



VIA RAID Host Controller User Manual For VT8251

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VIA TECHNOLOGIES, INC.

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Offices:

USA Office:

940 Mission Court
Fremont, CA 94539
USA
Tel: (510) 683-3300
Fax: (510) 683-3301 or (510) 687-4654
Home Page: <http://www.viatech.com>

Taipei Office:

1st Floor, No. 531
Chung-Cheng Road, Hsin-Tien
Taipei, Taiwan ROC
Tel: (886-2) 2218-5452
Fax: (886-2) 2218-5453
Home Page: <http://www.via.com.tw>

Revision History

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INTRODUCTION

This section gives a brief introduction on the RAID-related background knowledge and a brief introduction on the VIA IDE RAID Host Controller. For users wishing to install their VIA IDE RAID driver and RAID software, please proceed to the **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 are RAID 0, 1, 0+1, 5 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
RAID 0+1 (Striping/Mirroring)	4	2 * Smallest size	Highest performance with data protection
RAID 5 (Striped with Rotating Parity)	3	(Number drives-1) * smallest size	Data protection and high disk utilization
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.

RAID 0+1 (Striping/Mirroring)

RAID 0+1 is a combination of RAID 0 and RAID 1 array types. A minimum of four drives needs to be installed. With a four-drive array, there must be two pairs of RAID 0 drives. Each pair mirrors the data on the other pair of striping drives. The data capacity is two times the smallest drive.

In a four-drive array, a single drive failure will cause the whole array to become, in essence, a RAID Level 0 array. However, this does not impact the data access. Another unique feature of RAID 0+1 is dual fault tolerance. In some cases, two drives can fail simultaneously and still maintain the integrity of the data. The data can still be accessed and worked like a RAID 0 array.

Assume the drives are configured as follows (M = Master, S = Slave, A/B indicates which striping pair the drive belongs to, number indicates which part of stripe data):

	IDE 1	IDE 2
M	Drive A1	Drive A2
S	Drive B1	Drive B2

In a RAID 0+1 array, the data integrity will remain if any of the 1, 2 combinations survives. The following table indicates the possible combination of dual drive failure and the respective results of each case.

Failed Drives	Array Status	Note
A1, A2	Working	B1, B2 retains array integrity
B1, B2	Working	A1, A2 retains array integrity
A1, B2	Failure	A2, B1 contains only half of array data
B1, A2	Failure	B2, A1 contains only half of array data
A1, B1	Working	A2, B2 retains array integrity
A2, B2	Working	A1, B1 retains array integrity

RAID 5 (Striped with Rotating Parity)

RAID 5 Array uses block-level striping with parity data distributed across all member disks. It requires a minimum of 3 disks to implement. It has highest read data transaction rate and medium write data transaction rate. When one of the disks in RAID 5 fails, the data in RAID 5 can also be accessed, and the broken RAID 5 disk array can be repaired with a new disk. If more than one disk fail, the RAID 5 array is corrupt and the data can not be recovered. RAID 5 can be created in Option ROM, Windows or other operating system utilities, but it only can be initialized in Windows or other operating system utilities.

JBOD (Spanning)

A spanning disk array is equal to the sum of the all drives in the array. Spanning stores data on to 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 XXX RAID solution uses the storage chip as a RAID controller. The RAID software is a Windows-based software utility. Its graphical user interface provides an easy way to configure and manage disk drives or disk arrays connected to the controller. Listed below are the main features and benefits of VIA XXX RAID:

1. Supports four SATA ports at 3.0Gb/s (300MB/sec).
2. Supports AHCI mode of the VT8251 controller.
3. Supports hard disk drive larger than 137 GB (48-bits LBA).
4. Four independent AHCI ports and maximum connection of four hard disk drives are allowed.
5. Supports SATA I, SATA II, Ultra DMA mode 6/5/4/3/2/1/0, DMA mode 2/1/0, and PIO mode 4/3/2/1/0.
6. Supports PCI Plug and Play. PCI interrupt sharing and coexists with mainboard IDE controller.
7. Supports IDE bus master operation.
8. Supports RAID 0, 1, 0+1, 5 and JBOD (RAID 5 is only supported by VT8251).
9. 4 KB to 64 KB striping block size support.
10. Bootable disk or disk array support.
11. Windows-based RAID configure and management software tool. (Compatible with BIOS)
12. Real-time monitoring of device status and error alarm with popup message box and beeping.
13. Supports hot-swap failed disk drive in RAID 1, 0+1 and RAID 5 array.
14. Mirroring and RAID 5 automatic background rebuild support.
15. SATA and ATA SMART function support.
16. Microsoft Windows 98, Me, NT4.0, 2000, XP and Server 2003 operating systems support.
17. Event log for easy troubleshooting.
18. On-line help for easy operation for RAID software.

INSTALLING THE HARD DRIVES

Hard disk drives must be SATA II , SATA I, Ultra ATA/133, Ultra ATA/100, Ultra ATA/66, Ultra ATA/33, or ATA-3 compatible to operate with the XXXX XXX RAID controller. For optimal performance, it is recommended to install all identical drives of the same model and capacity.

1. Striping (RAID 0) and JBOD require at least two drives and has a limit of four drives. Mirroring (RAID 1) requires two drives. Striping and mirroring (RAID 0 +1) requires four drives. RAID 5 requires at least 3 drives and has a limit of four drives. Set the jumpers of each hard drive to “Master” (“Device 0”) or “Slave” (“Device 1”) under PATA channel according to the following table.

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

2. Connect the IDE cables and the power cables to the hard drives. When connecting hard drives, pay attention to its Master – Slave jumper setting. If two hard drives are connected to one IDE cable, then one drive must be set as master while the other as slave.
3. Attach the SATA cables into the connectors on the XXXX RAID controller SATA port. Attach the IDE cables into the connectors on the XXXX RAID controller PATA port.

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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.

```
VIA Technologies, Inc.VIA VT8251 SATA RAID CDROM BOOT BIOS V1.12
Copyright (C) VIA Technologies, Inc. All Right reserved.
8251R112.ROM - FOR RAID

Scan Devices,Please wait...
No Raid

      Ctrl0 Chnl0 Master      WDC WD360GD-00FNA(1)      - SATA mode
      Ctrl0 Chnl0 Slave      WDC WD360GD-00FNA(1)      - SATA mode
      Ctrl0 Chnl1 Master      WDC WD360GD-00FNA(1)      - SATA mode
      Ctrl0 Chnl1 Slave      WDC WD360GD-00FNA(1)      - SATA mode

Press <Tab> Key into User Window!

  If you want to install Linux Default partition RAID driver, please do not use
  OPRAM creation operation!
```

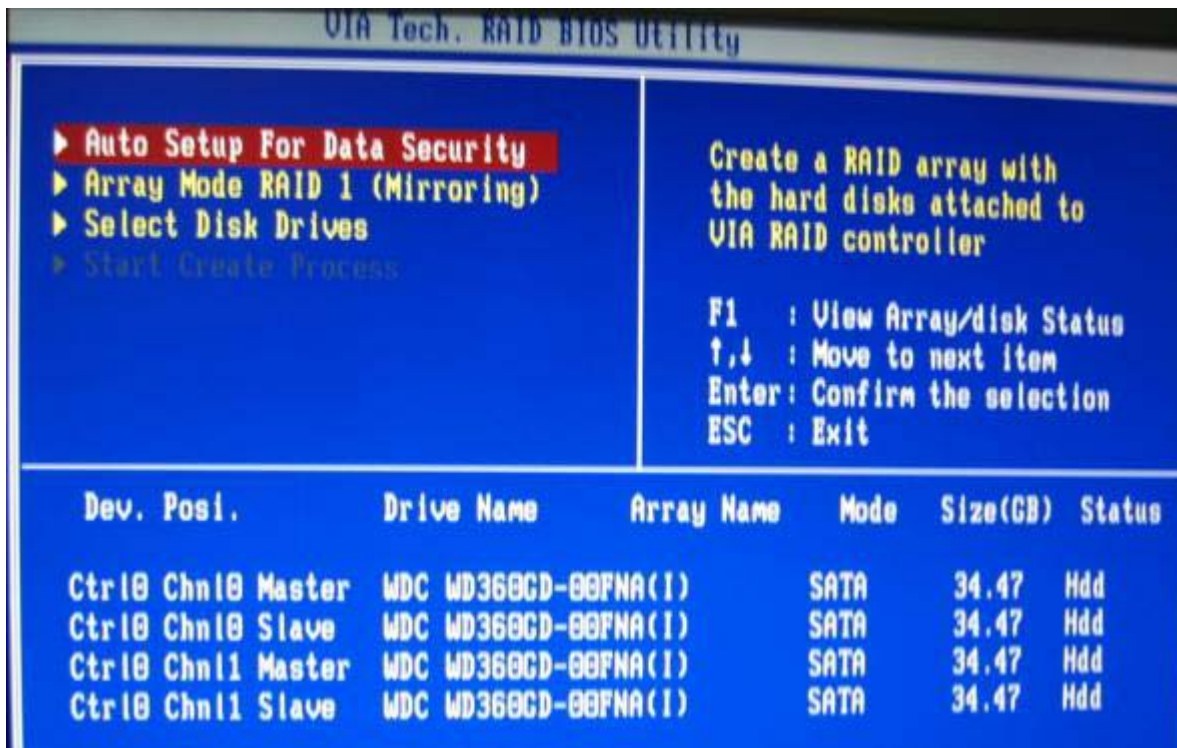
The main interface of BIOS configuration utility is as below:



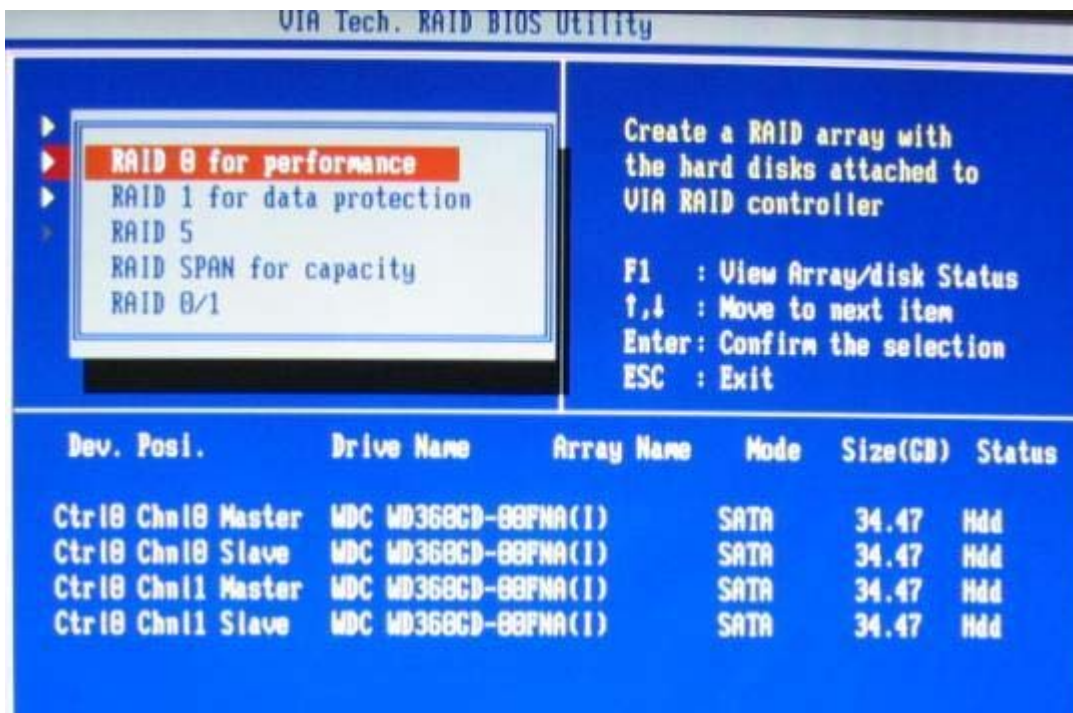
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Create Disk Array

1. Use the arrow keys to navigate the menu. Select **Create Array** and press <Enter> to call out the list of creation steps.



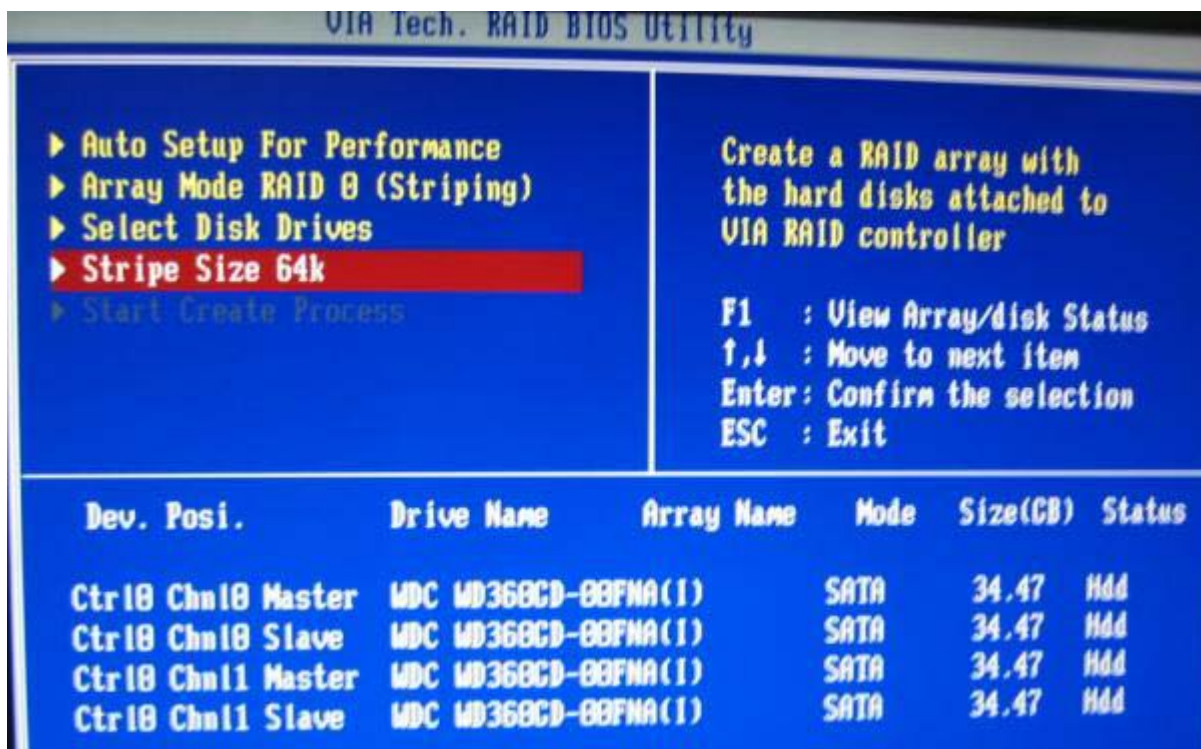
2. Select **Array Mode** and press <Enter>. A list of array modes will appear. Highlight the target array mode that you want to create, and press <Enter> to confirm the selection. If RAID 1 or RAID 0/1 is selected, an option list will pop up and enable the users to select **Create only** or **Create 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** allows BIOS to copy the data from the source to the mirroring drive.



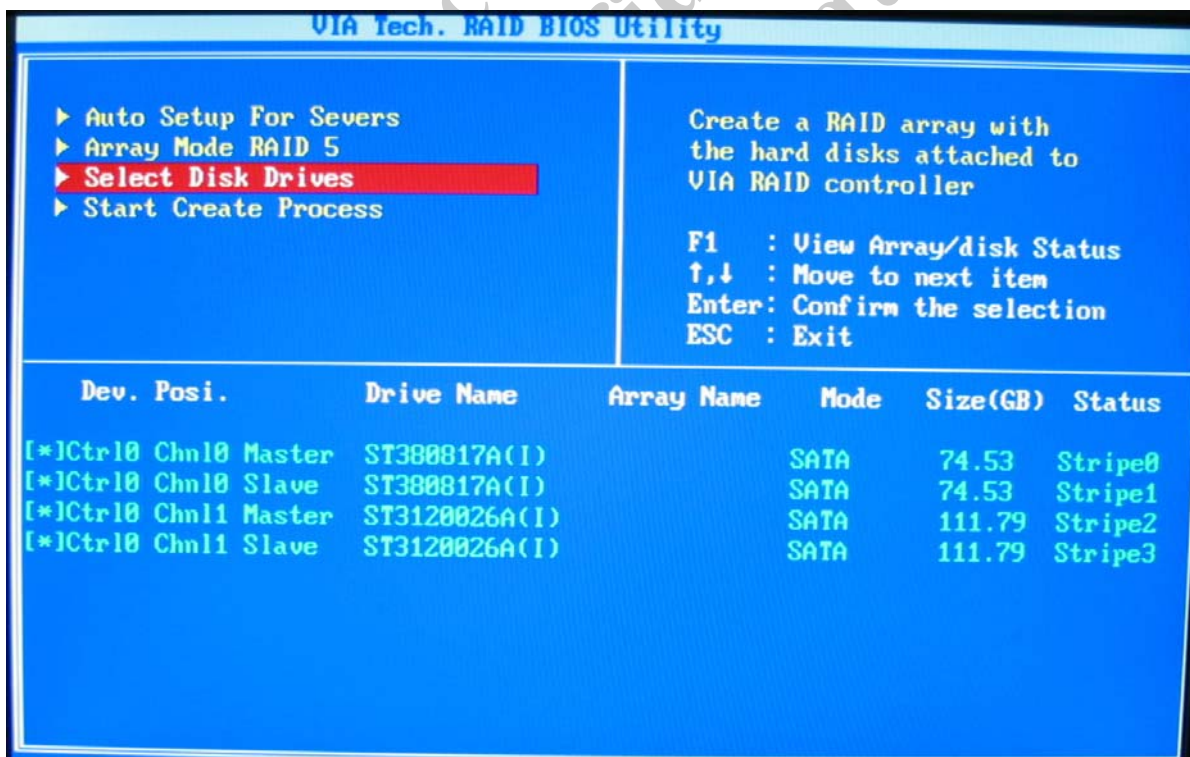
3. After array mode is selected, there are two methods to create a disk array. One method is “**Auto Setup**” and the other one is “**Select Disk Drives**”. **Auto Setup** allows BIOS to select the disk drives and create arrays automatically but it does not duplicate the mirroring drives even if the user selected **Create and duplicate** for RAID 1 or 0+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 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.



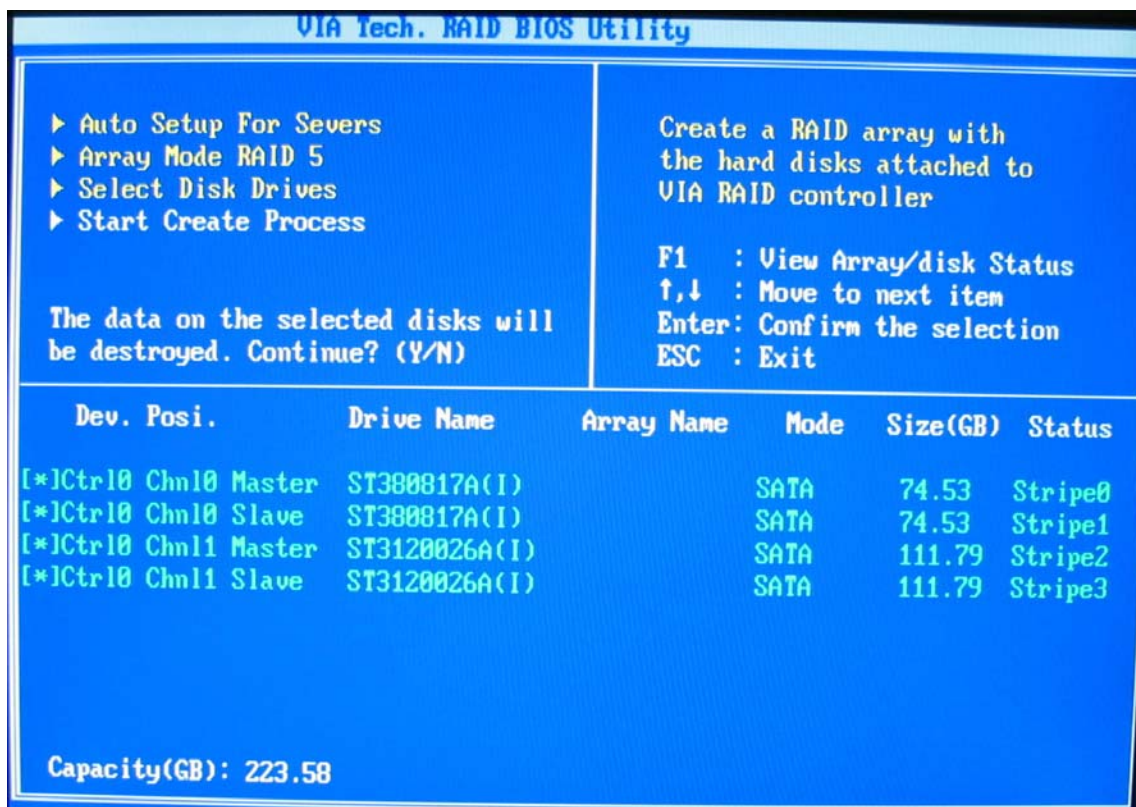
4. If RAID 0 or RAID 0+1 was selected in step 2, the block size of the array can also be selected. Use the arrow key to highlight **Block Size** and press <Enter>. Then select a block size from the popup menu. The block size can be 4KB to 64KB.



5. If RAID 5 was selected in step 2, then **Select Disk RAID 5 Array** is created.



6. Use the arrow key to highlight **Start Create Process** and press <Enter>. A confirmation message will appear. Press **Y** to finish the creation, or press **N** to cancel the creation.
7. Use the disc with the same capacity to create RAID, or some capacity will lose.



8. Important note: All existing content in the hard drive will be destroyed during 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** 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 display. 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> and the channel column will 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, then 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.



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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.

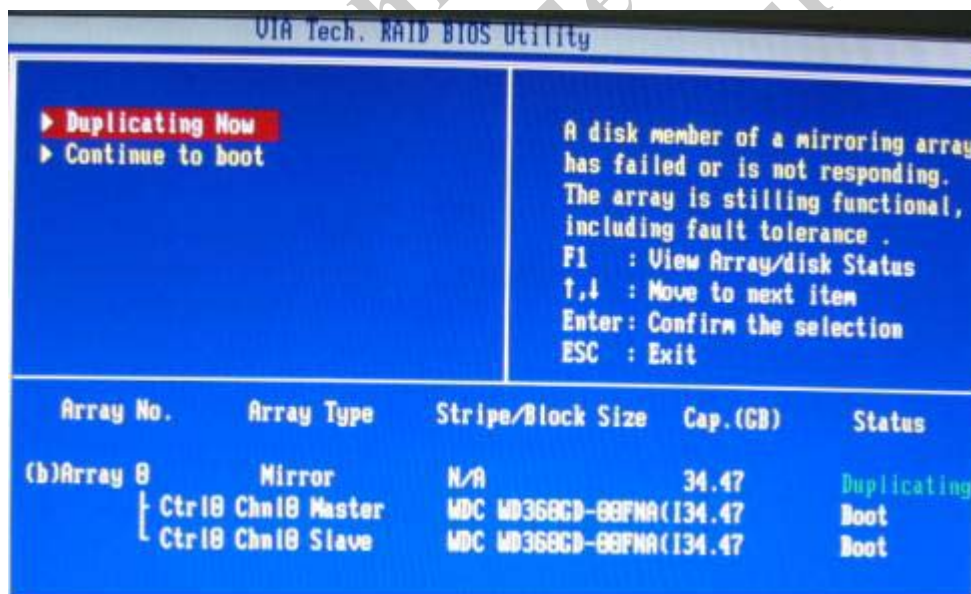
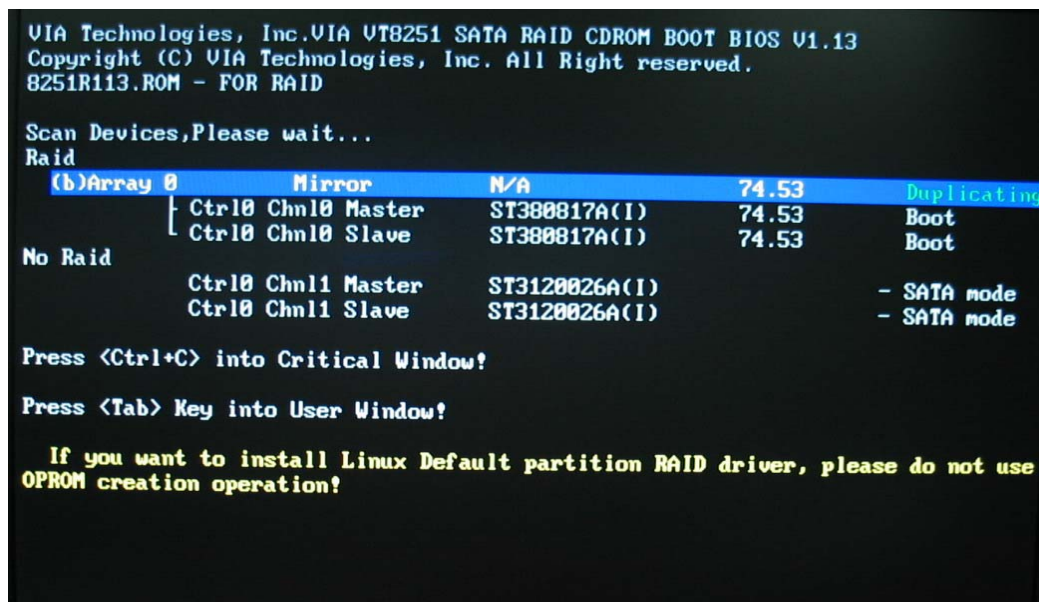
View Array Status

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



Duplicate Critical RAID 1/0+1 Array

When booting up the system, BIOS will detect if the RAID 1, RAID 0+1 or RAID 5 array has any inconsistencies between user data and backup data. If BIOS detects any inconsistencies, it prompts the user pressing Ctrl+C to enter the critical process window. The status of the disk array will be marked as critical and BIOS will prompt the user to duplicate the RAID 1 or 0+1 to make the backup data consistent with the user data. RAID 5 can not be rebuilt in the utility, user can use windows or other operating system utility to rebuild it.



Continue to boot will enable duplicating the array after 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.

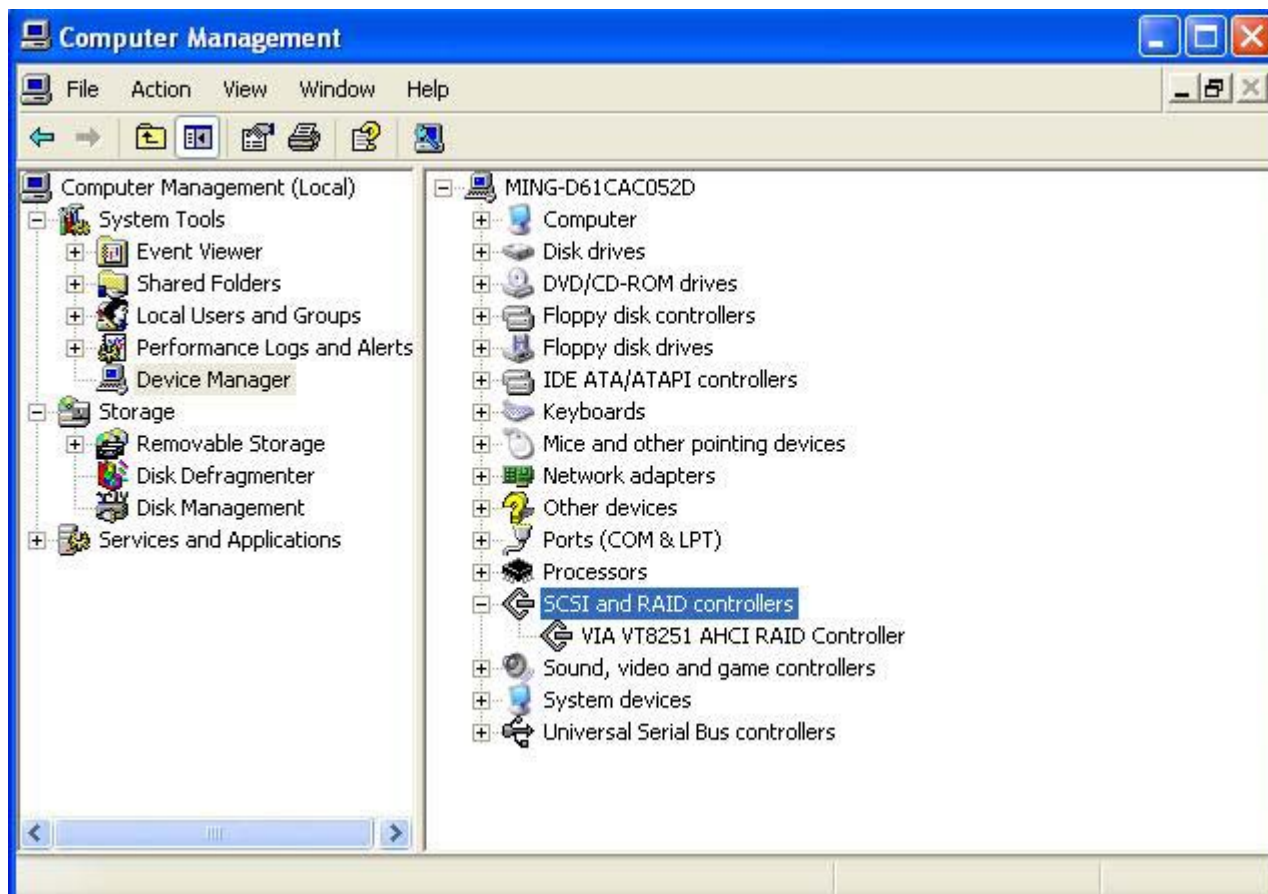


4. When the installation is completed, click **Finish** to restart the system.



Verify Installation

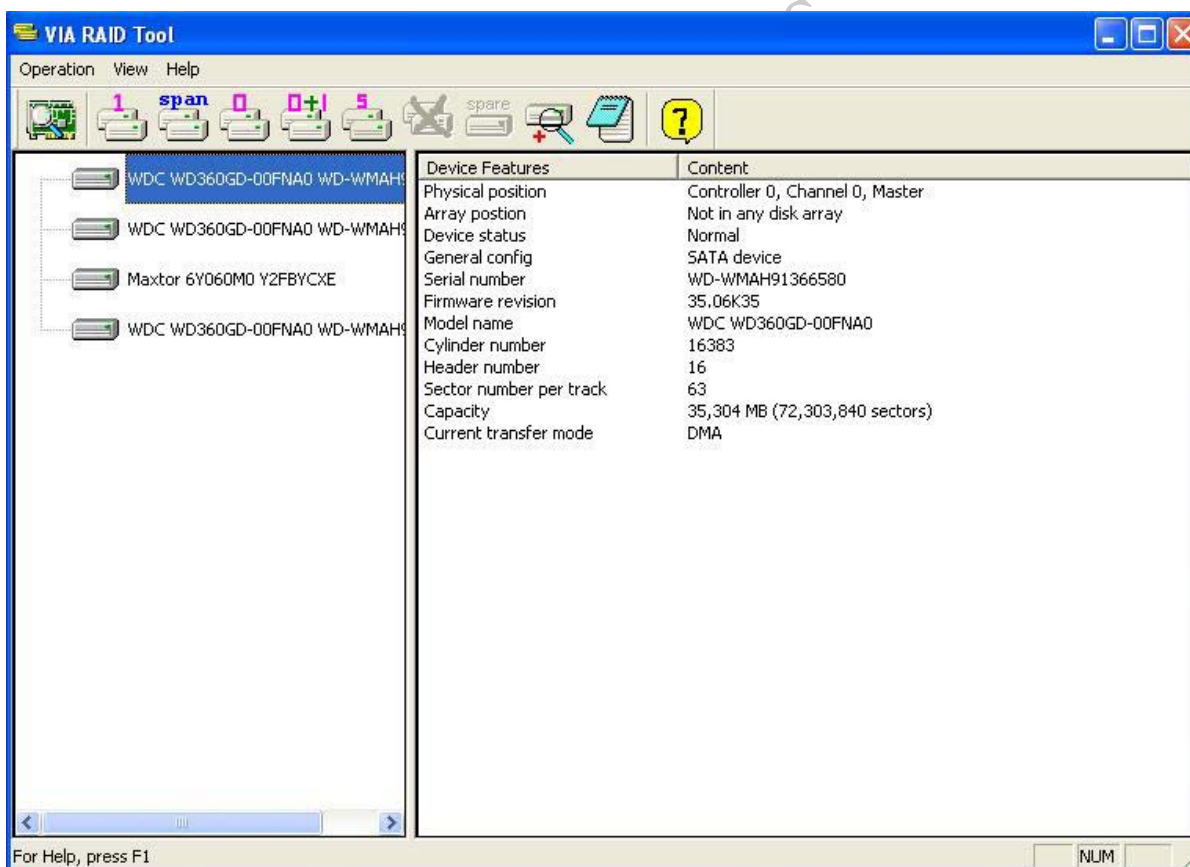
1. Right-click on **My Computer** and select **Properties** from the popup menu.
2. From the popup window, click on **Hardware**, then click on **Device Manager**.
3. Expand the **SCSI and RAID controllers** tree as shown below. If the VIA XXX RAID Host Controller does not exist or there is a “?” or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



Getting Start



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 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)



Create RAID 0+1



Remove Array



Check All Disks



Help Topics



Create Mirror Array (RAID 1)



Create Stripe Array (RAID 0)



Create RAID 5



Add/Remove Spare disk



View Event log




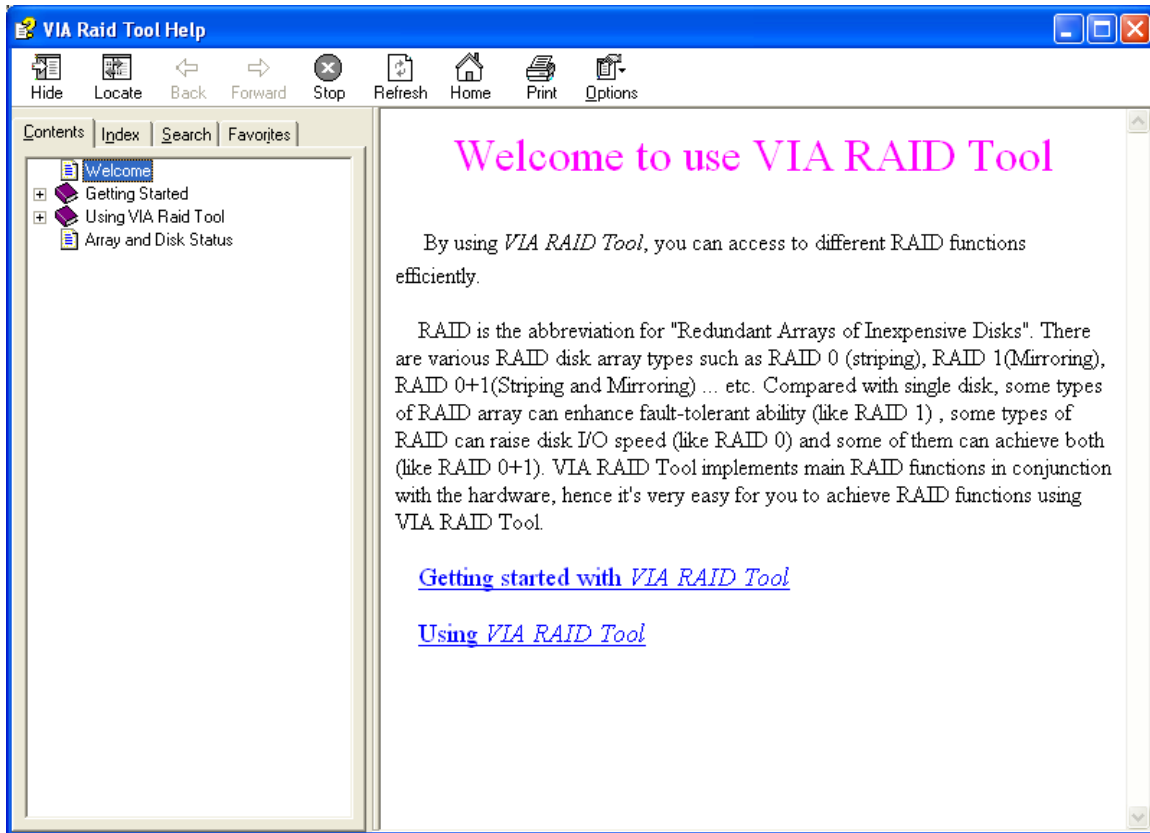
View by Devices

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View Online Help





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

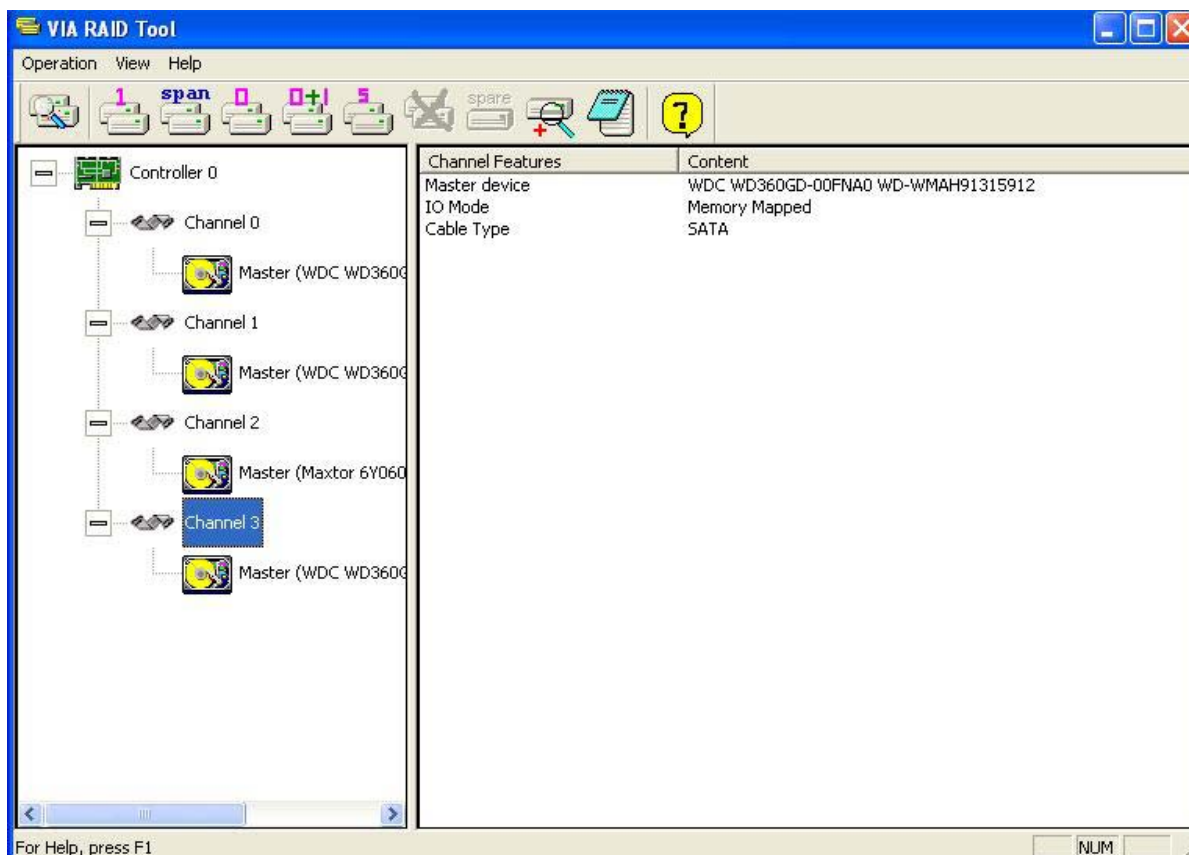


View Controller and Device Status








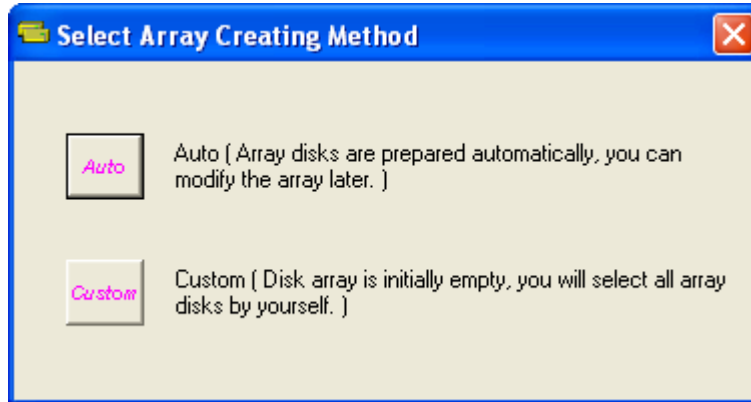
Click on  or  button to determine the viewing type of left windowpane. There are two viewing types: By controllers and by device. Click on the object in the left windowpane to display the status of the object in the right windowpane.

// AHCI mode controller



Create Disk Array

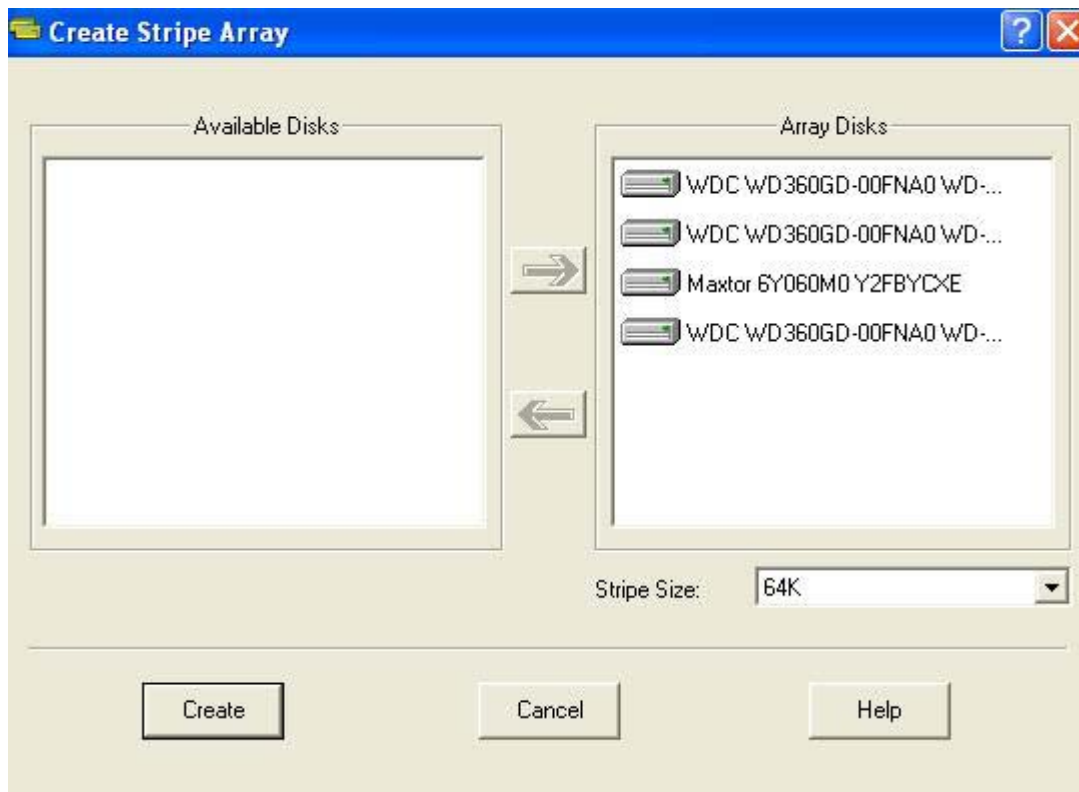
1. The following five buttons are used to create a disk array depending on users' preference:  RAID 1,  Span,  RAID 0,  RAID 0+1,  RAID 5. Click on the RAID button you want to create, the **Select Array Creating Method** will be displayed.



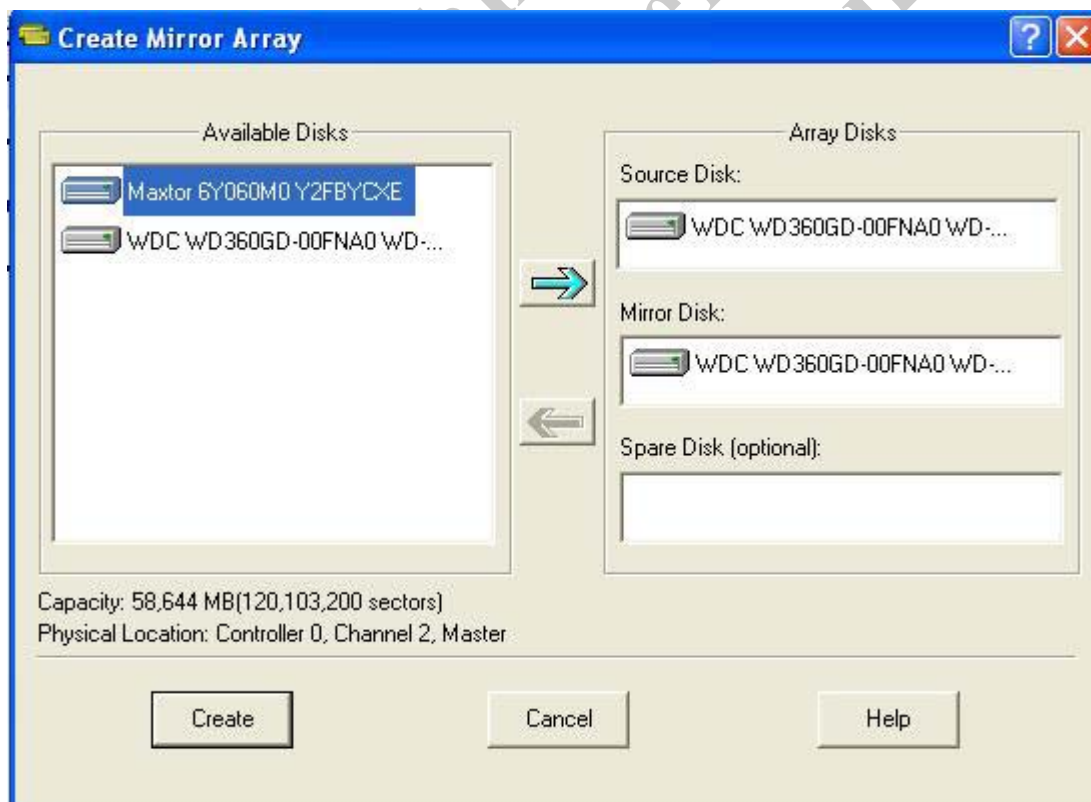
Auto: The utility will arrange the available hard disk drives to be the disk arrays. The hard disk drives can still be modified later. This method is strongly recommended.

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

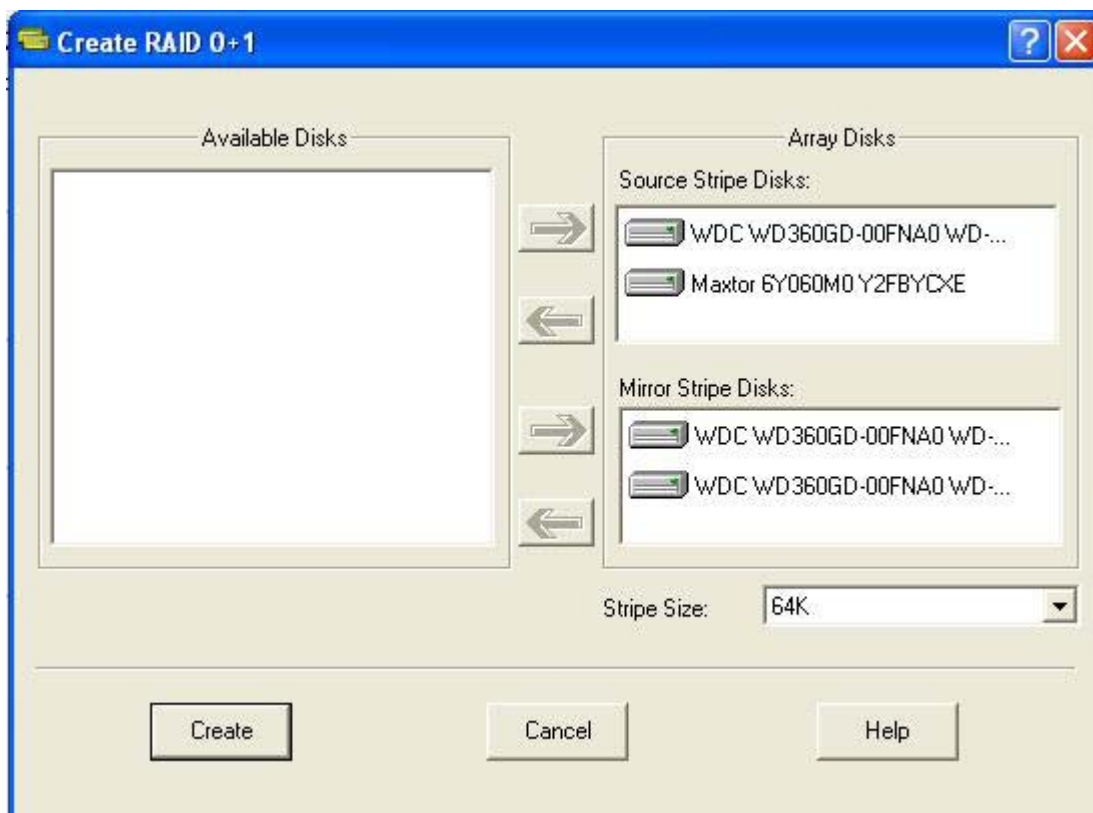
2. Click on “**Auto**” to launch the creating array window. If you select **Custom**, the available disks window lists the available disk drives that can be used to create the array. Select a disk drive and click on the right arrow button to add the specified disk drive to the array. Disk drives can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



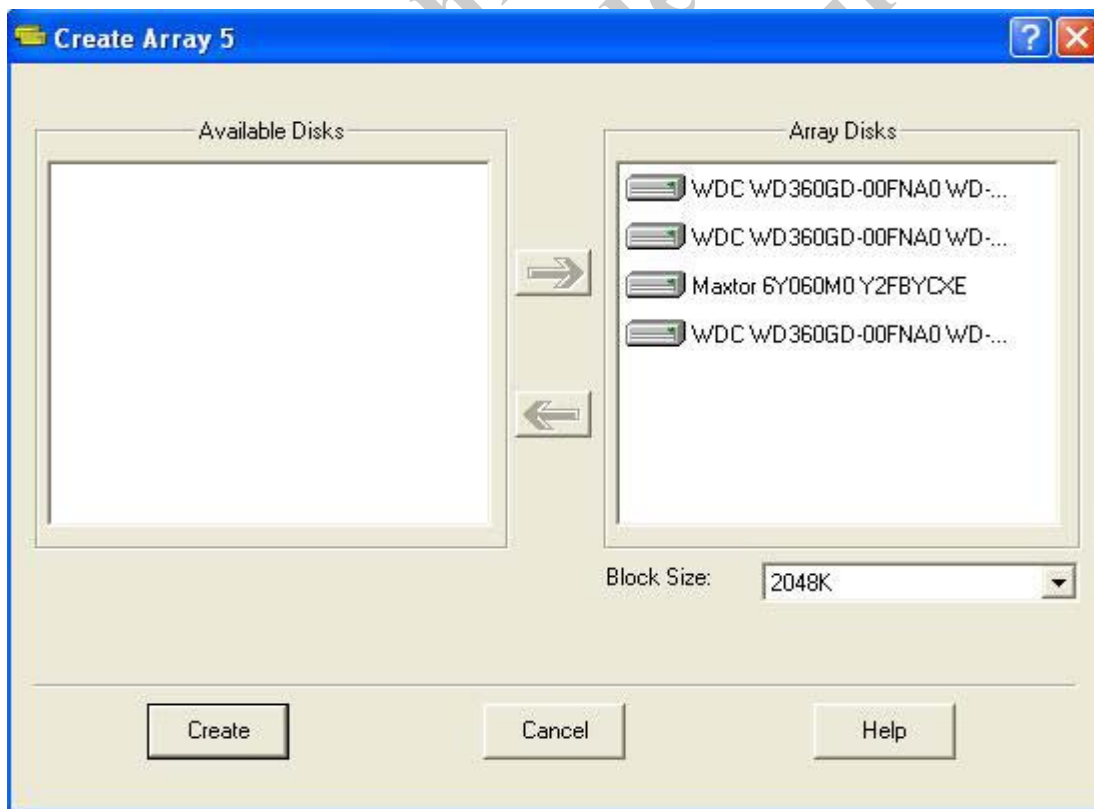
Create RAID 0 Disk Array



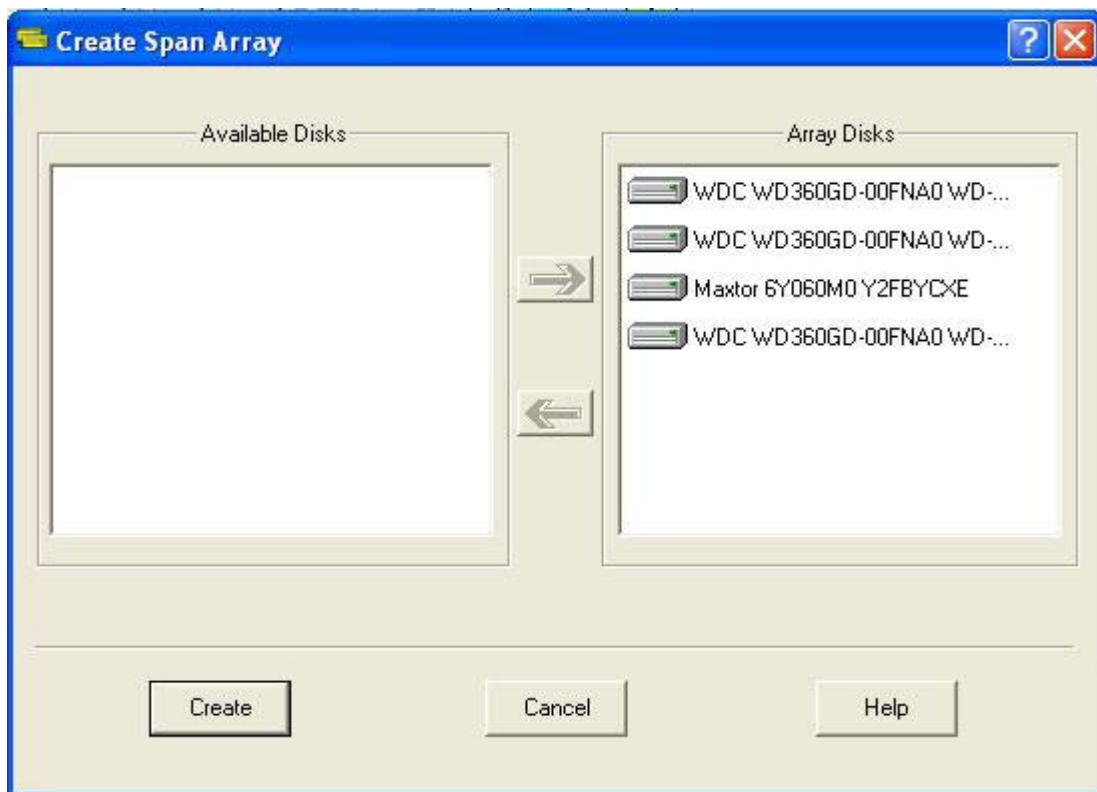
Create RAID 1 Disk Array



Create RAID 0+1 Disk Array



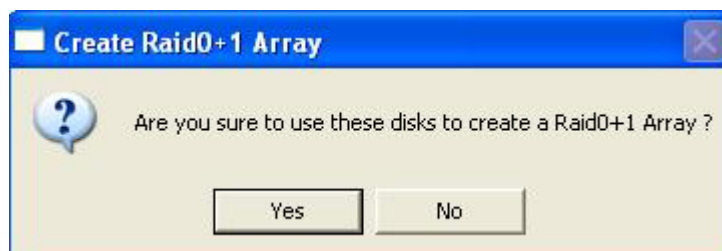
Create RAID 5 Disk Array



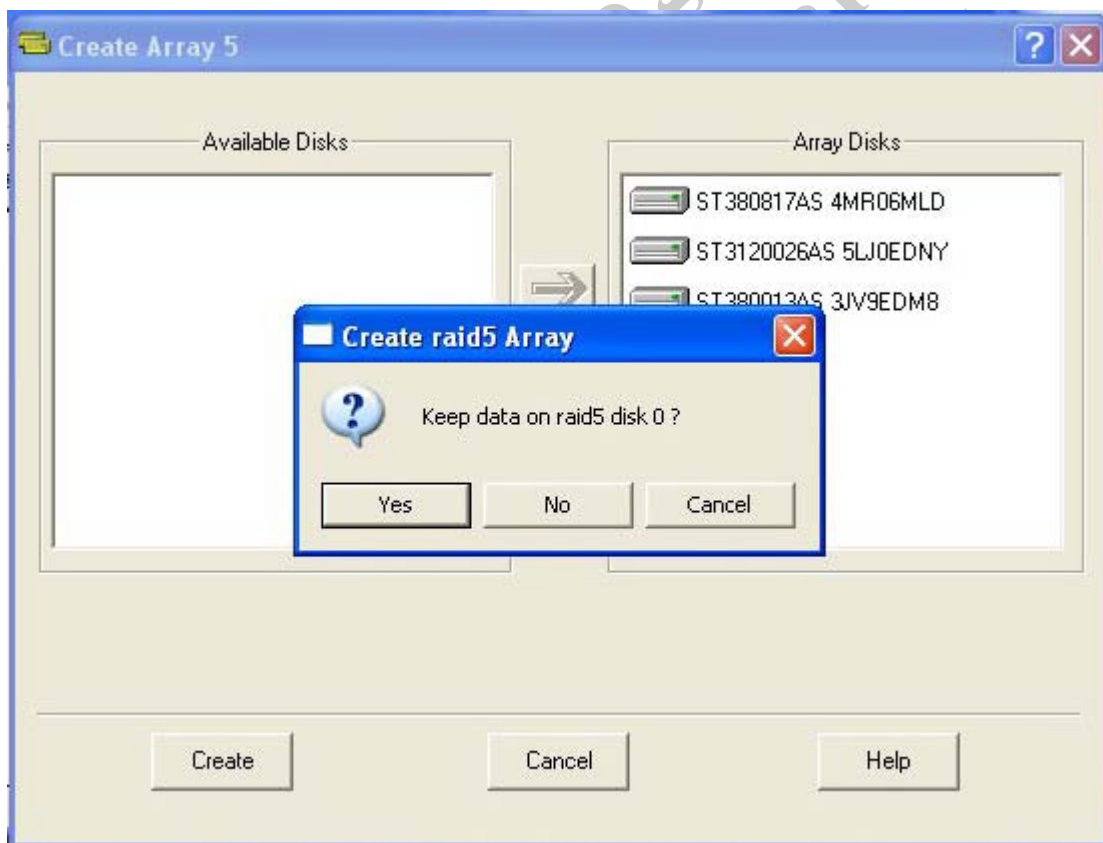
Create JOBD Disk Array

Click on **“Create”** to continue or **“Cancel”** to exit. Click on **“Help”** to launch the Help Topics window.

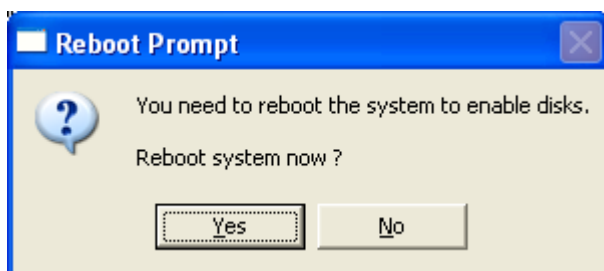
3. A warning message will pop up after clicking on **Create**. Click **Yes** to finish the creation of disk array, or **No** to cancel.



4. To keep the data in the first disk of RAID 5 array, click **Yes** to migrate the data from it to the other RAID 5 disks, or click **No** to delete all old data on disks.




5. A message box will pop up to prompt the user 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.

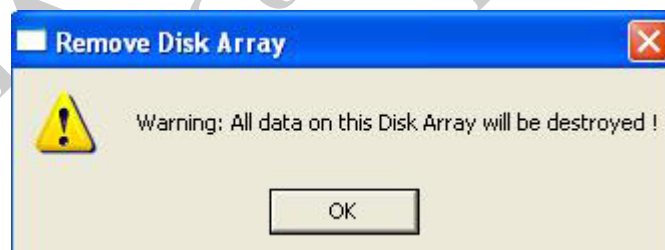
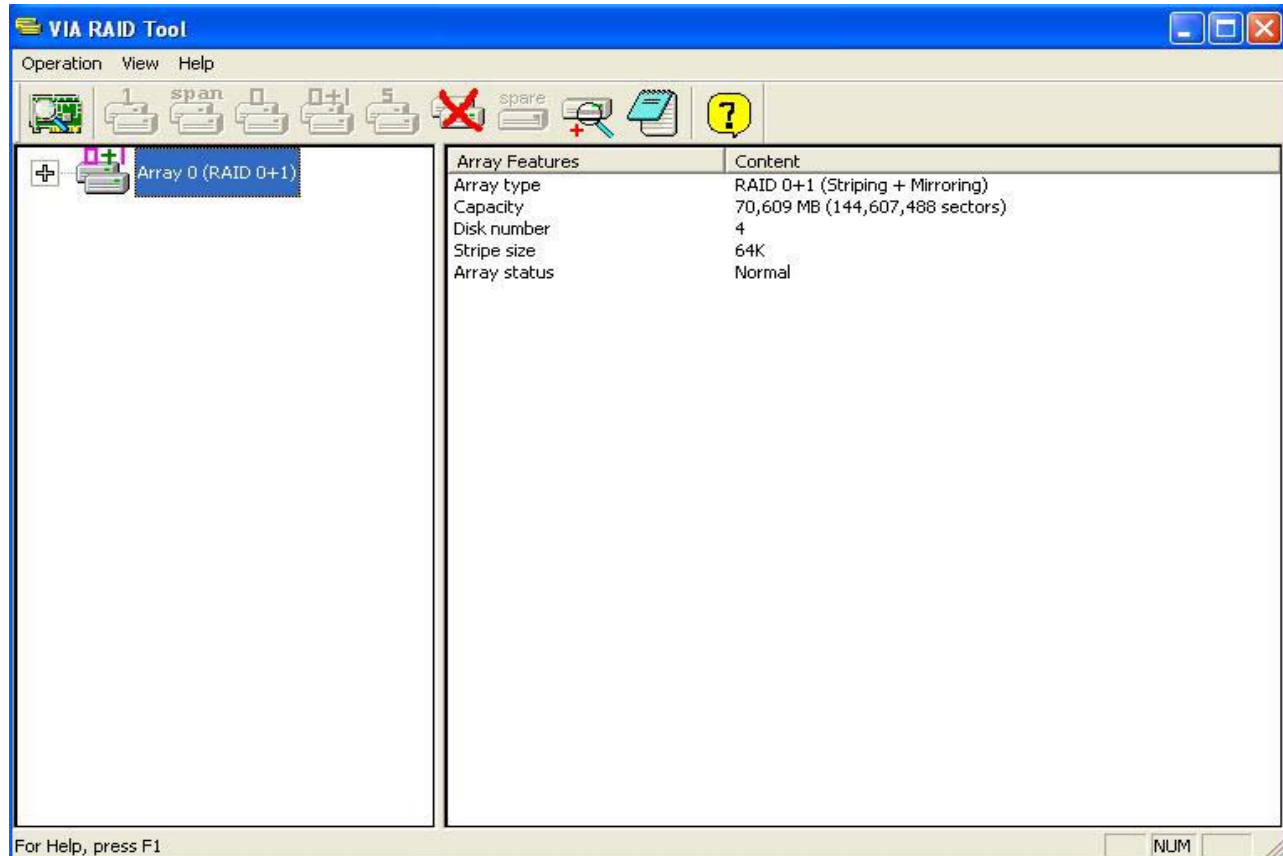


Note: There is no need to reboot for OS 2K and above operating systems.

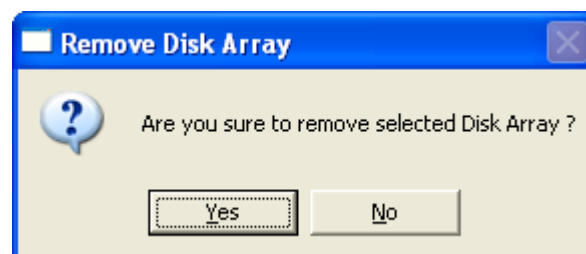
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Delete Disk Array

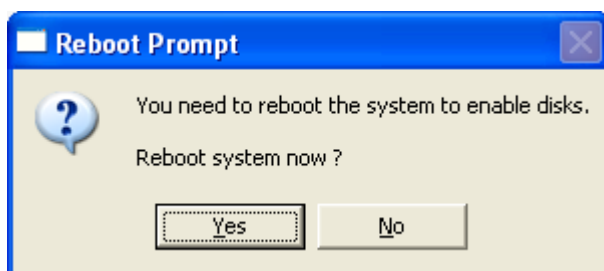
1. Select the disk array that you want to delete from the left windowpane. Click on **Remove Array** . A warning message will pop up.



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



3. A message box will pop up to prompt the user 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: There is no need to reboot for OS 2K and above operating systems.


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.


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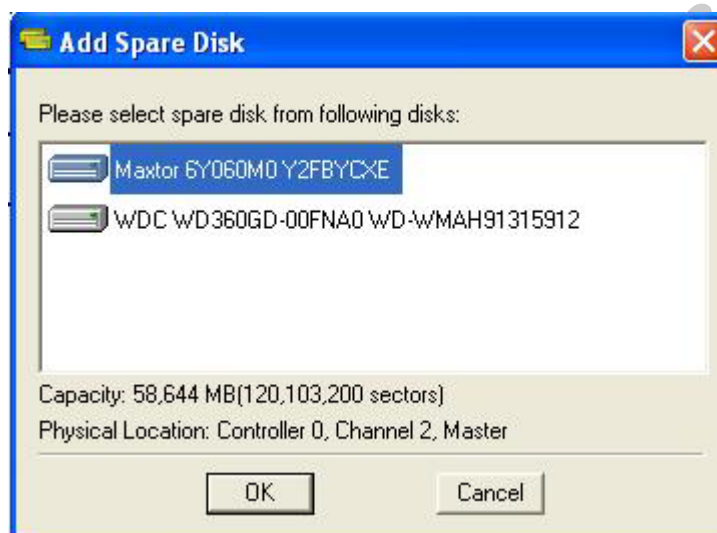
Add and Remove Spare Disk Drive

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 .

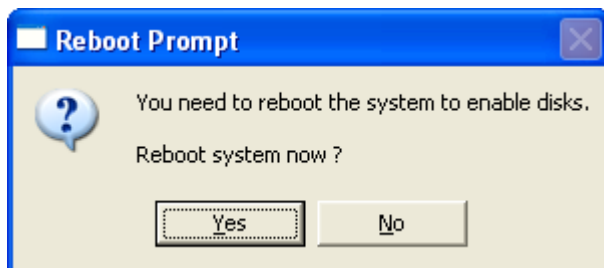
1. Select the RAID 1 array in the left windowpane and click on . Then the available disk drives will be listed in a popup window.
2. Select a disk drive and click on **OK** to add a spare disk drive to RAID 1.



3. A warning message will pop up. Click **Yes** to finish adding the spare disk, or **No** to cancel.



4. A message box will pop up to prompt the user 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.




Note1: There is no need to reboot for OS 2K and above operating systems.

Note2: The spare disk drive in the RAID 1 array cannot be accessed by the operating system.

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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 spare disk drive in the left windowpane and click on . A warning message will pop up.




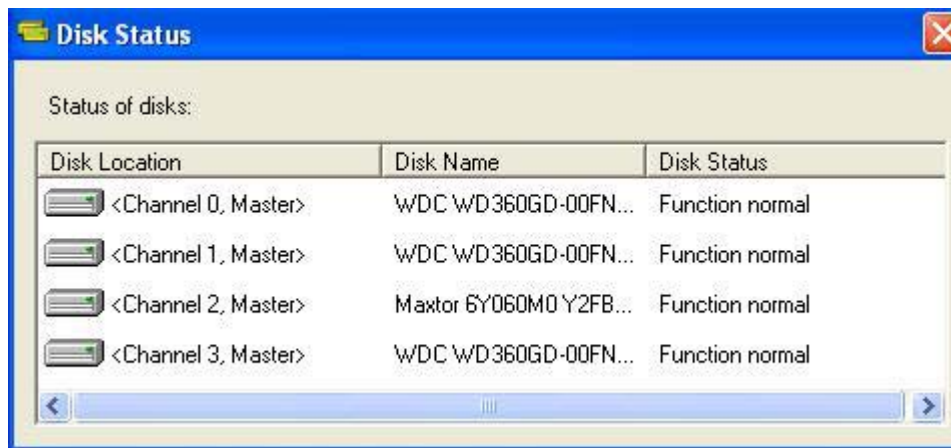
2. Click **Yes** to finish removing spare disk, or **No** to cancel.
3. A message box will pop up to prompt the user to restart the computer. Click **Yes** to restart the computer or click **No** to skip restarting. The new setting will take effect only after restarting

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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.







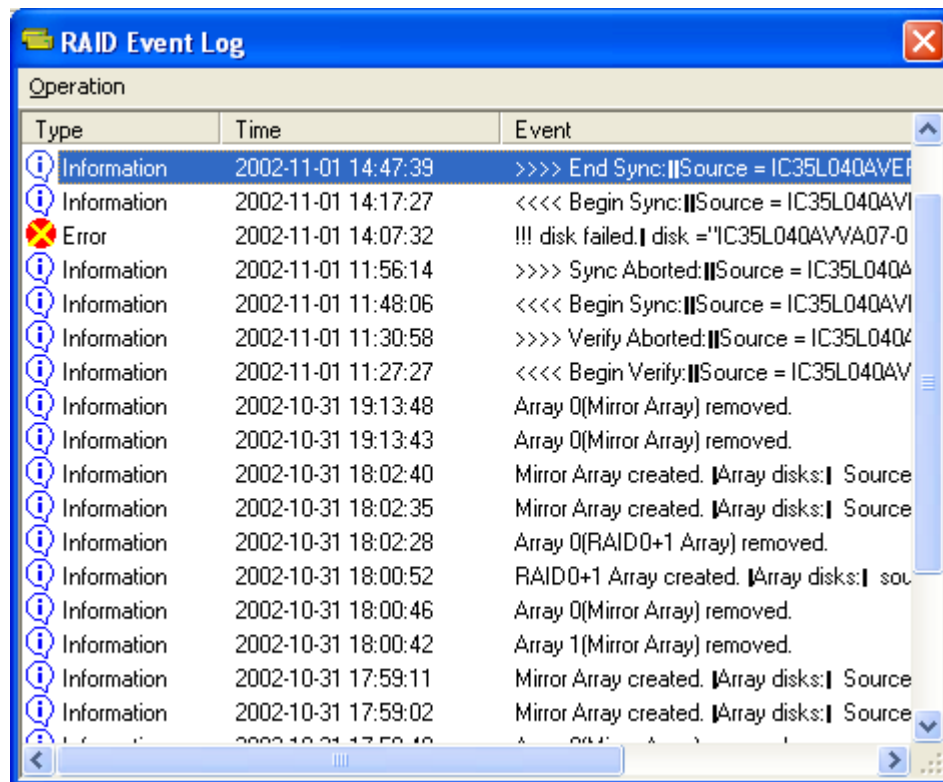
Your hard disk drive must be compatible with the ATA/ATAPI-5 specification and support SMART commands or the disk checking will fail.

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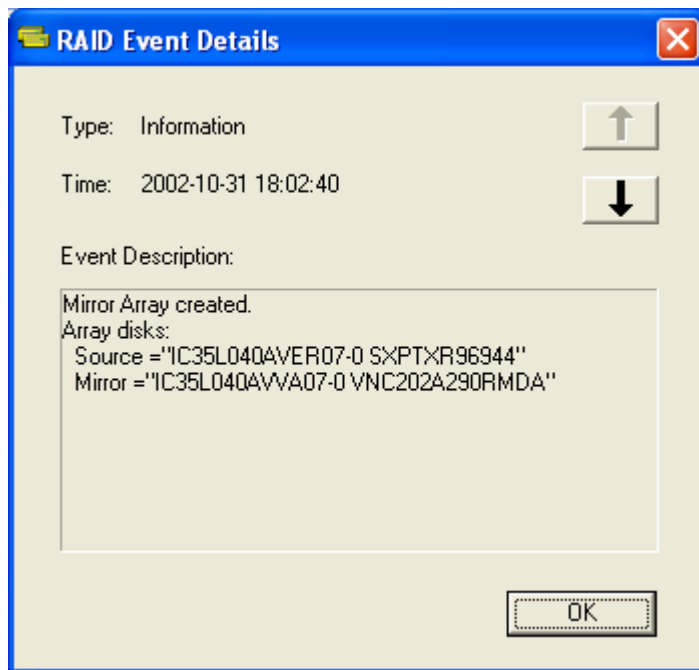
View Event Log


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 .



- 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.

- 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.

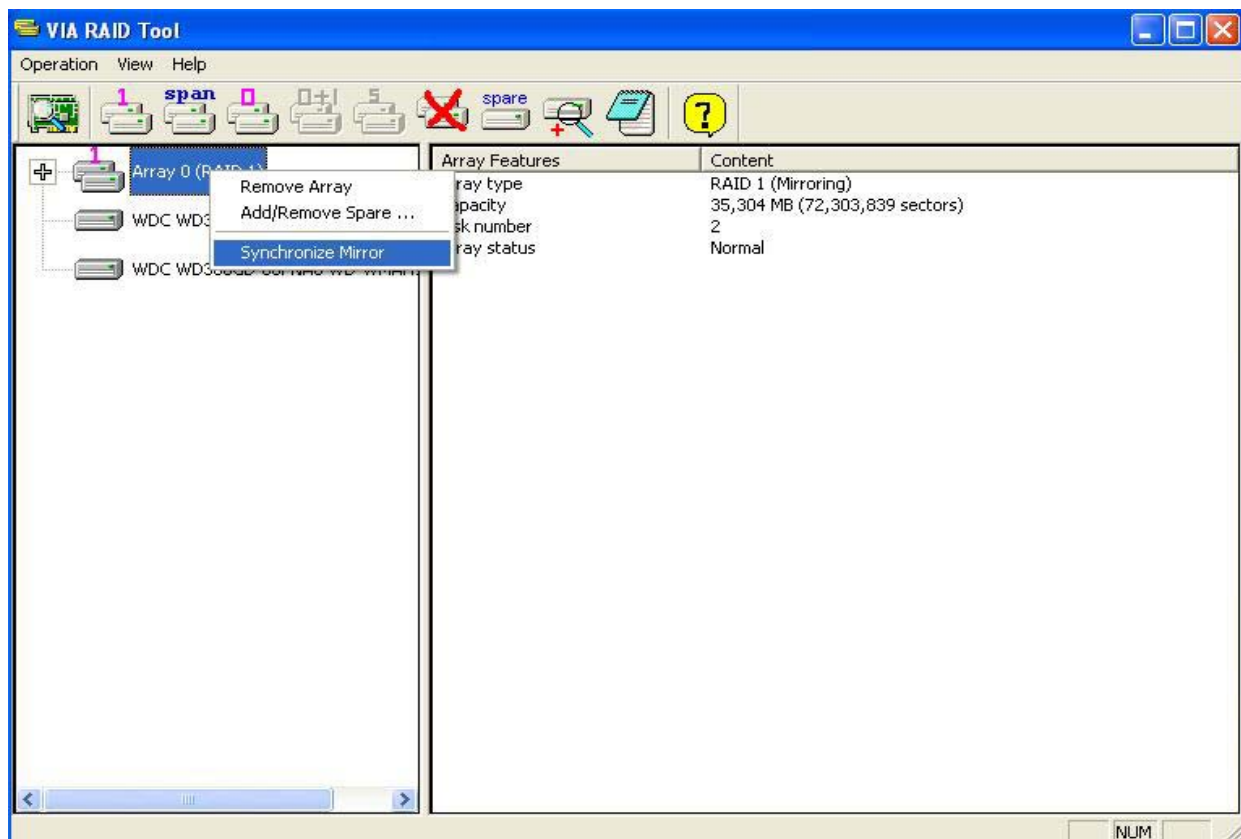
Synchronize Mirror Disk

RAID 1, RAID 0+1 or RAID 5 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 have identical data. The RAID software always marks the mirror disk with a “need-sync” icon



although the mirror disk may have the correct data.

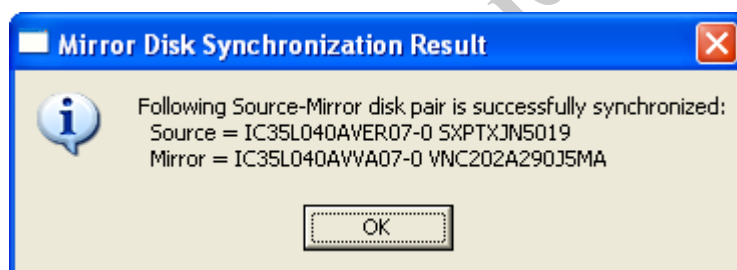
1. Select a RAID 1, RAID 0+1 or RAID 5 array. Right-click the selected RAID, then a shortcut menu will be shown. Click on **Synchronize Mirror** to synchronize the source and mirror disks.



- After synchronization has started, a dialog box will show the process. You can pause or cancel this process at any time.

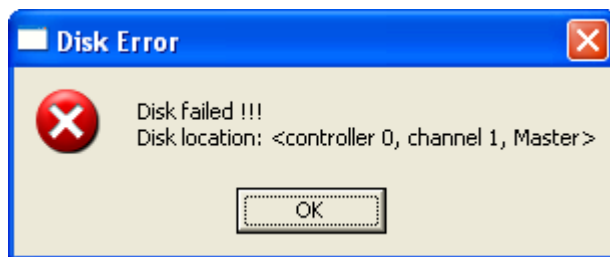


A message will pop up when the synchronization is finished.



Disk Error Detection

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



Duplicate Critical RAID 1/0+1/5 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, RAID 0+1 or RAID 5 arrays. If the software detects that a RAID 1, 0+1 or 5 array has any inconsistencies, then the status of the disk array will be marked as critical and the software will prompt the user to duplicate the RAID 1, 0+1 or 5 to make the mirror disk consistent with the corresponding source disk.

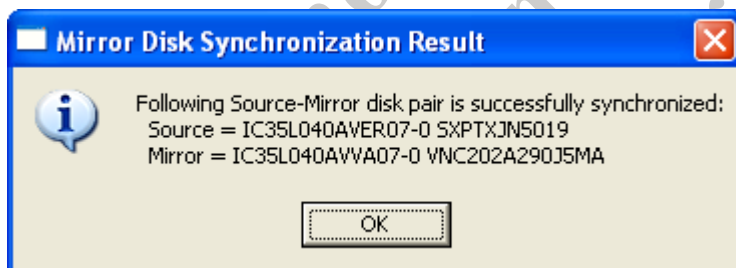


You can click **Yes** to synchronize now or click **No** to synchronize later.



After synchronization has started, a dialog box will show the process. You can pause or cancel this process at any time. If you cancel the synchronization process, the RAID will be on the “need-sync” condition. You should synchronize again to guarantee that the data between source and mirror disk drives is identical.

A message will pop up when the synchronization is finished.



Icon View

All icon types and their meanings are listed below. You can check the meaning of a specific icon here. 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

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