SATA hard disk drives and one "Master", one "Slave" PATA hard disk drives. Only SATA hard disk drive supports RAID, so it supports RAID 0, RAID 1, and JBOD. PATA Hard disk drives must be Ultra ATA/133, Ultra ATA/100, Ultra ATA/66, Ultra ATA/33, and/or ATA-3 compatible to operate with the VT6420 SATA RAID controller.

2. Four SATA Configuration:

Supports RAID 0, RAID 1, and JBOD.

For maximized performance, installing all identical SATA drives of the same model and capacity is recommended. Striping (RAID 0) and JBOD both use two up to four new drives, while mirroring (RAID 1) uses two new drives. Please connect SATA hard disk drivers according to the following table.

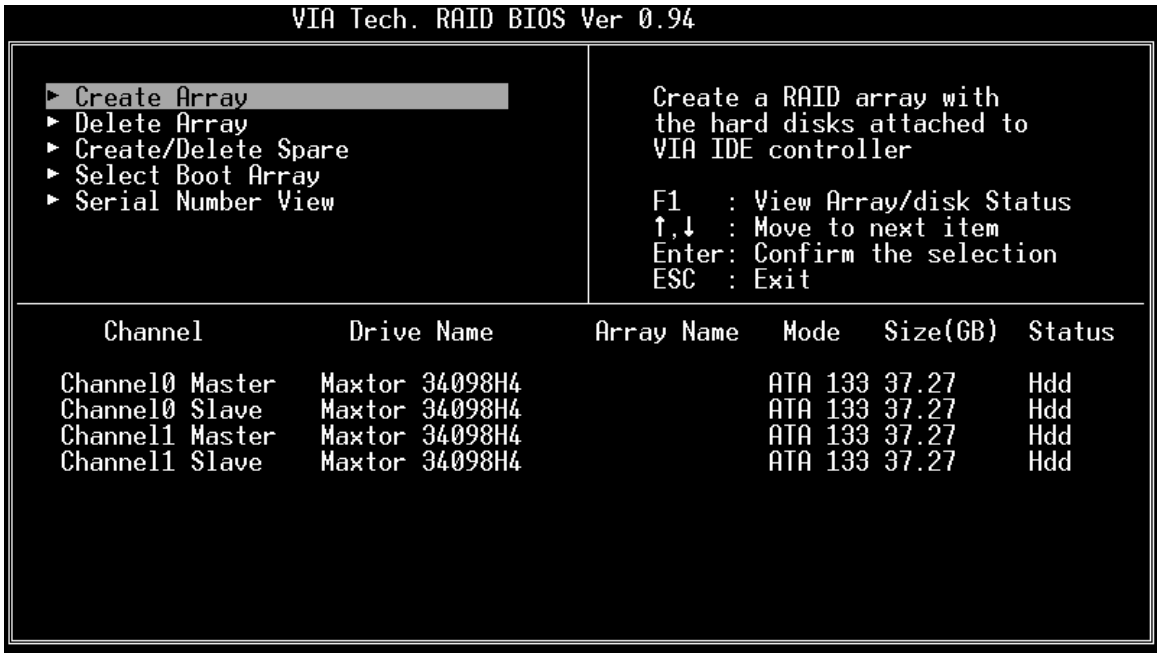
Number of Drives	SATA Channel 0	SATA Channel 1
1	Master	------
2	Master	Master
3	Master & Slave	Master
4	Master & Slave	Master & Slave

BIOS CONFIGURATION UTILITY

Enter BIOS Configuration Utility

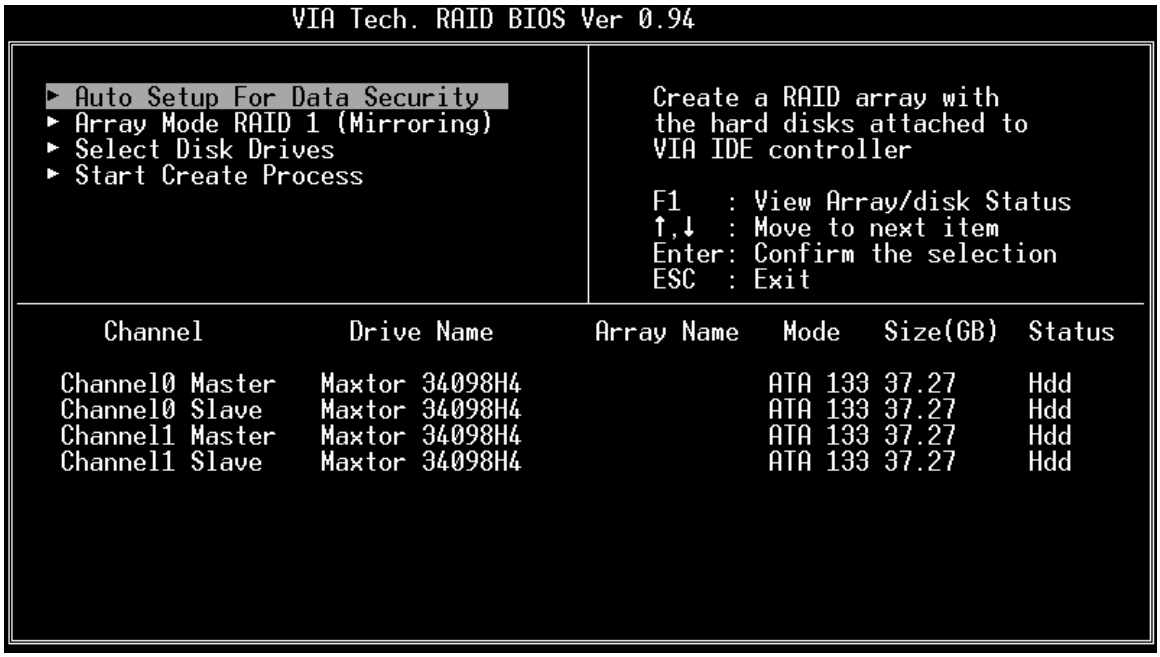
When the system powers on, the following information will appear on screen. Press the 'Tab' key to enter BIOS configuration utility.

The main interface of BIOS configuration utility is as below:

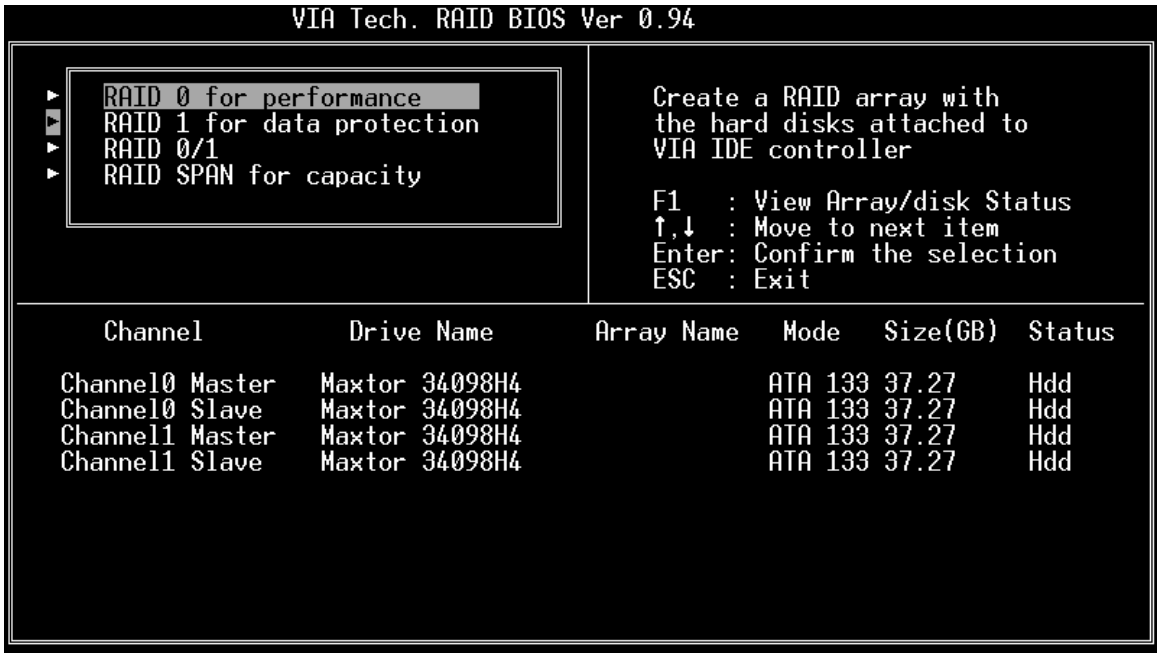


Create Disk Array

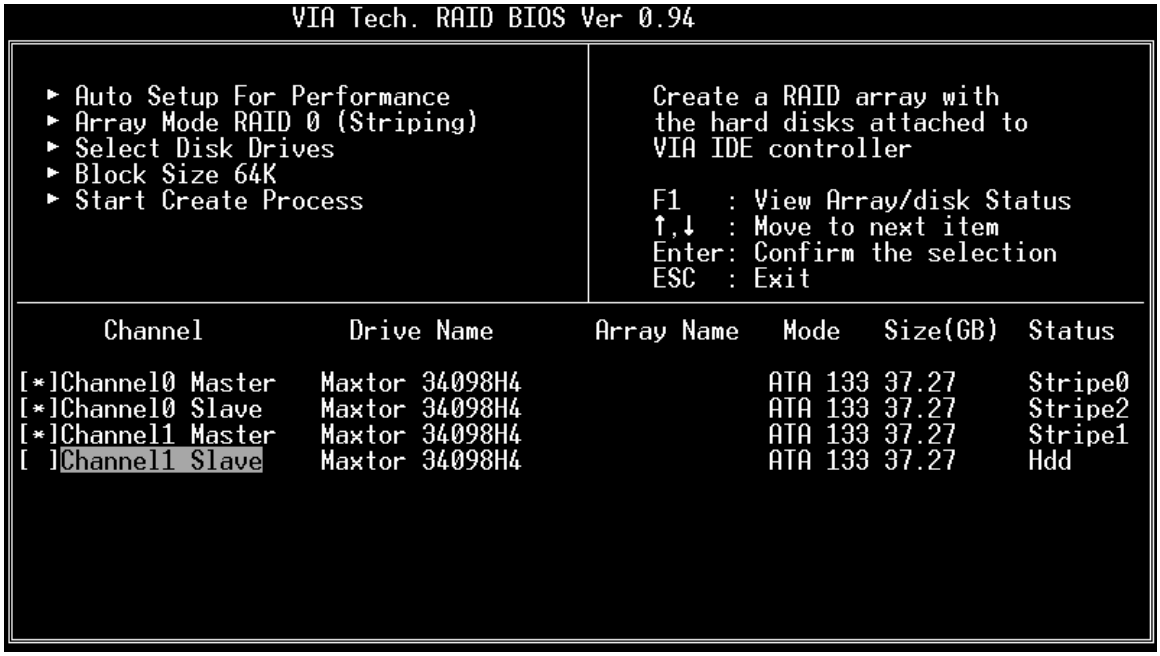
1. Use the arrow keys to navigate the main menu. Use the up and down arrow keys to select the **Create Array** command and press <Enter> to call out the list of creation steps.



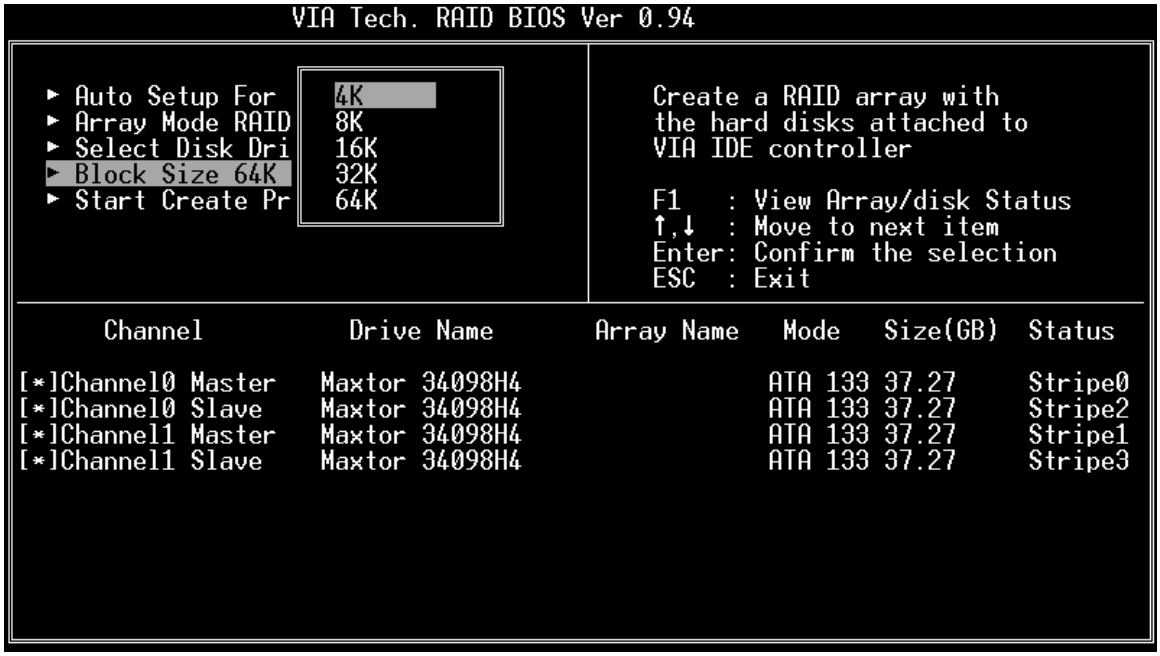
2. Select **Array Mode** and press <Enter>, a list of array modes will appear. Highlight the target array mode that you want to create, and press <Enter> to confirm the selection. If RAID 1 or RAID 0/1 is selected, an option list will popup and enable the users to select **Create only** or **Create and duplicate**. **Create only** will allow BIOS to only create an array. The data on the mirroring drive may be different from the source drive. **Create and duplicate** lets BIOS copy the data from the source to the mirroring drive.



3. After array mode is selected, there are two methods to create a disk array. One method is "**Auto Setup**" and the other one is "**Select Disk Drives**". **Auto Setup** allows BIOS to select the disk drives and create arrays automatically, but it does not duplicate the mirroring drives even if the user selected **Create and duplicate** for RAID 1. It is recommended all disk drives are new ones when wanting to create an array. **Select Disk Drives** lets the user select the array drives by their requirements. When using **Select Disk Drives**, the channel column will be activated. Highlight the target drives that you want to use and press <Enter> to select them. After all drives have been selected, press <Esc> to go back to the creation steps menu.



4. If user selects a RAID 0 array in step 2, the block size of the array can also be selected. Use the arrow key to highlight **Block Size** and press <Enter>, then select a block size from the popup menu. The block size can be 4KB to 64KB.

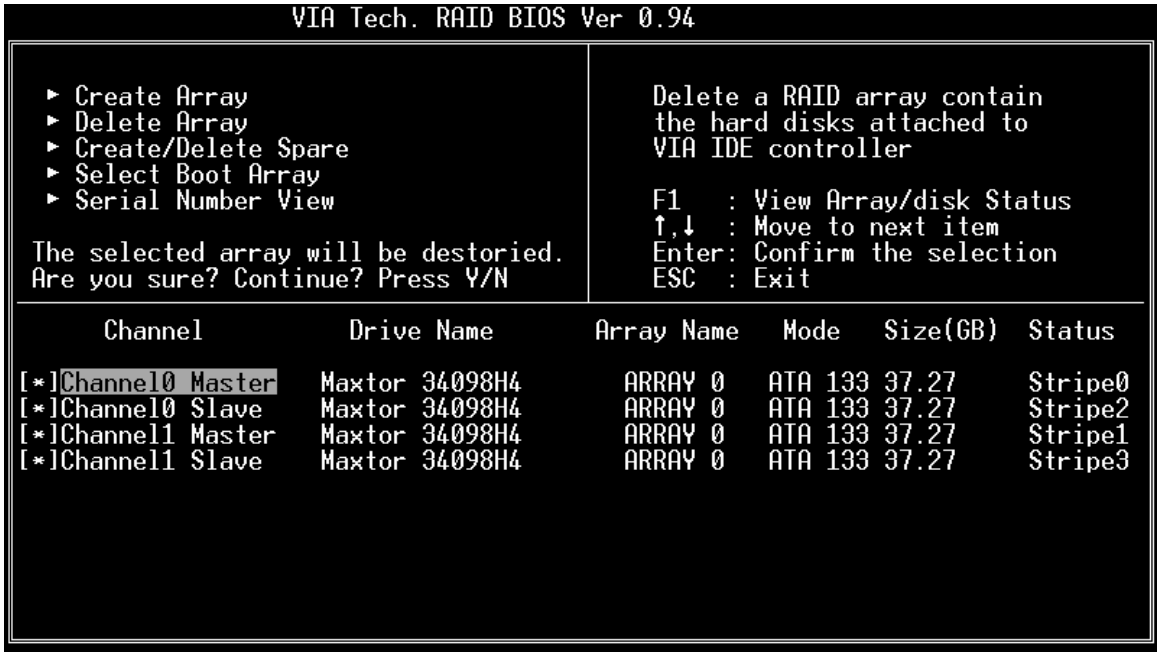


5. Use the arrow key to highlight **Start Create Process** and press <Enter>. A warning message will appear, Press **Y** to finish the creation, or press **N** to cancel the creation.
6. Important note: All existing content in the hard drive will be destroyed after array creation.

Delete Disk Array

A RAID can be deleted after it has been created. To delete a RAID, use the following steps:

1. Select **Delete Array** in the main menu and press <Enter>. The channel column will be activated.
2. Select the member of an array that is to be deleted and press <Enter>. A warning message will show up, press Y to delete or press N to cancel.

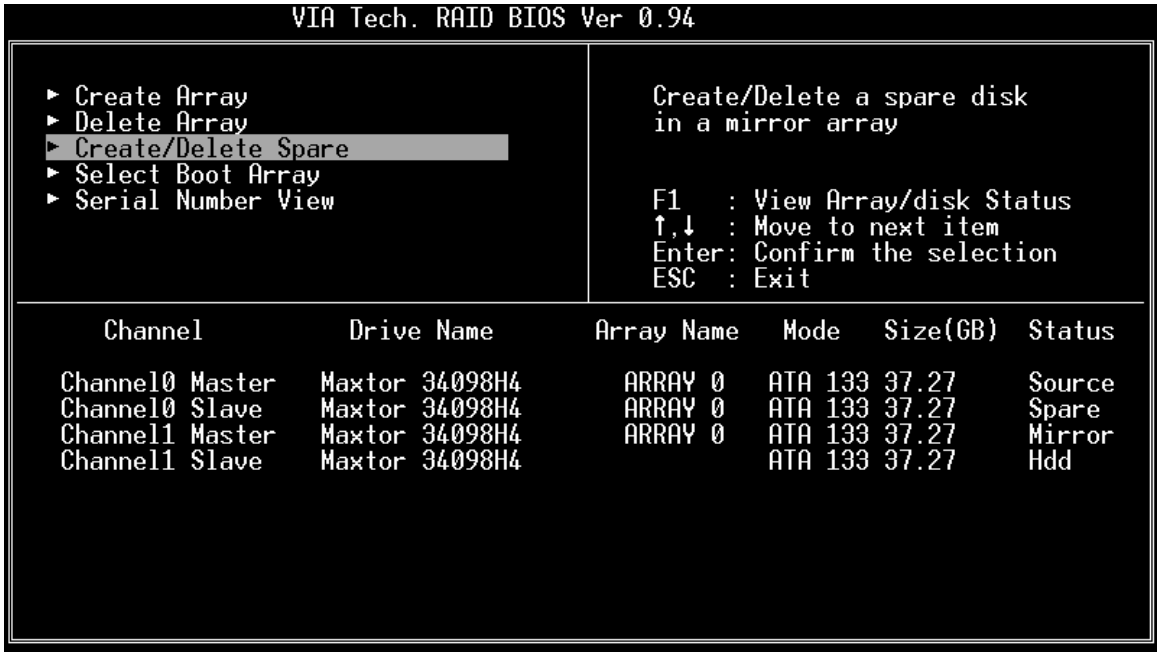


Deleting a disk array will destroy all the data on the disk array except RAID 1 arrays. When a RAID is deleted, the data on these two hard disk drives will be reserved and become two normal disk drives.

Create and Delete Spare Hard Drive

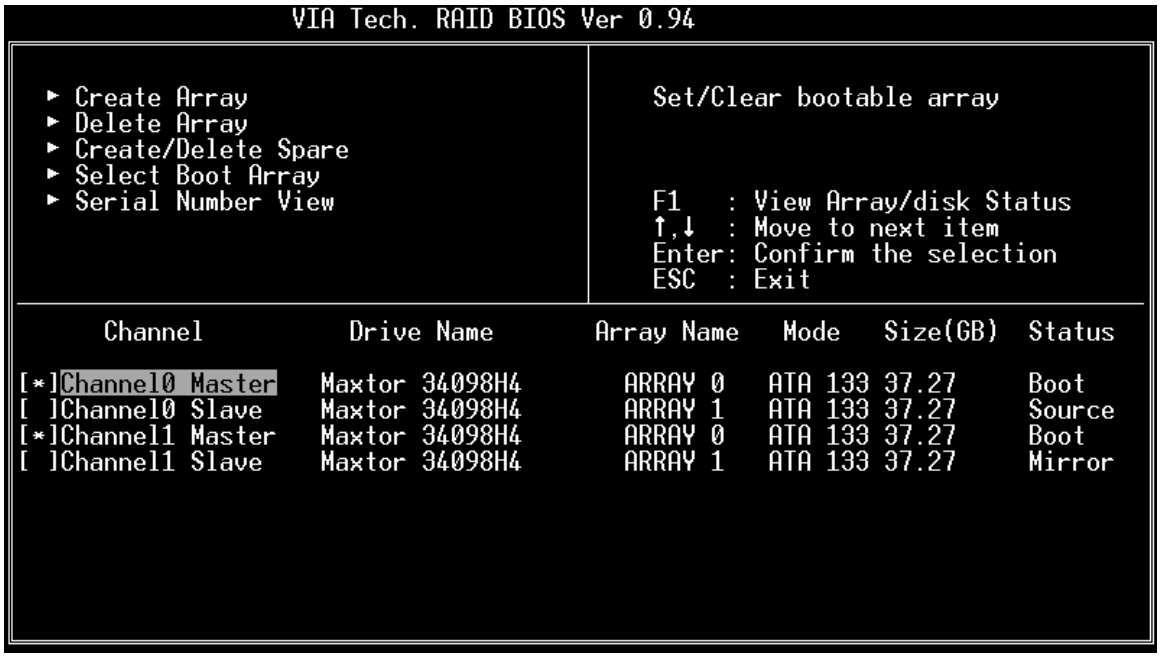
If a RAID 1 array is created and there are drives that do not belong to other arrays, the one that has a capacity which is equal to or greater than the array capacity can be selected as a spare drive for the RAID 1 array. Select **Create/Delete Spare** and press <Enter>, the channel column will then be activated. Select the drive that you want to use as a spare drive and press <Enter>, the selected drive will be marked as **Spare**. The spare drive cannot be accessed in an OS.

To delete a spare drive, highlight **Create/Delete Spare** and press <Enter>. The spare drive will be highlighted, press <Enter> to delete the spare drive.



Select Boot Array

User can select a disk array as boot device if user wants to boot operating system from an array. Boot disk array cannot be selected if the operating system does not boot from the disk array. Highlight the **Select Boot Array** item; press <Enter> and the channel column will be activated. Then highlight the target disk array and press <Enter>. If user selects a disk array that has a boot mark and press <Enter>, its boot setting will be canceled.

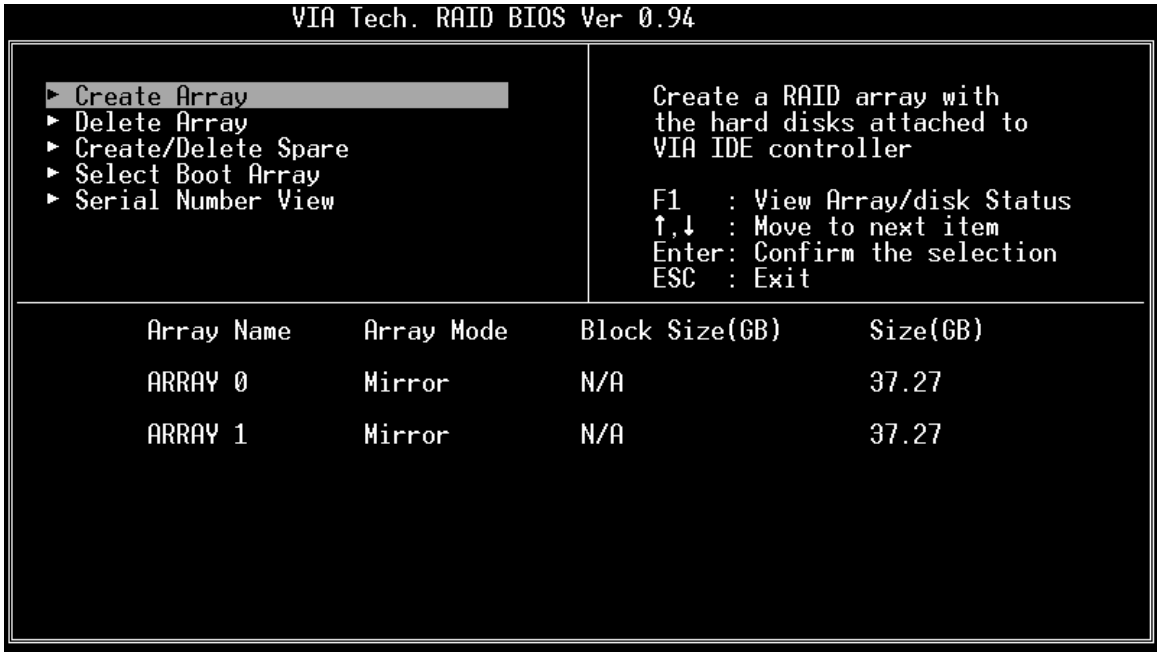


View Serial Number of Hard Drive

Highlight **Serial Number View** and press <Enter>. Use arrow key to select a drive, the selected drive's serial number can be viewed in the last column. The serial number is assigned by the disk drive manufacturer.

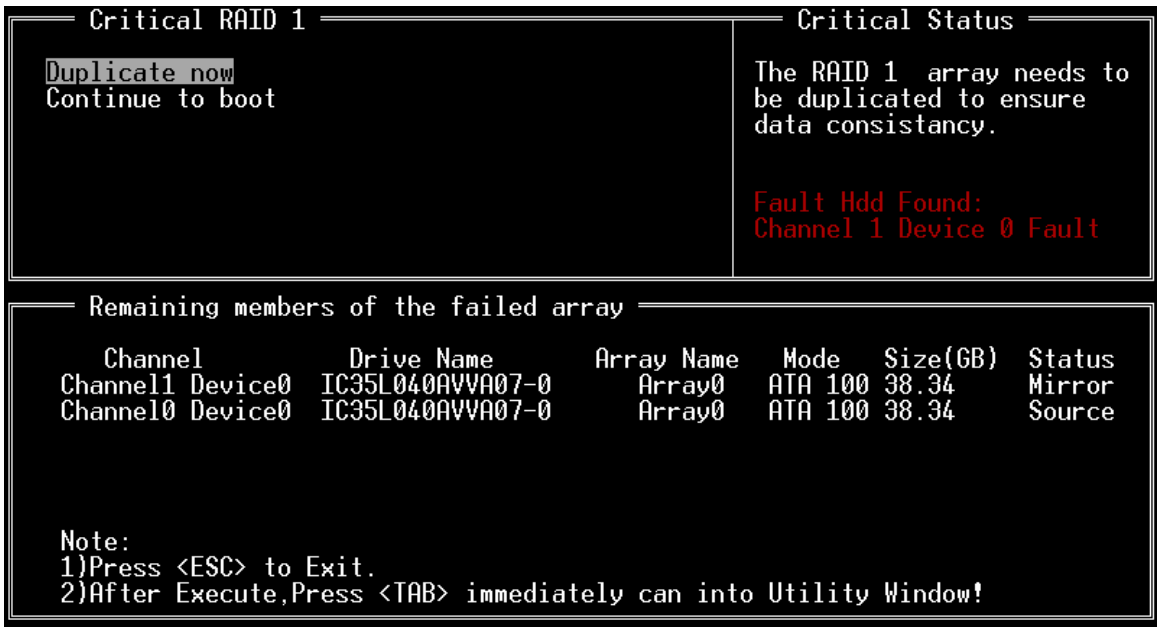
View Array Status

Press the **F1** key to show the array status on the lower screen. If there are no disk arrays then nothing will be displayed on the screen.



Duplicate Critical RAID 1 Array

When booting up the system, BIOS will detect if the RAID 1 array has any inconsistencies between user data and backup data. If BIOS detects any inconsistencies, the status of the disk array will be marked as critical, and BIOS will prompt the user to duplicate the RAID 1 in order to ensure the backup data consistency with the user data.



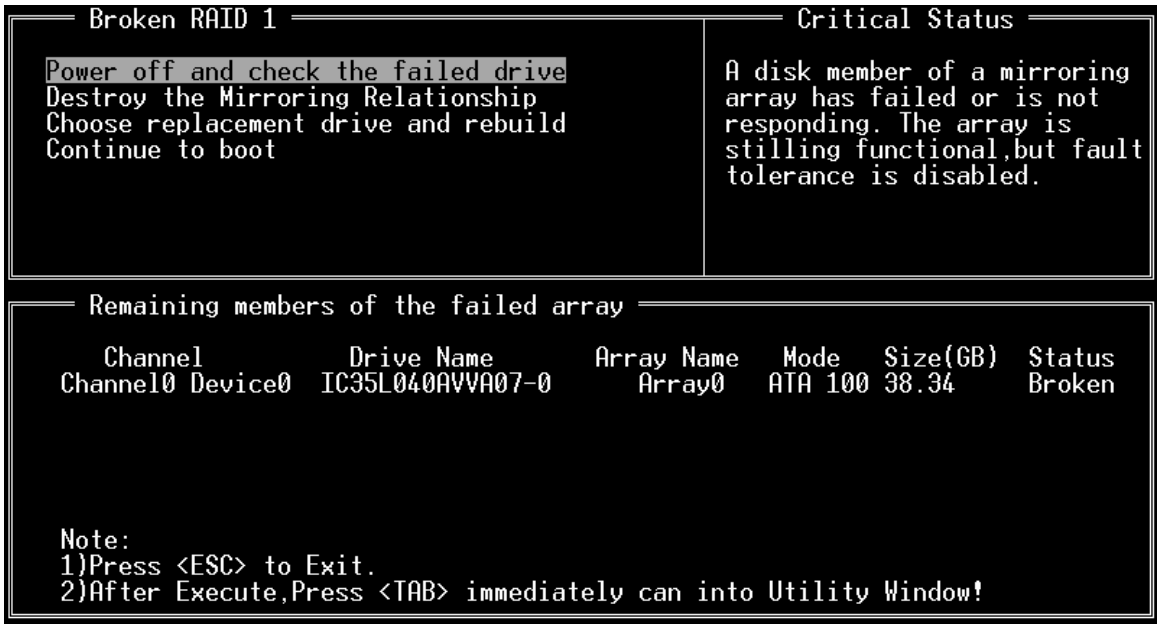
If user selects **Continue to boot,** it will enable duplicating the array after booting into OS.

Rebuild Broken RAID 1 Array

When booting up the system, BIOS will detect if any member disk drives of RAID has failed or is absent. If BIOS detects any disk drive failures or missing disk drives, the status of the array will be marked as broken.

If BIOS detects a broken RAID 1 array but there is a spare hard drive available for rebuilding the broken array, the spare hard drive will automatically become the mirroring drive. BIOS will show a main interface just like a duplicated RAID 1. Selecting **Continue to boot** enables the user to duplicate the array after booting into operating system.

If BIOS detects a broken RAID 1 array but there is no spare hard drive available for rebuilding the array, BIOS will provide several operations to solve such problem.



1. Power off and Check the Failed Drive:

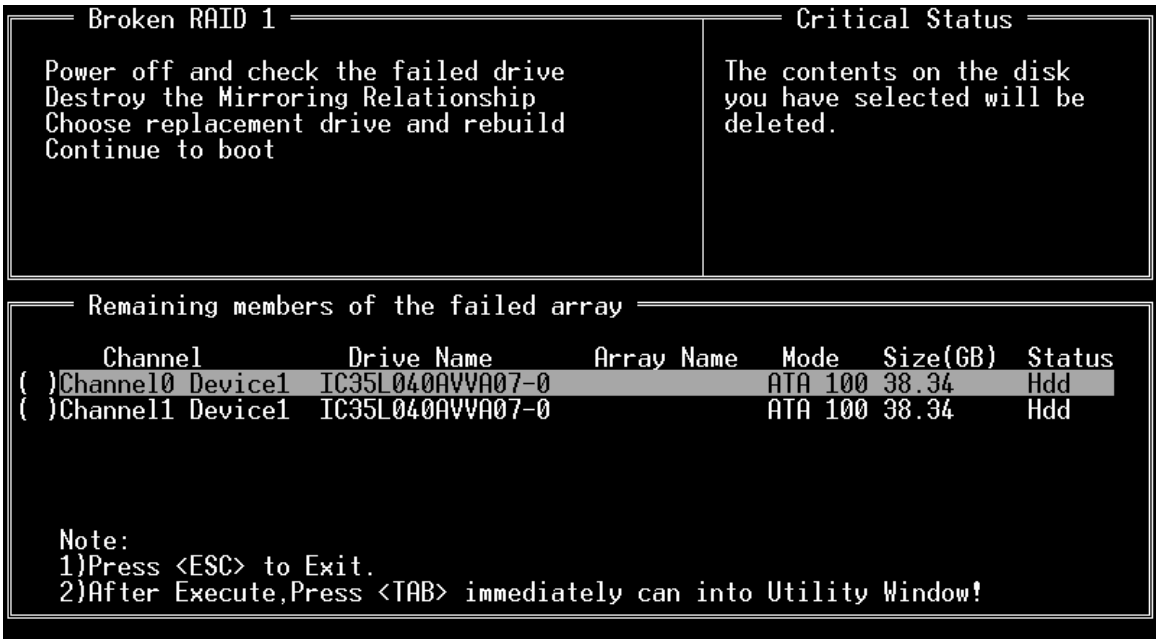
This item turns off the computer and replaces the failed hard drive with a good one. If your computer does not support APM, you must turn off your computer manually. After replacing the hard drive, boot into BIOS and select **Choose replacement drive and rebuild** to rebuild the broken array.

2. Destroy the Mirroring Relationship:

This item cancels the data mirroring relationship of the broken array. For broken RAID 1 arrays, the data on the surviving disk will remain after the destroy operation. However, **Destroy the Mirroring Relationship** is not recommend because the data on the remaining disk will be lost when the hard drive is used to create another RAID 1 array.

3. Choose Replacement Drive and Rebuild:

This item enables users to select an already-connected hard drive to rebuild the broken array. After choosing a hard drive, the channel column will be activated.



Highlight the target hard drive and press <Enter>, a warning message will appear. Press **Y** to use that hard drive to rebuild, or press **N** to cancel. Please note selecting option **Y** will destroy all the data on the selected hard drive.

4. Continue to boot:

This item enables BIOS to skip the problem and continue booting into OS.

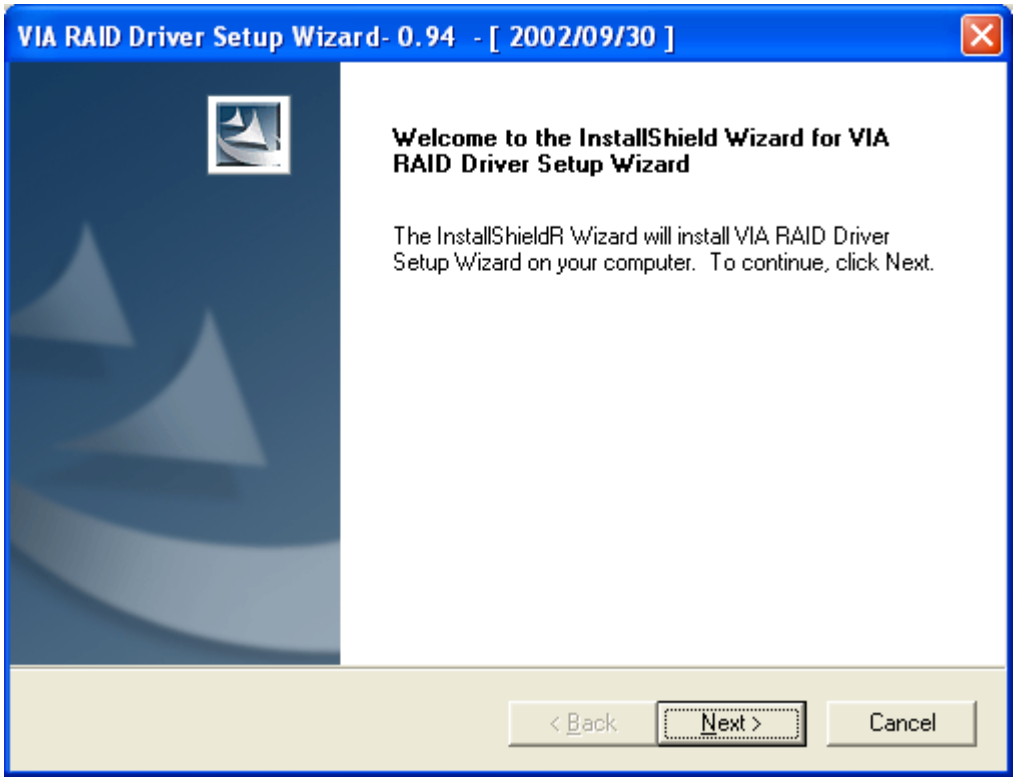
DRIVER AND RAID SOFTWARE INSTALLATION

Microsoft Windows Driver Installation

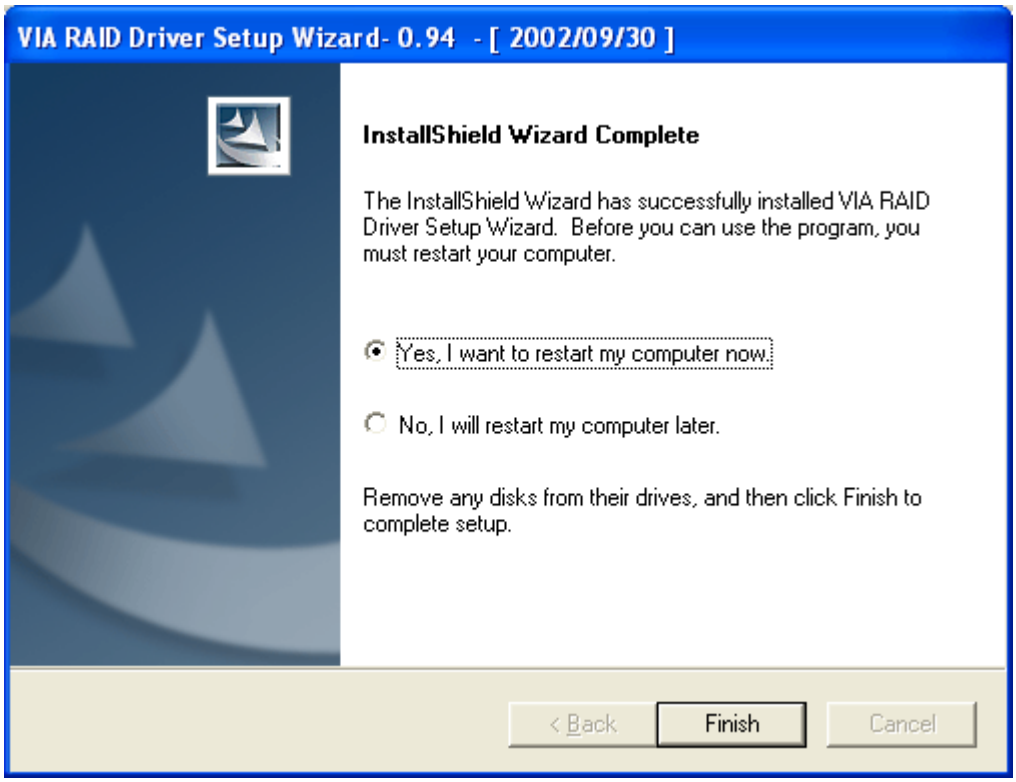
1. After Windows has finished booting up, the system will automatically find the newly installed adapter and prompt the **Found New Hardware Wizard** window. Click **Cancel** to skip it.

2. Insert the RAID driver and software installation CD or diskettes. Browse the CD or diskettes and double click on **setup.exe** to begin the driver and software installation.

3. Confirm the follow-up dialogue windows to finish the installation.



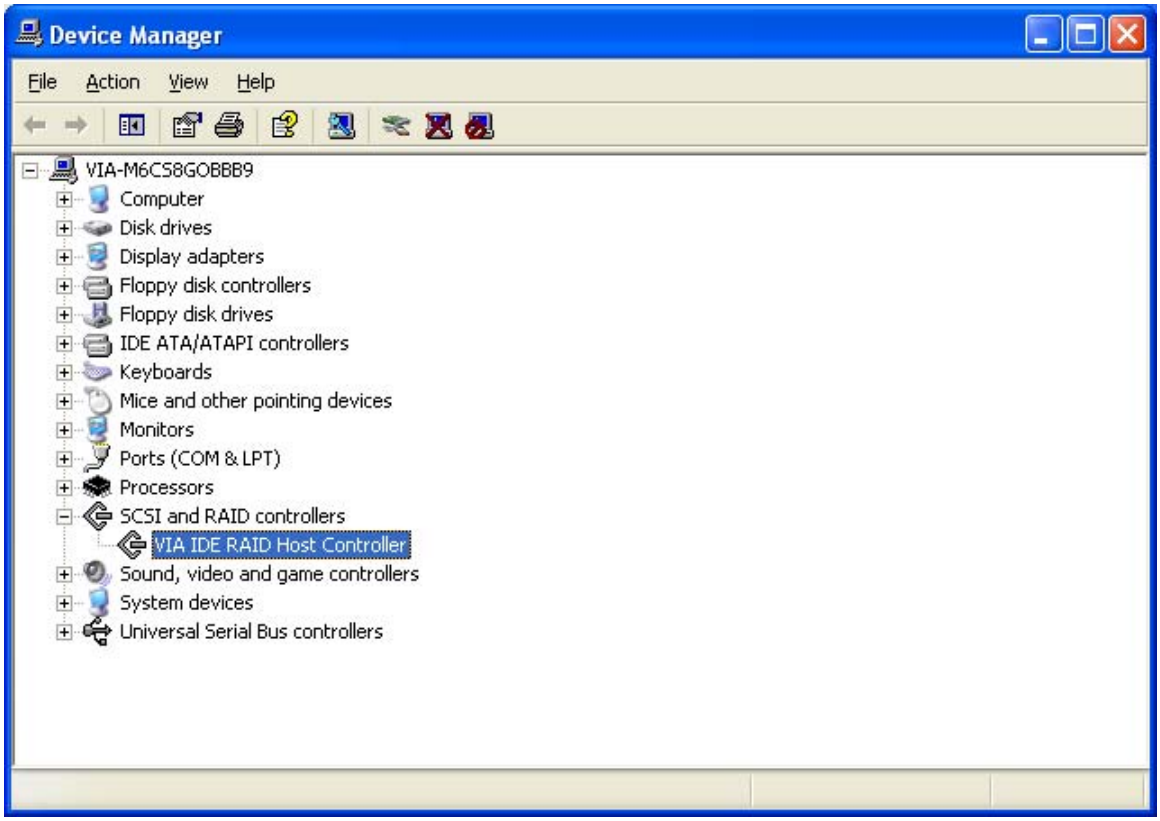
4. When installation is completed, click **Finish** to restart the system.



Verify Installation

After the driver installation is completed and the system has restarted:

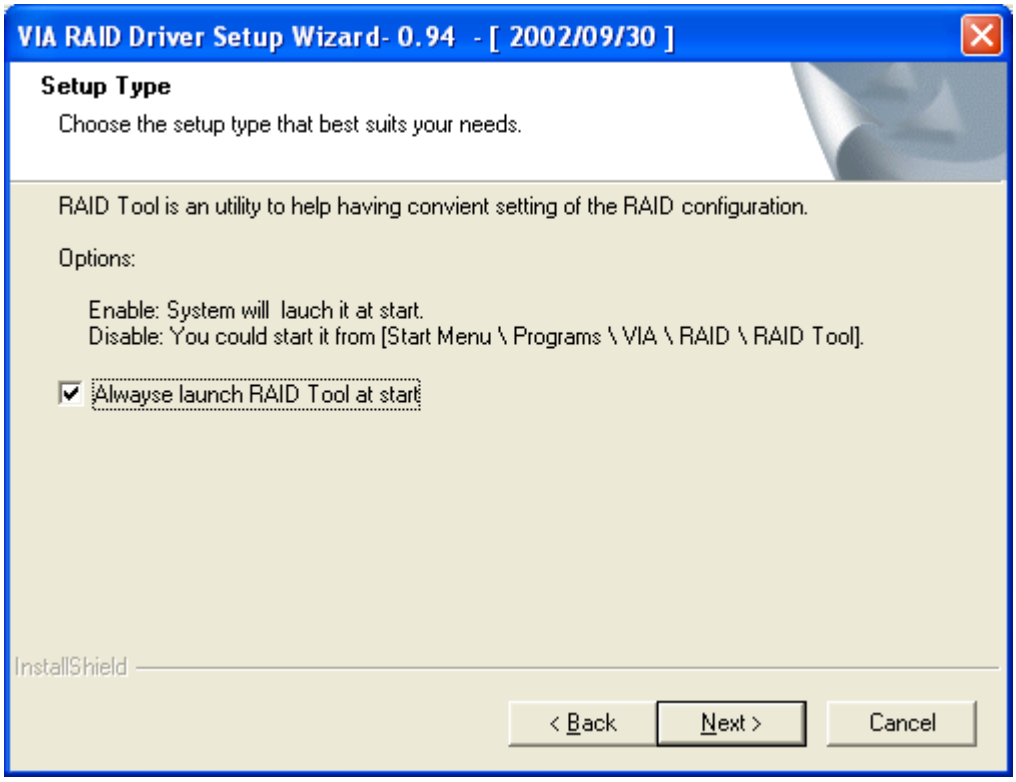
1. Right-click on **My Computer** and select **Properties** from the popup menu.
2. From the popup window, click on **Hardware** and then click on **Device Manager**.
3. Expand the **SCSI and RAID controllers** tree as shown below. If the VIA IDE RAID Host Controller does not exist or there is a "?" or "!" marking on the device icon, it means the driver has not been installed correctly and needs to be reinstalled.



RAID SOFTWARE

Installation

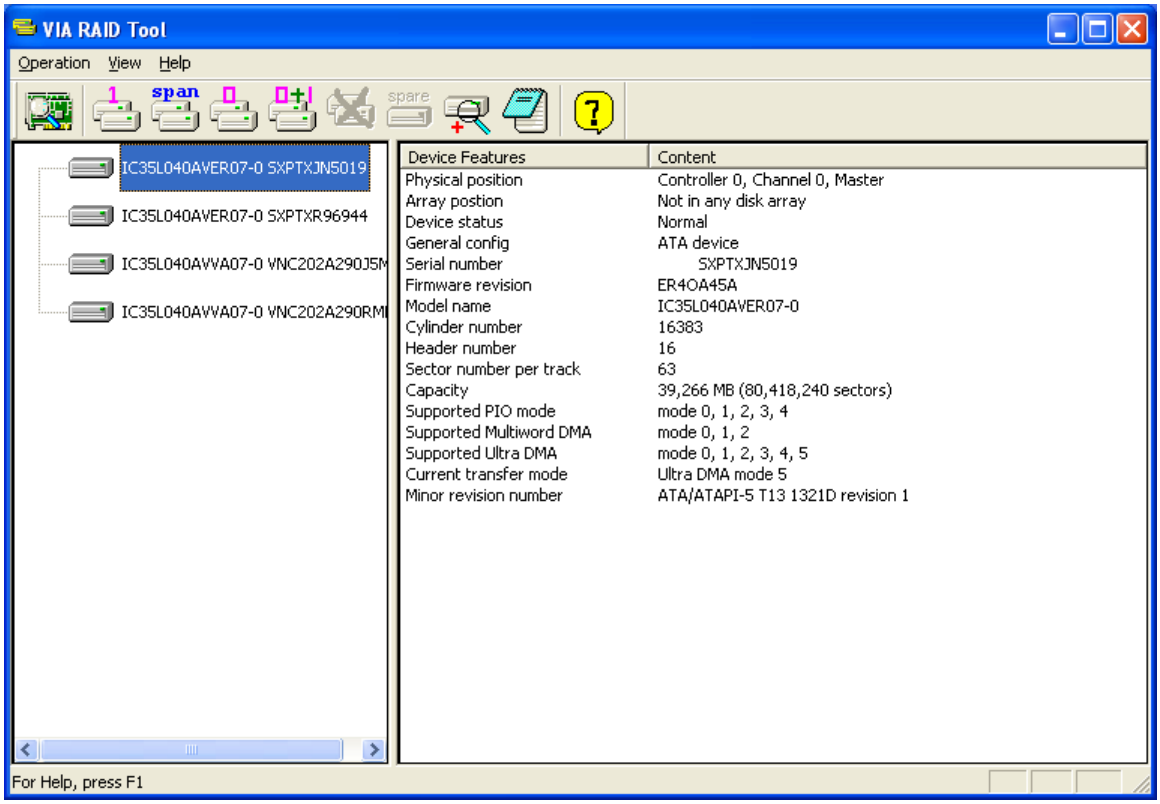
The RAID software is installed simultaneously with driver installation.



Getting Start

After installing the GUI software, it will be automatically started every time Windows is initiated. An icon  will appear in the system tray of the tool bar to indicate that GUI software is currently running.

Double click on the system tray icon to launch the main interface of the utility.



The main interface is divided into two windows and the toolbar above contain the main functions. Click on these toolbar buttons to execute their specific functions. The left windowpane displays the controller and disk drives and the right windowpane displays the details of the controller or disk drives.

 View by Controller

 Create Span Array (JBOD)

 Add/Remove Spare disk

 View Event log

 View by Devices

 Create Mirror Array (RAID 1)

 Create Stripe Array (RAID 0)

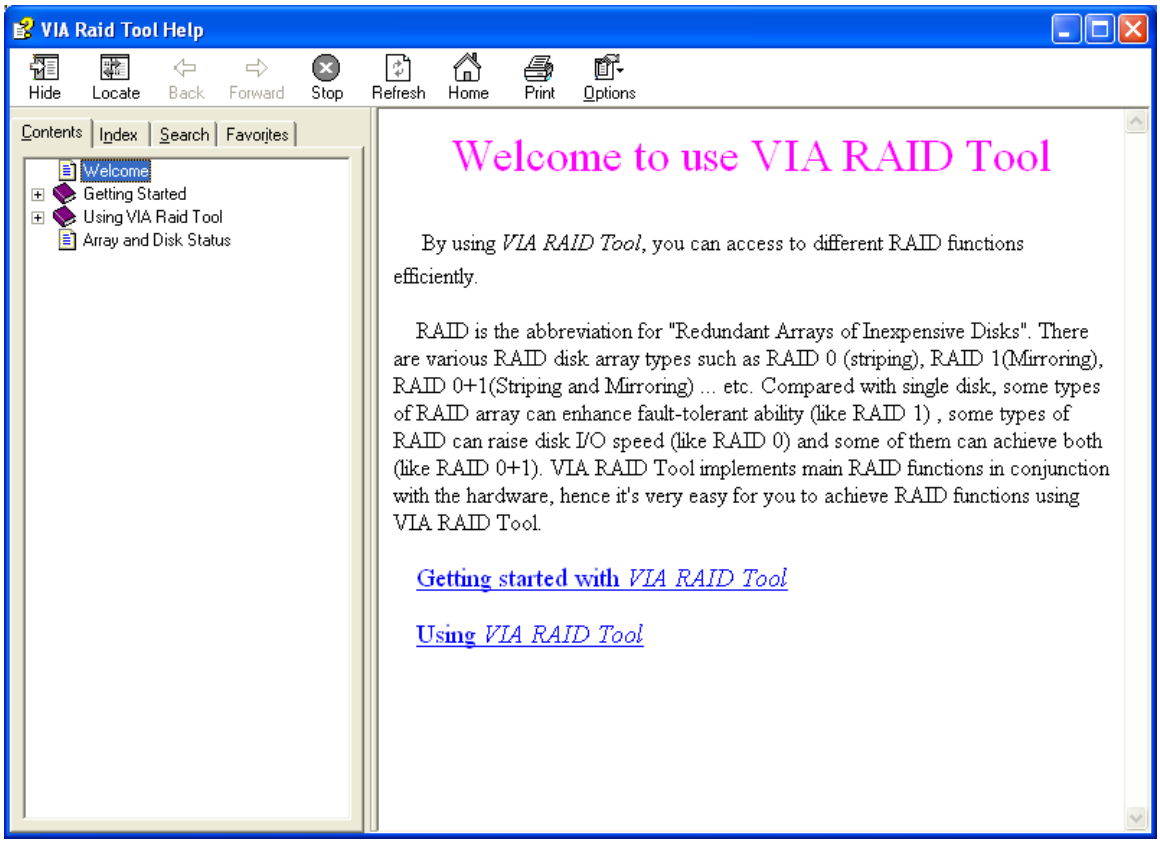
 Remove Array

 Check All Disks

 Help Topics

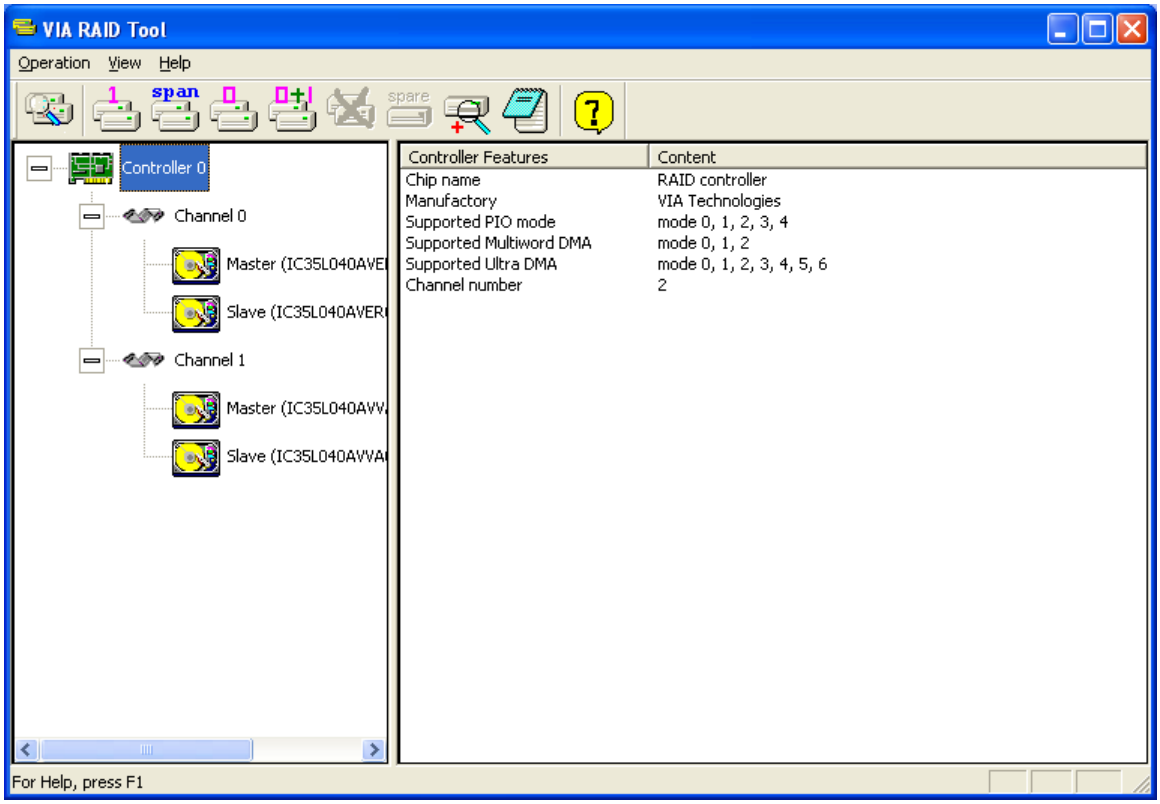
View Online Help

Click on  to launch the Help Topics. It is recommended that you read through the help articles before using RAID utility.



View Controller and Device Status

Click on  or  button to determine the viewing type of left windowpane. There are two viewing types: By controllers and by device. Click on the object in the left windowpane to display the status of the object in the right windowpane.



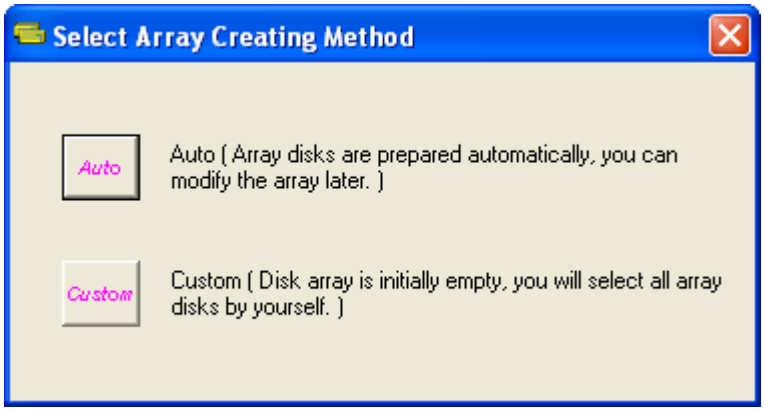
Create Disk Array

1. Depending on users' preferences, there are three buttons used to create a disk array: 

RAID 1, 

Span, and 

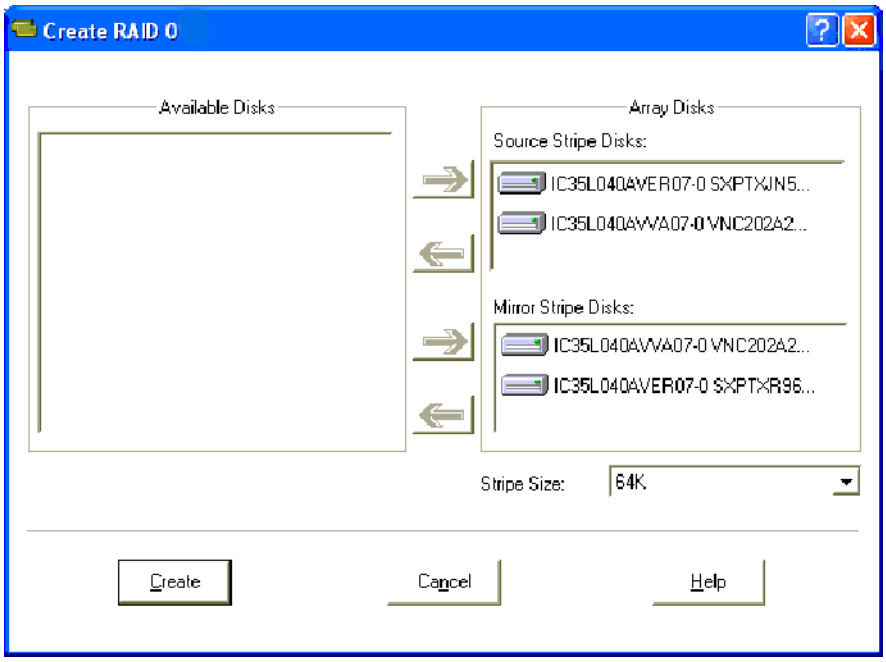
RAID 0. Click on the RAID button you want to create, the **Select Array Creating Method** will be displayed.



Auto: The utility will arrange the available hard disk drives to be the disk arrays. The hard disk drives can still be modified later. This method is strongly recommended.

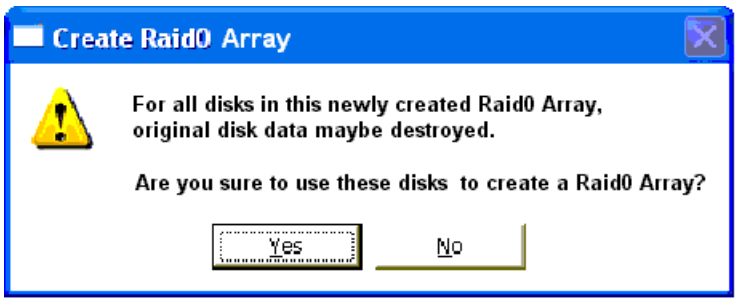
Custom: The utility will provide an interface to manually arrange the array.

2. Click on **Auto** to launch the creating array window. If **Custom** is selected, the available disks window lists the available disk drives that can be used to create the array. Select a disk drive and click on the right arrow button to add the specified disk drive to the array. Disk drives can be removed from the array by selecting an array disk and clicking on the left arrow button to remove the drive from the array.

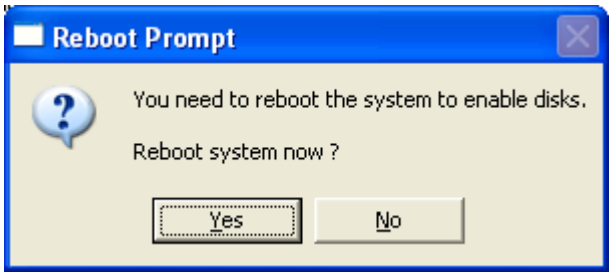


Click on "**Create**" to create or "**Cancel**" to exit. Click on "**Help**" to launch the Help Topics window.

3. A warning message will pop up after clicking on **Create** button. Click **Yes** to finish the creation of disk array, or **No** to cancel.

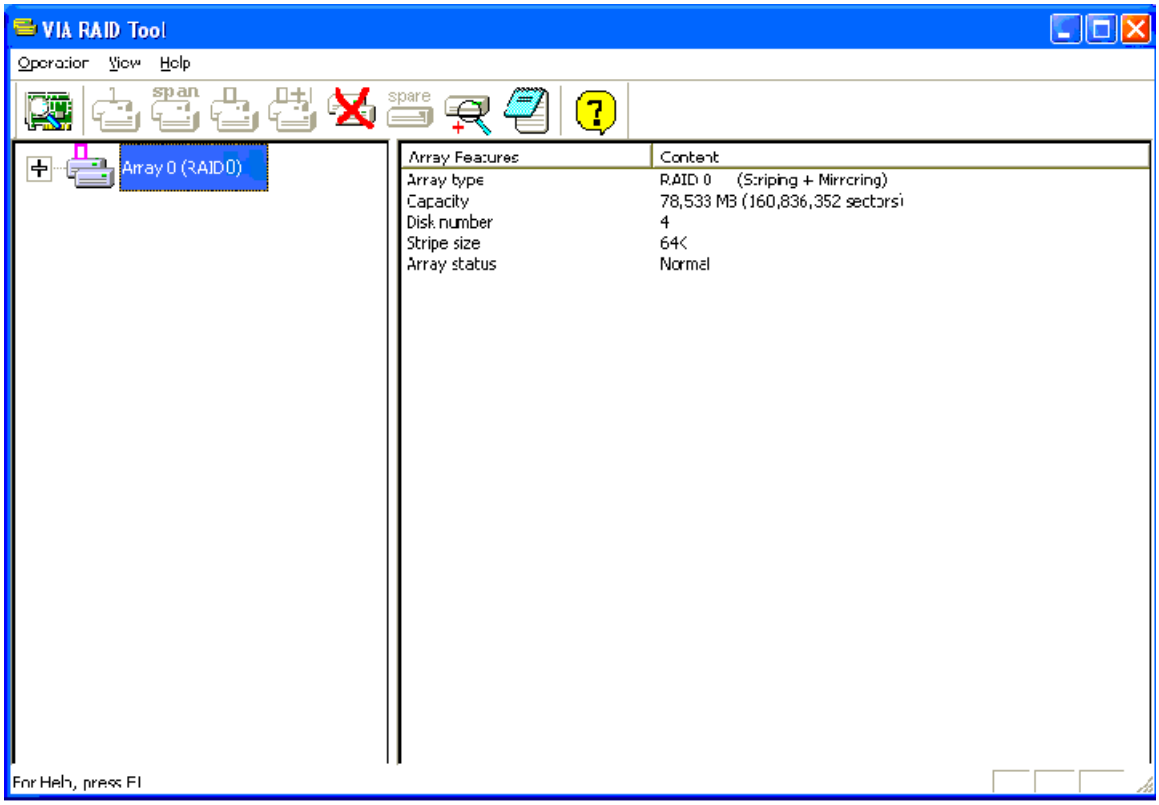


4. A message box will popup to prompt the user that disk array has been created successfully and ask the user whether to restart the computer. Click **Yes** to restart the computer or click **No** to skip restarting. The new disk array setting will take effect only after restarting.

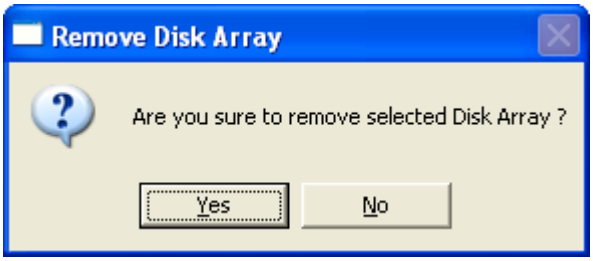


Delete Disk Array

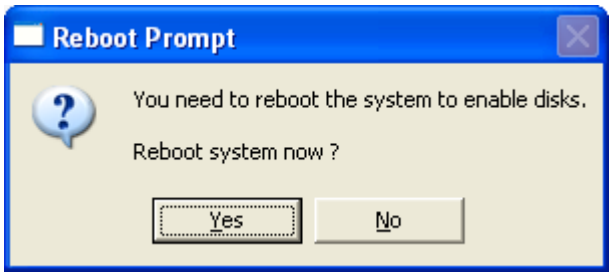
1. Select the disk array that you want to delete from the left windowpane, click on **Remove Array**  , a warning message will pop up.



2. Click **Yes** to delete the specified disk array or click **No** to cancel.



3. A message box will popup to prompt the user that disk array has been removed successfully and ask the user whether to restart the computer. Click **Yes** to restart the computer or click **No** to skip restarting. The new setting will take effect only after restarting.



Warning: Deleting a disk array will destroy all the data on the disk array except RAID 1 arrays. When a RAID 1 array is deleted, the data on these two hard disk drives will still remain and become two normal disk drives.

Add and Remove Spare Disk Drive

Add Spare Disk Drive

A spare disk drive can be added when a RAID 1 array is created. The capacity of the spare disk drive must be greater than or equal to the capacity of the RAID 1 array. If there is no spare disk drive in a RAID 1 array, user can add a spare disk drive after RAID 1 array is created by clicking on 

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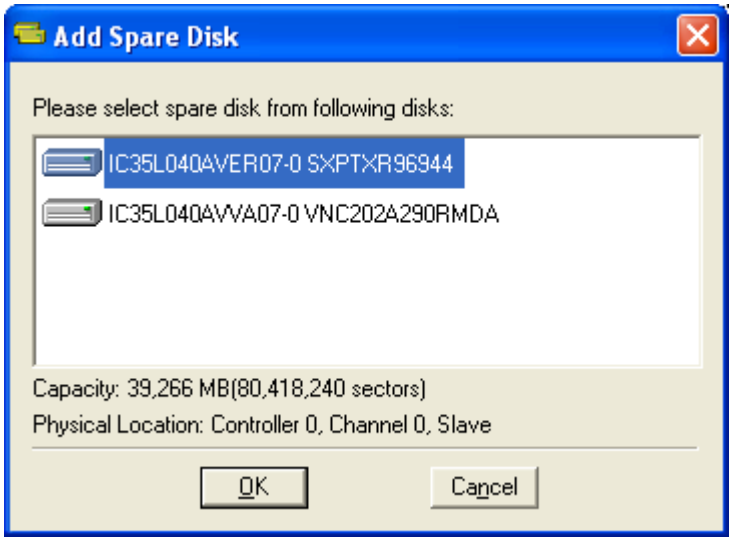
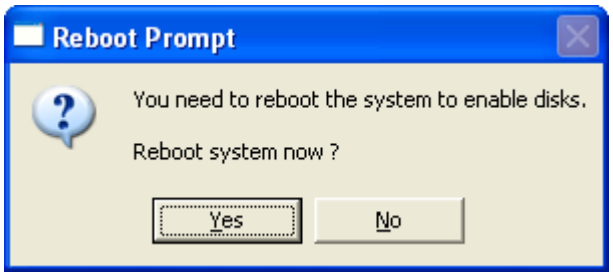
1. Select the RAID 1 array in the left windowpane and click on 

, the available disk drives will then be listed in a popup window.
2. Select a disk drive and click on **OK** to add a spare disk drive to RAID 1.



3. A warning message will popup, click **Yes** to finish adding the spare disk or **No** to cancel it.

4. A message box will popup to prompt the user that a spare disk drive has been successfully added to the specific RAID 1 array, and ask whether the user would like to restart the computer. Click **Yes** to restart the computer or click **No** to skip restarting. The new setting will take effect only after restarting.



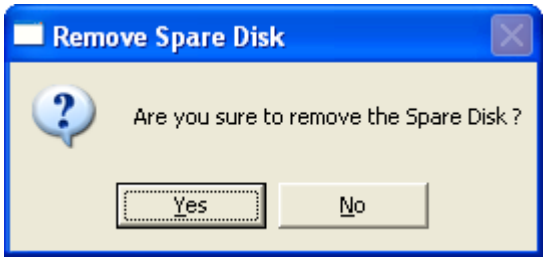
Note: The spare disk drive in the RAID 1 array cannot be accessed by the operating system.

Remove Spare Disk Drive

Spare disk drives can be removed from a specified RAID 1 and changed into normal hard disk drives.

1. Select the RAID 1 array that you want to remove from the spare disk drives in the left windowpane, and click on 

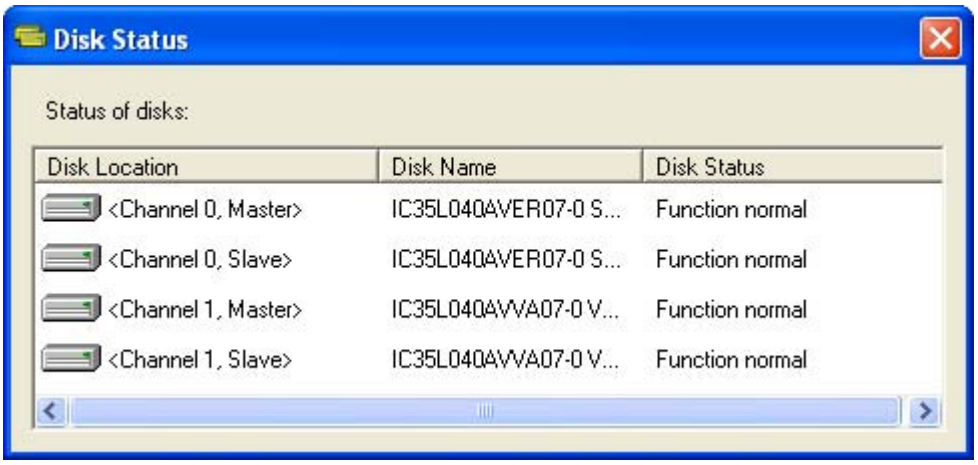
, a warning message will popup.



2. Click **Yes** to finish removing spare disk, or **No** to cancel.
3. A message box will popup to prompt the user that the spare disk drive has been successfully removed from specific RAID 1 array, and ask the user whether to restart the computer. Click **Yes** to restart the computer or click **No** to skip restarting. The new setting will take effect only after restarting

Check All Disks

You can check whether the disk drives are working normally at any time by clicking on  . After the disk check is completed, a dialog window will pop up to show the status of each disk. See picture below.

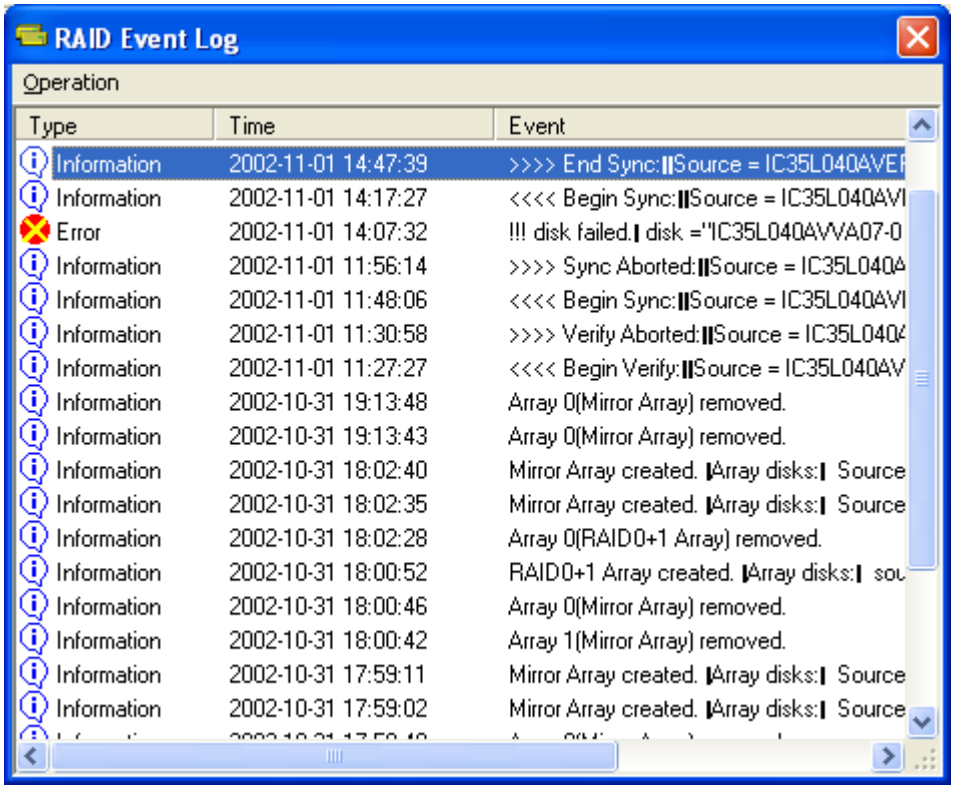


The hard disk drive must be compatible with the ATA/ATAPI-5 specification and support SMART commands, or the disk checking will fail.

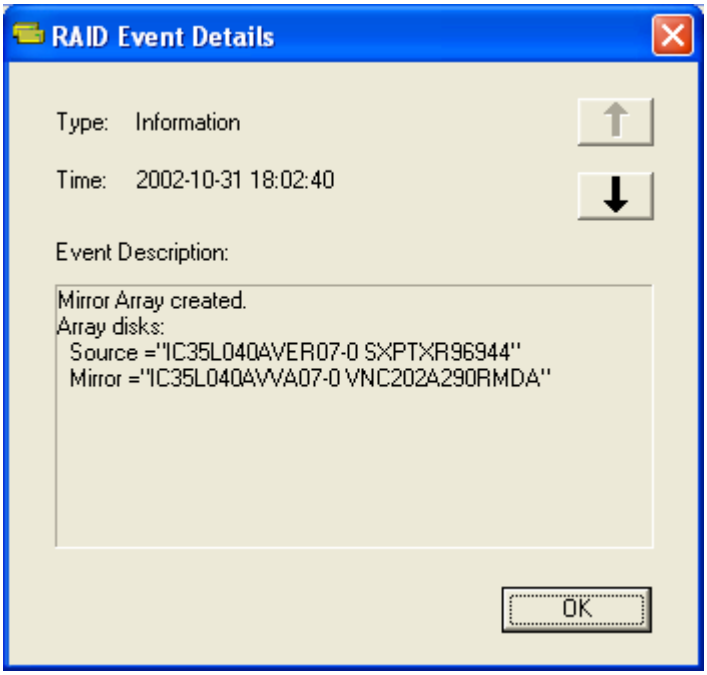
View Event Log

The RAID software records important events into a log file, such as disk array creation, disk array removal, disk failure, synchronization…etc.

1. Click on  to display the event log. There are three types of log items: Information  , Warning  , and Error  .



2. To view the details of a log item, you can double click on the log item, select the log item and press <Enter>, or select the log item and click on **Operation->View Detail** in the menu bar. The following dialog will appear.



Click on  or  to browse the next or previous log item.

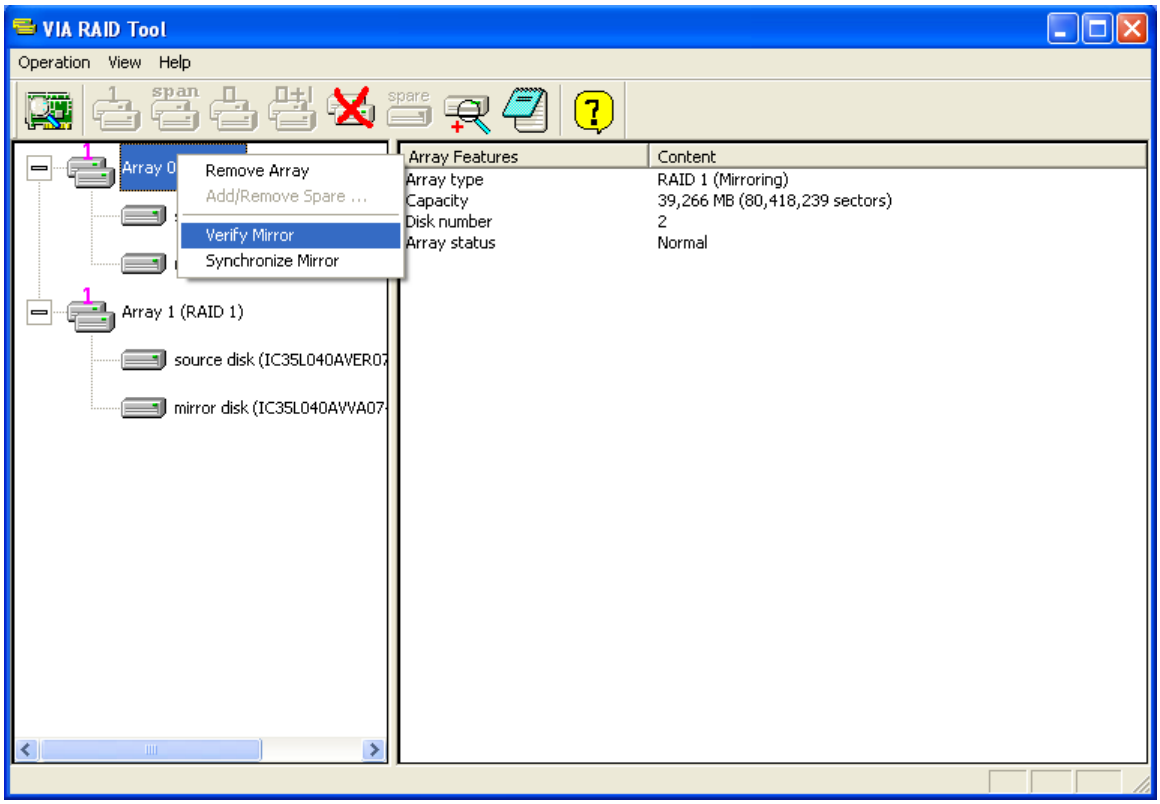
3. To clear all log items, click on **Operation->Clear All** in the menu bar.

Note: Only the operations in the RAID software can be recorded into the log file. The operations in BIOS will not be recorded.

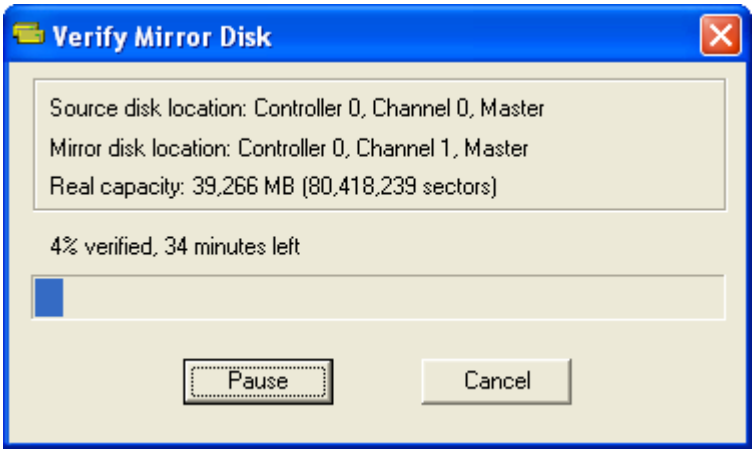
Verify Mirror Disk

The data on the mirror disk must be the same with its corresponding source disk to provide fault tolerance for RAID 1.

1. Select a RAID 1 array. Right-click the selected RAID, then a shortcut menu will be shown. Click on **Verify Mirror** to verify whether the source and mirror are identical.



2. After executing the “verify mirror” command, a dialog box will show the verifying process. This action can paused or canceled at any time. It may take a long time to verify the source and mirror disk if the capacity of the RAID is large.

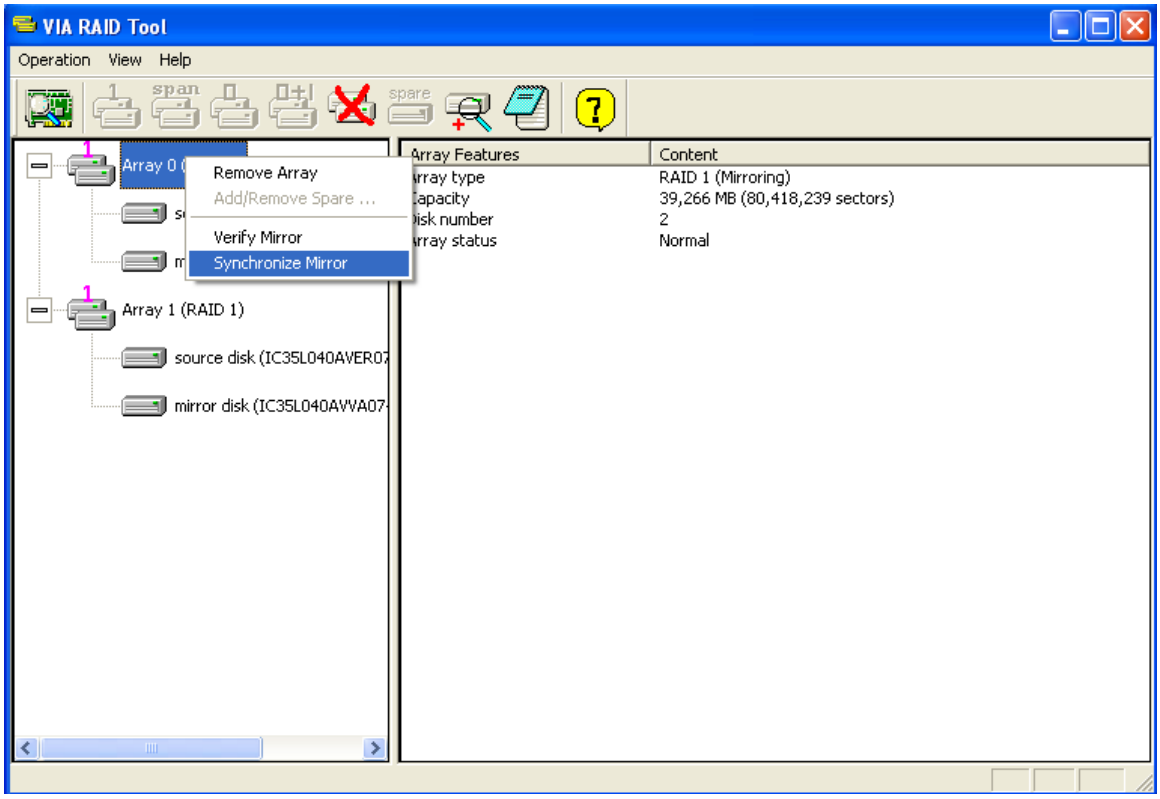


3. When mirror disk is not identical with the corresponding source disk, the mirror disk will be marked with a “need-sync” flag. The icon used to indicate this status is  . A “need-sync” mirror disk should be synchronized as soon as possible.

Synchronize Mirror Disk

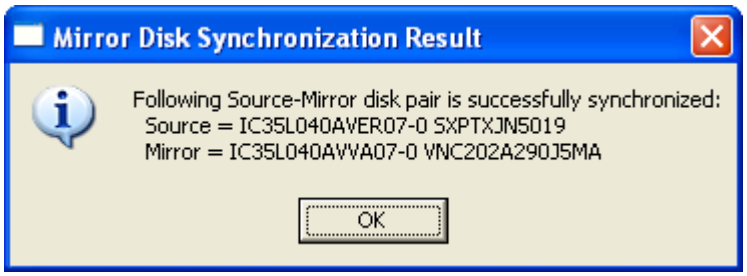
RAID 1 arrays must be synchronized when the data on the mirror disk is not identical with its corresponding source disk. Sometimes the data on the mirror disk may be newer than the data on the source disk. For example, the source disk is absent and the mirror disk runs in the tolerance mode. So the exact meaning of "Synchronize Mirror" is to make a pair of source and mirror disks contain identical data. The RAID software always marks the mirror disk with a "need-sync" icon  despite the fact that the mirror disk may have the correct data.

1. Select a RAID 1 array, right-click the selected RAID and a shortcut menu will be shown. Click on **Synchronize Mirror** to synchronize the source and mirror disks.



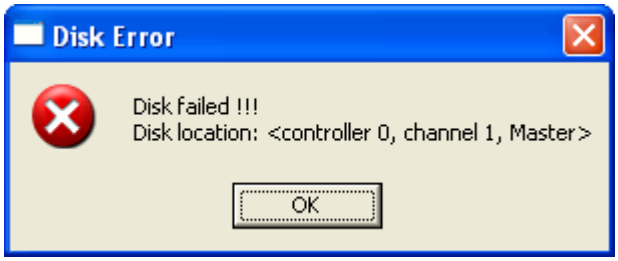
2. After synchronization has started, a dialog box will show the process. This action can be paused or canceled at any time.

3. An informing message will appear when the synchronization is finished.



Disk Error Detection

The RAID software will pop up an error message if a disk drive fails or missing.



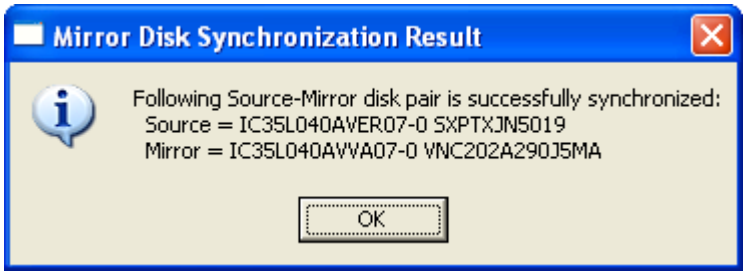
Duplicate Critical RAID 1 Array

When booting up the system, the RAID utility will detect if there are any inconsistencies between the source and mirror disk drives of the RAID 1 array. If the software detects that a RAID 1 array has any inconsistencies, the status of the disk array will be marked as critical and the software will prompt the user to duplicate RAID 1, as to make the mirror disk consistent with the corresponding source disk.

You can click **Yes** to synchronize now or click **No** to synchronize later.

After synchronization has started, a dialog box will show the process and this action can be paused or canceled at any time. If the synchronization process is cancelled, the RAID will be on the "need-sync" condition and synchronization should be proceeding again to guarantee the data consistency between sources and mirror disk drives.

A message will pop up when the synchronization process is finished.



Rebuild Broken RAID 1 Array

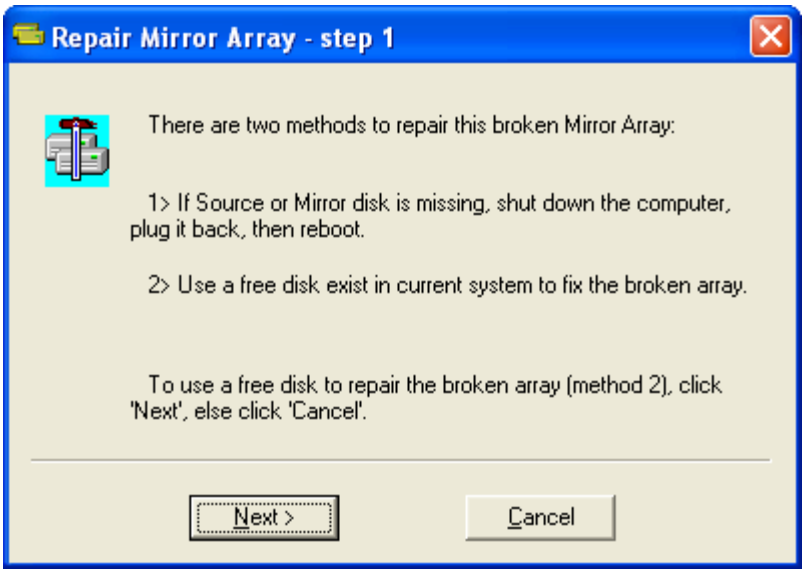
After booting up the system, the RAID utility will detect if any member disk drives of the RAID 1 array has failed or is absent. If the RAID utility detects any disk drive failures or missing disk drives, the status of the array will be marked as broken.

If the RAID software detects a RAID 1 array being broken, and there is a spare hard drive that could be used to rebuild the broken array, the spare hard drive will automatically become the mirroring drive. Software will remind users to synchronize this RAID like the duplicating RAID 1.

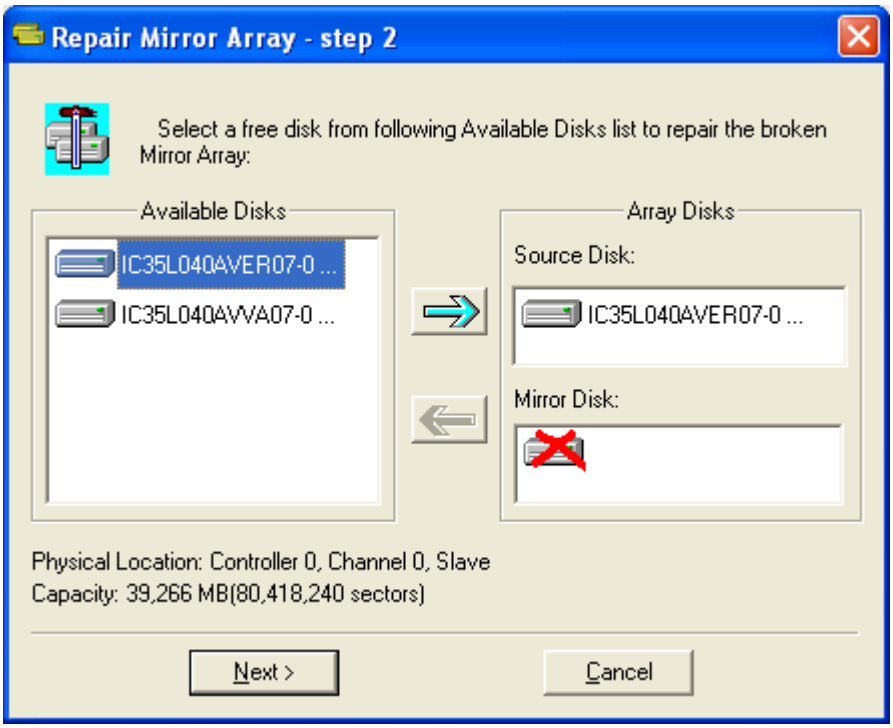
If the RAID software detects a RAID 1 array being broken but there is no spare hard drive, the RAID software will indicate a series of steps to repair such problem.

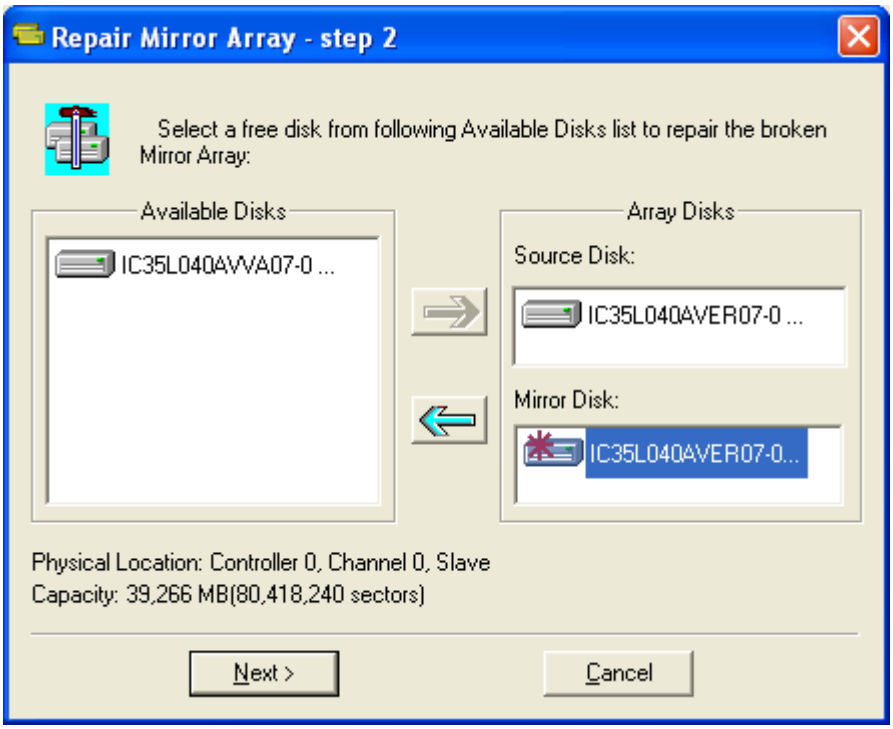
1. A dialog box will be shown to indicate that the RAID is broken. Click **Yes** to repair the array.

2. Another dialog box will pop up. If the source or mirror disk drive is unplugged only, click **Cancel** to stop the rebuilding process and shut down the system. Plug in the absent disk drive and then reboot system. If the original disk drive is broken, plug in a new disk drive and then reboot the system. Click **Next** to proceed to the next step.



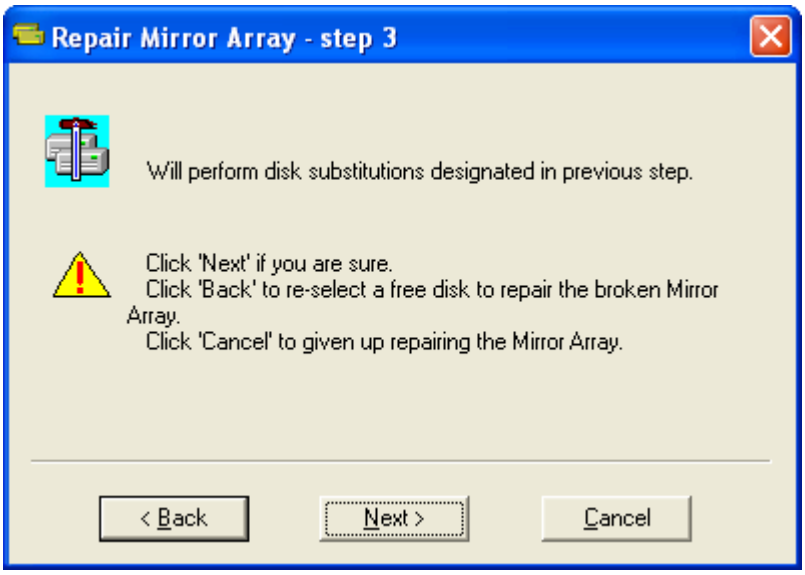
3. Select a disk drive from **Available Disks** and click on  to replace the broken drive and then click **Next**.





4. A warning message will appear. If you want to rebuild the RAID using the disk driver that you selected in the previous step, click **Next**.

Warning: All the data on the selected disk drive will be lost.



5. Reboot the system

6. This RAID is marked as a critical RAID. The RAID software will duplicate this critical RAID 1 process.

Icon View

All icon types and their corresponding meanings are listed below. The real status of an array or a disk drive is described on “Array status” or “Device status” in the right windowpane.


Normal Disk Array


Disk Array with Warning status


Broken Disk Array


Disk Drive with Normal status


Absent Disk Drive in a Array


Disk Drive with Error


Disk Drive with Warning status


The pair of Source and Mirror Disks should be synchronized


Disk Drive which needs system rebooting to enable its function.