SATA RAID SOFTWARE

to be used with the VIA VT8237

User's Manual

Table of Contents

INTRODUCTION

This section gives a brief introduction on the RAID-related background knowledge and an outlined introduction on the VIA SATA RAID Host Controller. For users wishing to install their VIA SATA RAID driver and RAID software, please refer 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 prohibits the occurrence of operating system failure or data lost. The individual disk drives in an array are called "members". Configuration information of member is recorded in their "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.

There are usually a few methods in which hard disk drives can be combined together. The different methods referred as different RAID levels. Different RAID levels represent different performance level, security level and implementation cost. The RAID levels which VIA VT8237 SATA RAID Controller supported are RAID 0, 1, and JBOD. Here is a brief table of these RAID levels.

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

RAID 0 (Striping)

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

RAID 1 (Mirroring)

Writes duplicate data on to a pair of drives while reads are preformed 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 "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, any one drive of RAID 1 failing does not impact the data access.

JBOD (Spanning)

A spanning disk array is equal to the sum of the all drives when the drives used are different capacities. 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 a really RAID and does not support fault tolerance.

Key Features

VIA SATA RAID solution uses VT8237 south bridge as a RAID controller that is a 2-channel SATA. RAID software is a Windows-based software utility with graphical user interface and provides user an easy-operation tool to configure and manage disk drives or disk arrays connected to VT8237 SATA controller. Below are the main features and benefits of VIA SATA RAID:

 1. Supports two SATA hard disk drives.
 2. Supports SATA Generation 1 hard disk drive.
 3. Supports hard disk drive larger than 137 GB (48-bits LBA).
 4. Dual independent ATA channels and maximum 2 hard disk drives
     allowed connection.
 5. Supports SATA PIO and DMA mode transaction.
 6. Supports PCI Plug and Play. PCI interrupt sharing and coexists with
     mainboard IDE controller.
 7. Supports bus master operation.
 8. Supports RAID 0, 1, and JBOD.
 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 SATA disk drive in RAID 1 array.
14. Mirroring automatic background rebuilds support.
15. ATA SMART function support.
16. Microsoft Windows 98, Me, NT4.0, 2000, XP operating systems support.
17. Event log for easy trouble shooting.
18. On-line help for easy operation for RAID software.

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 Serial ATA RAID BIOS Setting Utility v 2.20
Copyright (C) VIA Technologies, Inc. All Right reserved.

Scan Devices, Please wait...
Press < Tab > key into User Window!
Channel 0 Master:  IC35L040NVVN07-0
Channel 1 Master:  IC35L040AVVA07-0
```

The main interface of BIOS configuration utility is as below:

```
                    VIA Tech. RAID BIOS Ver 2.20

  ▶ Create Array                    Create a RAID array with
  ▶ Delete Array                    the hard disks attached to
  ▶ Create/Delete Spare             VIA IDE controller
  ▶ Select Boot Array
  ▶ Serial Number View              F1   : View Array/disk Status
                                    ↑,↓  : Move to next item
                                    Enter: Confirm the selection
                                    ESC  : Exit

     Channel        Drive Name      Array Name   Mode   Size(GB)  Status

  Channel0 Master  IC35L040AVVA07-0              ATA 100 38.34    Hdd

  Channel1 Master  IC35L040AVVA07-0              ATA 100 38.34    Hdd
```

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. Highlight the **Array Mode** and press <Enter>, then a list of array modes will appear. Just highlight the target array mode that you want to create, and press <Enter> to confirm the selection.

3. After selected array mode, there are two methods to create a disk array. One method is "**Auto Setup**" another is "**Select Disk Drives**". **Auto Setup** let BIOS select the disk drives and create array automatically. **Select Disk Drives** let user select the array drives by required. When using **Select Disk Drives** method, the channel column will be activated. Just highlight the target drives that you want to use and press <Enter> to select them respectively. After all drives have been selected, press <Esc> to go back to the creation steps menu.
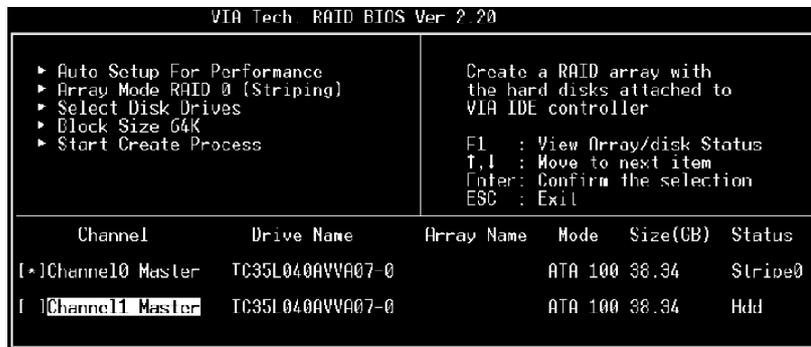
4. If user selected a RAID 0 array in step 2, user also can select a block size for the array. Use the arrow key to highlight the Block Size and press <Enter>, then select a block size from will popup. The block size can be selected from 4K to 64K Bytes.

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. Please note that all existing content in the hard drive will be destroyed after the array creation.

Delete Disk Array

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

1. Select **Delete Array** in the main menu and press <Enter>.
The channel bcolumn 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 1 is deleted, the data on these two hard disk drives will be reserved and become two normal disk drives

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 can be not selected if user does not boot operating system from disk array. Use the arrow key to highlight the Select Boot Disk item then press <Enter>. The channel column will be activated. Just use arrow key to highlight the target disk array then press <Enter>. If user select a disk array that has a boot mark and press <Enter>, then its boot setting will be canceled.

```
                    VIA Tech. RAID BIOS Ver 2.20

   ► Create Array                    Set/Clear bootable array
   ► Delete Array
   ► Create/Delete Spare
   ► Select Boot Array
   ► Serial Number View              F1   : View Array/disk Status
                                     ↑,↓  : Move to next item
                                     Enter: Confirm the selection
                                     ESC  : Exit

      Channel          Drive Name      Array Name   Mode   Size(GB)  Status

 [*]Channel0 Master   IC35L040AVVA07-0   ARRAY 0   ATA 100  38.34     Boot

 [*]Channel1 Master   IC35L040AVVA07-0   ARRAY 0   ATA 100  38.34     Boot
```

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.

```
                    VIA Tech. RAID BIOS Ver 2.20

   ► Create Array                    Create a RAID array with
   ► Delete Array                    the hard disks attached to
   ► Create/Delete Spare             VIA IDE controller
   ► Select Boot Array
   ► Serial Number View              F1   : View Array/disk Status
                                     ↑,↓  : Move to next item
                                     Enter: Confirm the selection
                                     ESC  : Exit

      Array Name     Array Mode    Block Size(GB)     Size(GB)

      ARRAY 0        Stripe        64K                76.69
```

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.

```
┌─── Critical RAID 1 ─────────────────┐┌──── Critical Status ────┐
│ Duplicate now                       ││ The RAID 1  array needs to│
│ Continue to boot                    ││ be duplicated to ensure   │
│                                     ││ data consistancy.         │
│                                     ││                           │
│                                     ││ Fault Hdd Found:          │
│                                     ││ Channel 1 Device 0 Fault  │
├─── Remaining members of the failed array ──────────────────────┤
│                                                                 │
│    Channel         Drive Name     Array Name   Mode   Size(GB)  Status│
│  Channel1 Device0  IC35L040AVVA07-0   Array0   ATA 100 38.34    Mirror│
│  Channel0 Device0  IC35L040AVVA07-0   Array0   ATA 100 38.34    Source│
│                                                                 │
│                                                                 │
│  Note:                                                          │
│  1)Press <ESC> to Exit.                                         │
│  2)After Execute,Press <TAB> immediately can into Utility Window!│
└─────────────────────────────────────────────────────────────────┘
```

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.

```
┌─── Broken RAID 1 ───────────────────┬──── Critical Status ────┐
│ Power off and check the failed drive│ A disk member of a mirroring│
│ Destroy the Mirroring Relationship  │ array has failed or is not │
│ Choose replacement drive and rebuild│ responding. The array is   │
│ Continue to boot                    │ stilling functional,but fault│
│                                     │ tolerance is disabled.     │
│                                     │                            │
├─── Remaining members of the failed array ─────────────────────┤
│                                                               │
│    Channel        Drive Name      Array Name  Mode  Size(GB) Status│
│ Channel0 Device0  IC35L040AVVA07-0  Array0   ATA 100 38.34  Broken │
│                                                               │
│                                                               │
│                                                               │
│ Note:                                                         │
│ 1)Press <ESC> to Exit.                                        │
│ 2)After Execute,Press <TAB> immediately can into Utility Window!│
└───────────────────────────────────────────────────────────────┘
```

1. Power off and Check the Failed Drive:
   This item enables users to turn off the computer and replace the failed
   hard drive with a good one. If users• e computer does not support APM,
   the computer would need to be turned off manually. After the replacement,
   users can boot into BIOS and select **3 Choose replacement drive and
   rebuild** to rebuild the broken array.

2. Destroy the Mirroring Relationship:
   This item enables users to cancel the data mirroring relationship of the
   broken array. For broken RAID 1 array, the data on the surviving disk will
   remain after the destroy operation. However, **Destroy the Mirroring Rela
   tionship** 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 and replace the data to that particular hard drive.
   After choosing the item, the channel column will be activated.

```
┌─── Broken RAID 1 ─────────────────┬──── Critical Status ─────┐
│                                   │                          │
│ Power off and check the failed drive   The contents on the disk │
│ Destroy the Mirroring Relationship     you have selected will be │
│ Choose replacement drive and rebuild   deleted.               │
│ Continue to boot                  │                          │
│                                   │                          │
│                                   │                          │
└───────────────────────────────────┴──────────────────────────┘
┌═══ Remaining members of the failed array ═══════════════════════┐
│                                                                 │
│    Channel        Drive Name      Array Name   Mode  Size(GB)  Status │
│ ( )Channel1 Device0  IC35L040AVVA07-0          ATA 100 38.34    Hdd  │
│                                                                 │
│                                                                 │
│                                                                 │
│    Note:                                                        │
│    1)Press <ESC> to Exit.                                       │
│    2)After Execute,Press <TAB> immediately can into Utility Window! │
└─────────────────────────────────────────────────────────────────┘
```

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 by selecting option **Y**, all the data on the selected hard drive will
be destroyed.

4. Continue to boot:
   This item enables BIOS to skip the problem and continue booting into OS.

DRIVER AND RAID SOFTWARE INSTALLATION

Installation of VIA SATA RAID Utility

1. Insert the motherboard CD driver into your CD-ROM drive and the CD AutoRun screen should appear. If the AutoRun screen does not appear, double click on Autorun icon in My Computer to bring up Shuttle Mainboard Software Setup screen. Select using your pointing device (e.g. mouse) on the **"Install VIA RAID Driver"** bar to install raid driver.

2. The **InstallShield Wizard** will begin automatically for installation. Click on the **"Next"** button to proceed the installation in the welcoming window.
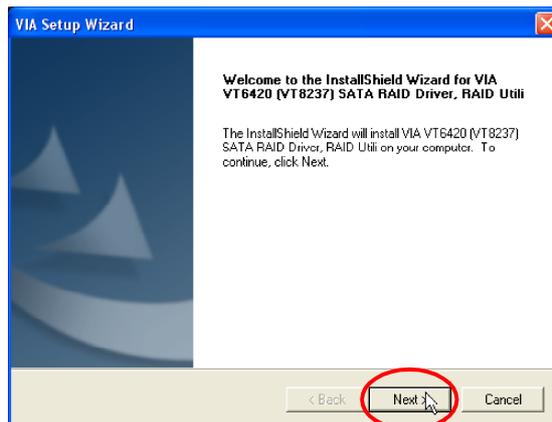
3. Please read the following license agreement carefully. Select using your pointing device (e.g. mouse) on the **"I Agree"** and click the **"Next"** button to proceed the installation.
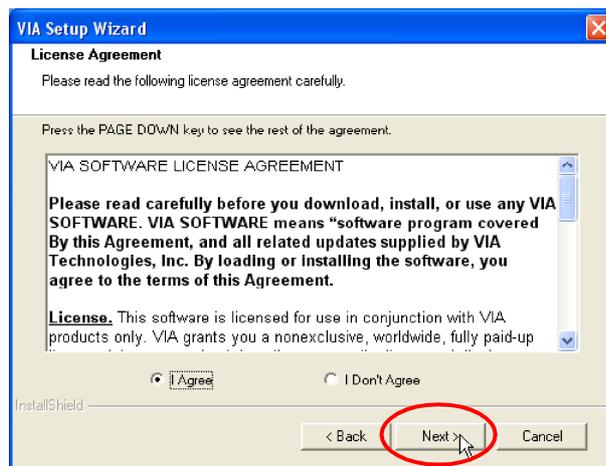
4. Put a check mark in the check box to install the feature you want. Then click **"Next"** button to proceed the installation.
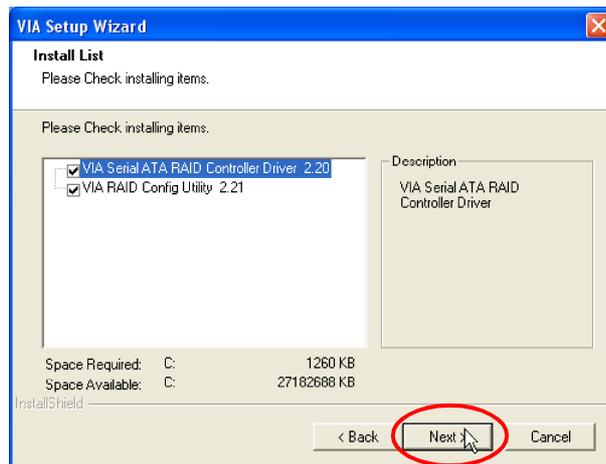
5. Setup has enough information to start installing the components. If you want to review or change any settings, click **"Back"**. If you are satisfied with settings, click **"Next"** to begin installing components.
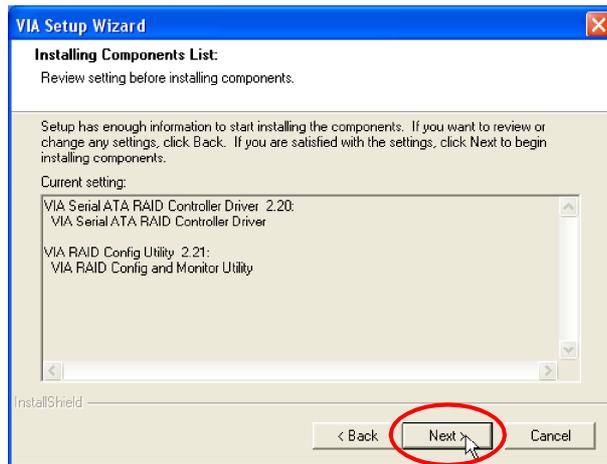
6. The following information will tell you whether or not the components is installed successfully. Click on the **"Next"** button.
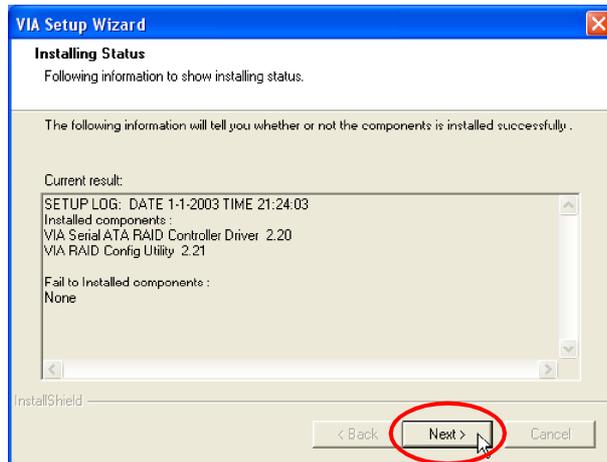
7. When installation is completed, click **"Finish"** to restart the system.
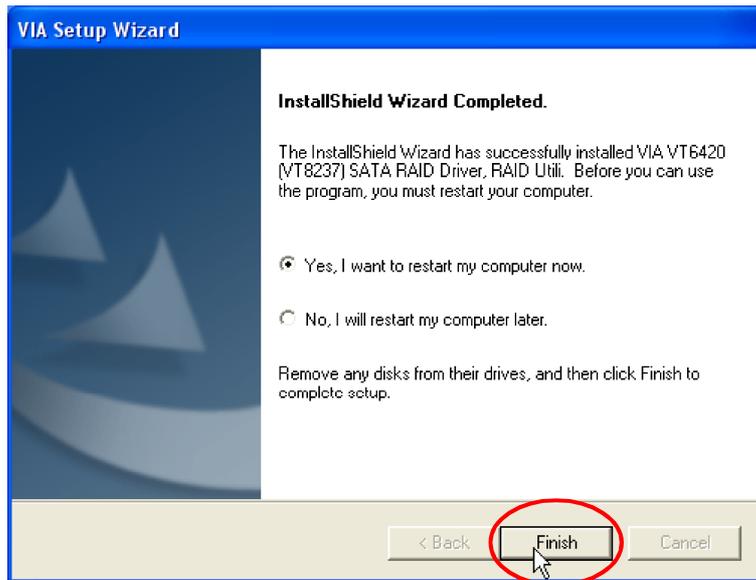
Verify Installation

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.
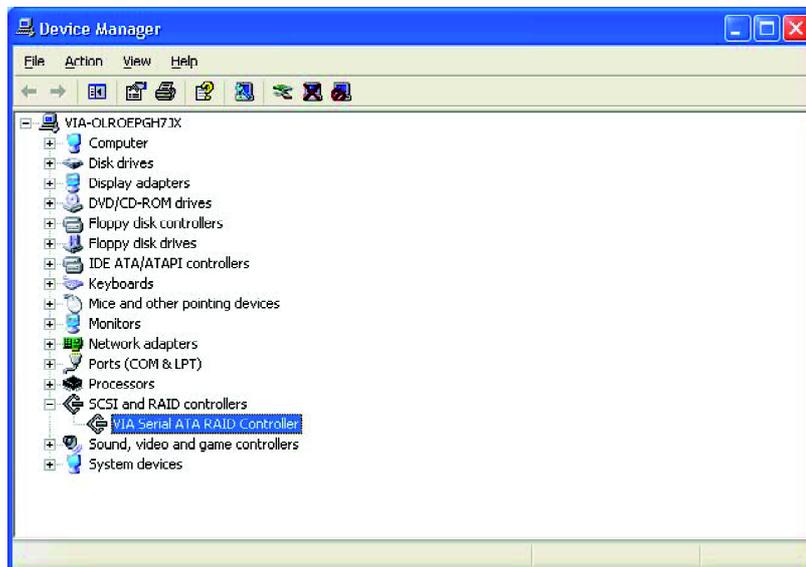
RAID SOFTWARE

Getting Start

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

Just double click on the small icon to call out the main interface of the software.
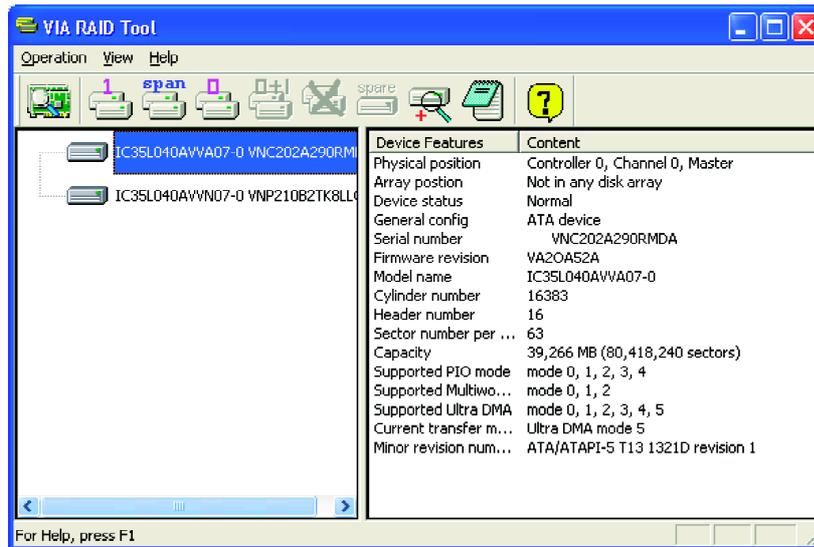
The main interface is divided into two windows and the toolbar contain the main functions. Click on these toolbar buttons to execute their specific functions. The left windowpane displays the controller and disk drives and the right windowpane displays the details of the controller or disk drives.

	View by Controller		Create Mirror Array (RAID 1)
	Create Span Array (JBOD)		Create Stripe Array (RAID 0)
	Add/Remove Spare disk		Remove Array
	View Event log		Check All Disks
	View by Devices		Help Topics
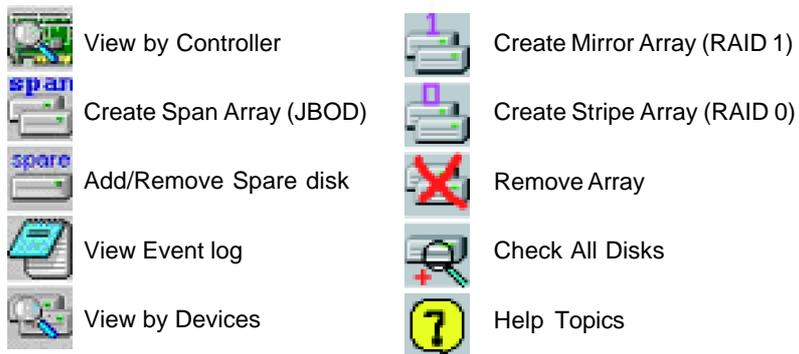
View Onlione Help

Click on [?] to launch the Help Topics. It is recommended to read through the help articles before using RAID utility.
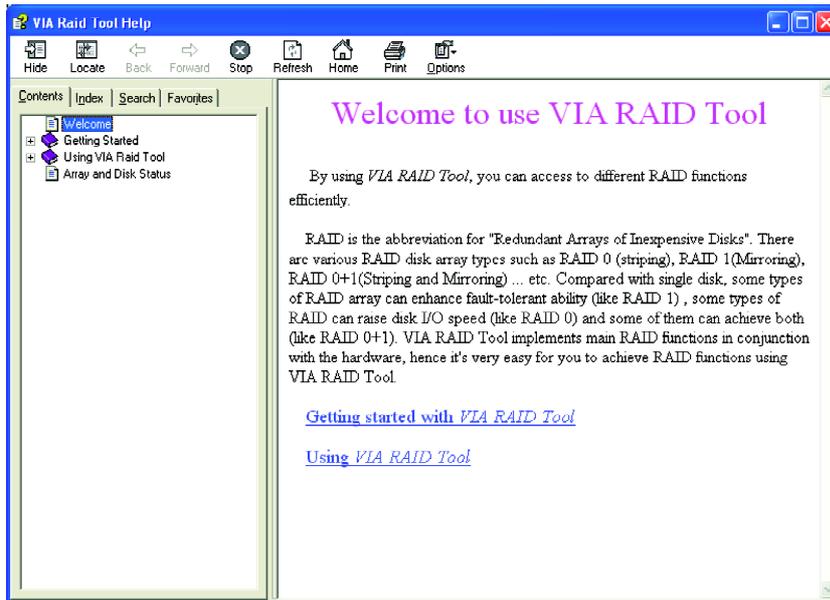
View Controller and Device Status

Click on ![icon] or ![icon] button to determine the viewing types 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.
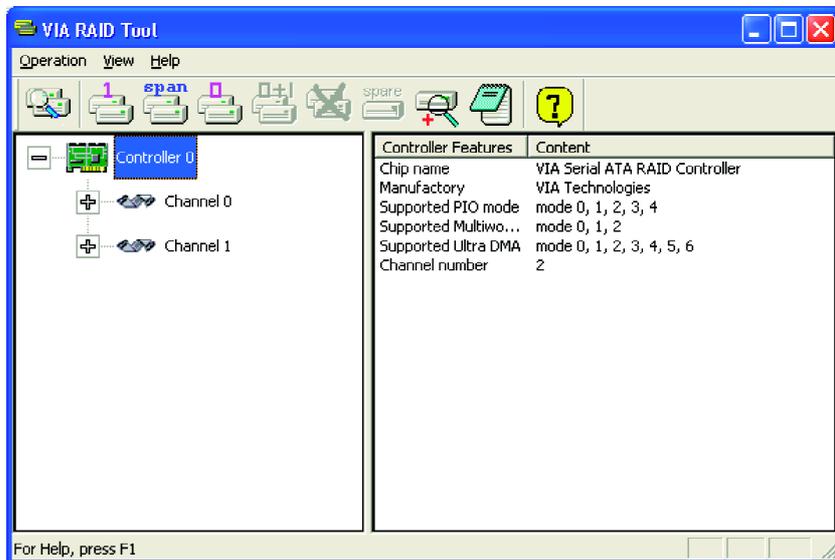
Create Disk Array

1. Depending on user's preferences, there are three buttons that could be 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.
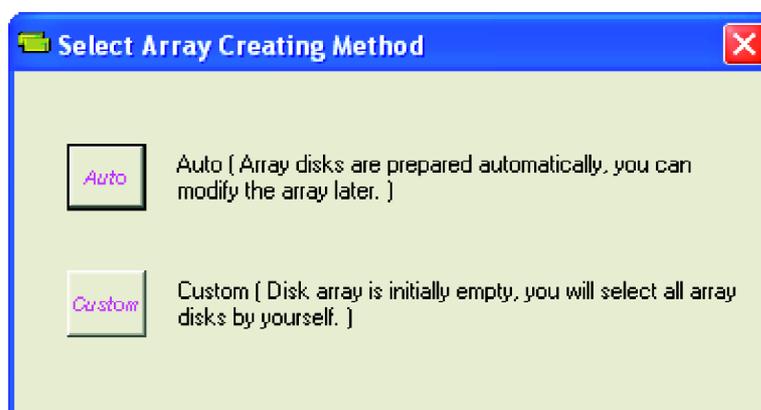
Auto: The utility will arrange the available hard disk drives to be the disk arrays.The hard disk drives can still be modified later. This method is strongly recommended.

Custom: The utility will provide an interface for arranging the disk array manually.

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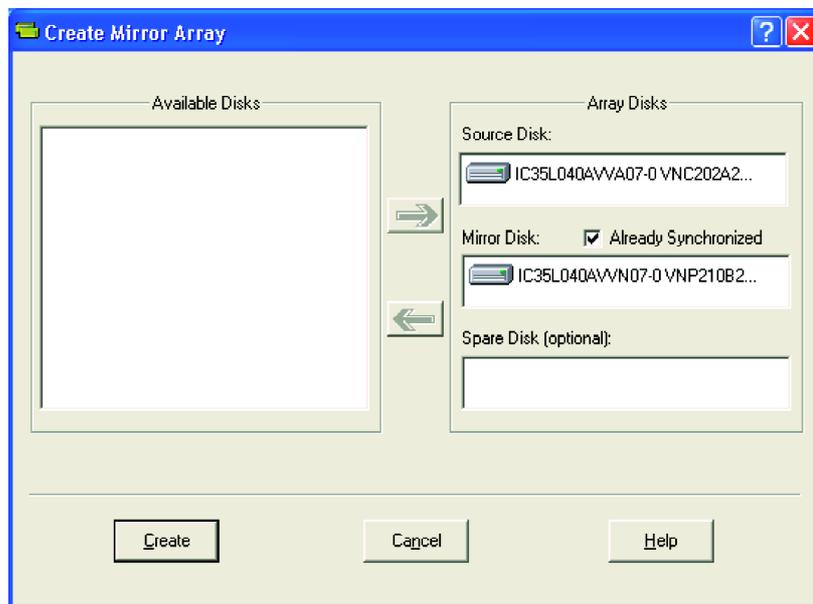
Click on "**Create**" to create or "**Cancel**" to exit. Click on "**Help**" to launch the Help Topics window.

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

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.
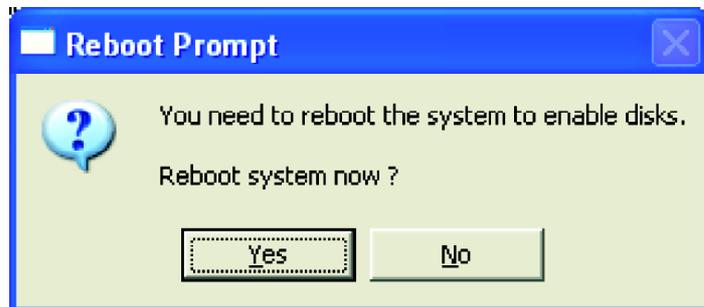
Delete Disk Array

1. Select the disk array wish to be deleted from the left windowpane, click on **Remove Array** and a warning message will popup.
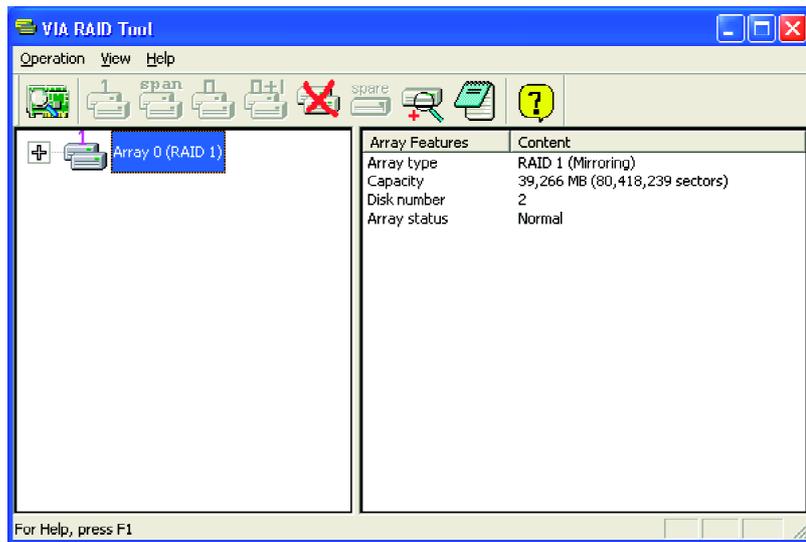
2. Click **Yes** to delete the specified disk array or click **No** to cancel.

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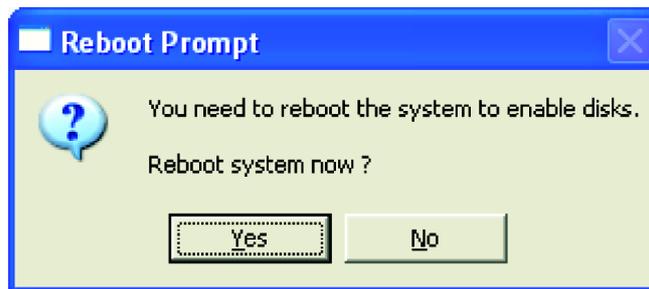
Warning: Deleting a disk array will destroy all the data on the disk array except RAID 1 arrays. When a RAID is deleted, the data on these two hard disk drives will still remain and become two normal disk drives.

Check All Disks

At any time, by clicking on the [icon] , the disk drives can be checked on whether they are working properly or not. After the disk check is completed, a dialog window will pop up to show the status of each disk. See picture below.
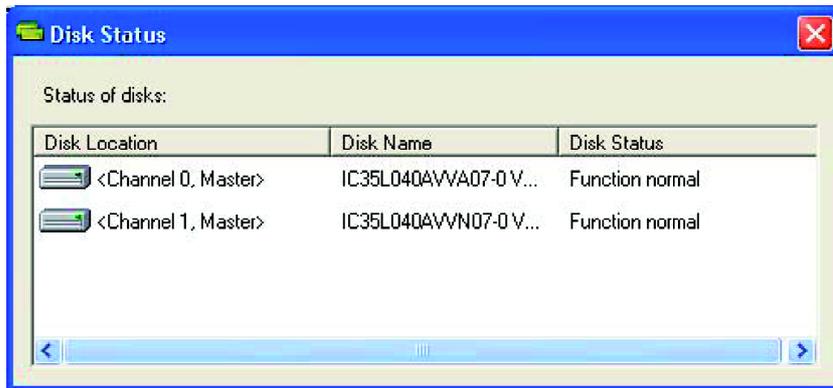
The hard disk drive must be compatible with the ATA/ATAPI-5 specification and support SMART commands, or the disk checking will fail.

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 .

Type	Time	Event
Information	2002-11-01 14:47:39	>>>> End Sync:‖Source = IC35L040AVEF
Information	2002-11-01 14:17:27	<<<< Begin Sync:‖Source = IC35L040AVI
Error	2002-11-01 14:07:32	!!! disk failed.‖ disk ="IC35L040AVVA07-0
Information	2002-11-01 11:56:14	>>>> Sync Aborted:‖Source = IC35L040A
Information	2002-11-01 11:48:06	<<<< Begin Sync:‖Source = IC35L040AVI
Information	2002-11-01 11:30:58	>>>> Verify Aborted:‖Source = IC35L040A
Information	2002-11-01 11:27:27	<<<< Begin Verify:‖Source = IC35L040AV
Information	2002-10-31 19:13:48	Array 0(Mirror Array) removed.
Information	2002-10-31 19:13:43	Array 0(Mirror Array) removed.
Information	2002-10-31 18:02:40	Mirror Array created. ‖Array disks:‖ Source
Information	2002-10-31 18:02:35	Mirror Array created. ‖Array disks:‖ Source
Information	2002-10-31 18:02:28	Array 0(RAID0+1 Array) removed.
Information	2002-10-31 18:00:52	RAID0+1 Array created. ‖Array disks:‖ sou
Information	2002-10-31 18:00:46	Array 0(Mirror Array) removed.
Information	2002-10-31 18:00:42	Array 1(Mirror Array) removed.
Information	2002-10-31 17:59:11	Mirror Array created. ‖Array disks:‖ Source
Information	2002-10-31 17:59:02	Mirror Array created. ‖Array disks:‖ Source

2. To view the details of a log item, diuble click on the row, select the row and press <Enter> to execute the menu item **Operation->View Detail**. The following dialog will appear.
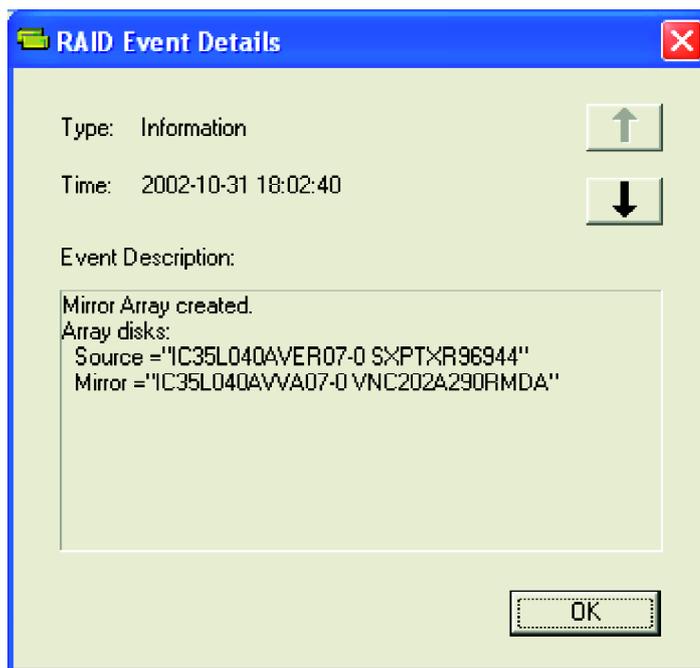
Click on ⬇ or ⬆ to browse the next or previous log item.

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. Right-click on the selected RAID and a shortcut menu will be shown. Click on **Verify Mirror** to verify whether the source and mirror are identical.
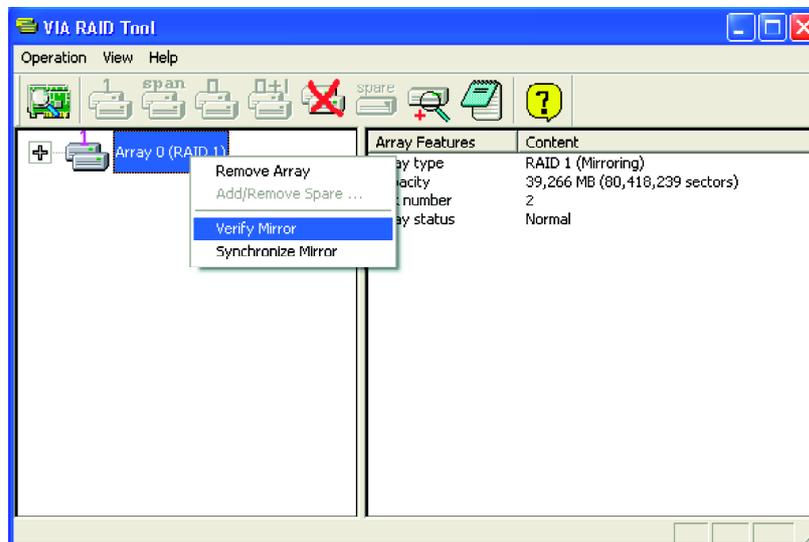
2. After executing the "verify mirror" command, a dialog box will show the verifying process. This action can paused or canceled at any time. It may take a long time to verify the source and mirror disk if the capacity of the RAID is large.

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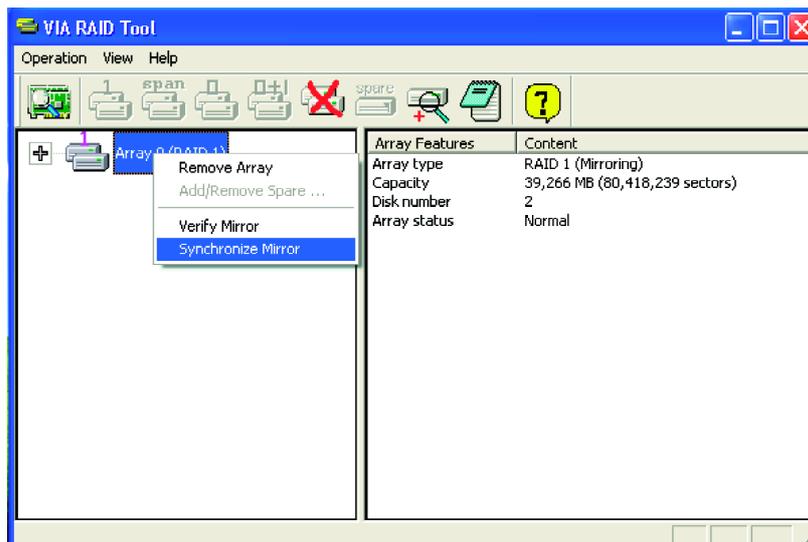
2. After synchronization has started, a dialog box will show the process. This action can be paused or canceled at any time.

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.
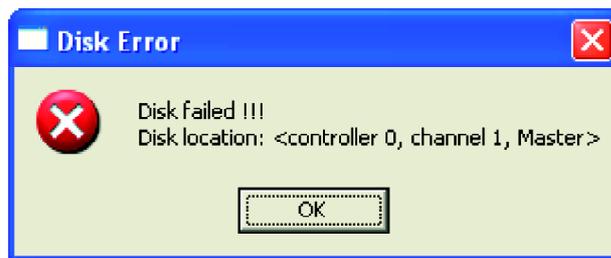
Duplicate Critical RAID 1 Array

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 arrays. If the software detects that a RAID 1 array containing inconsistencies, the status of the disk array will be marked as critical and the software will prompt the user to duplicate RAID 1 to make the mirror disk consistent with the corresponding source disk.
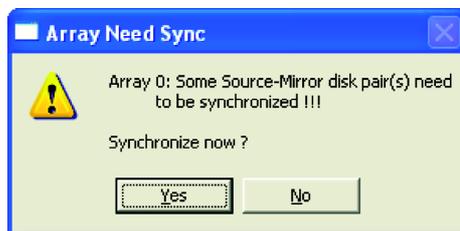
You can click **Yes** to synchronize now or click **No** to synchronize later.

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 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, 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 un plugged 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.
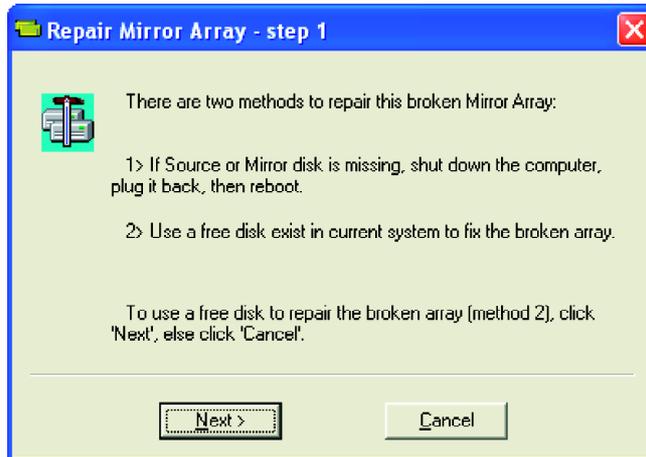
3. Select a disk drive from **Available Disks** and click on to replace the broken drive and then click **Next**.
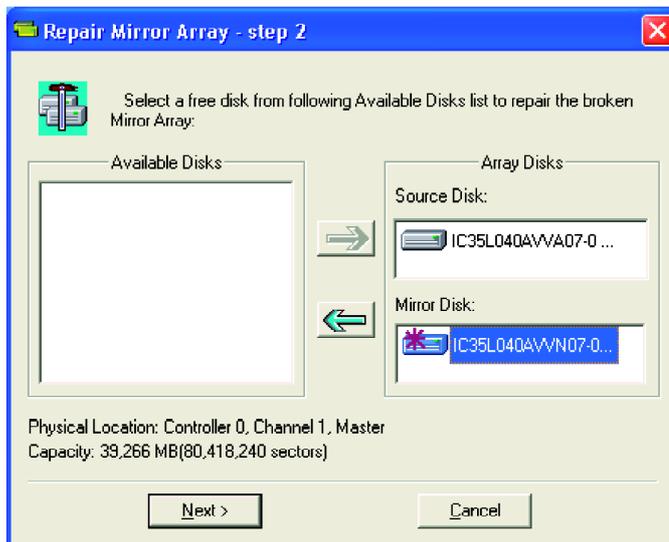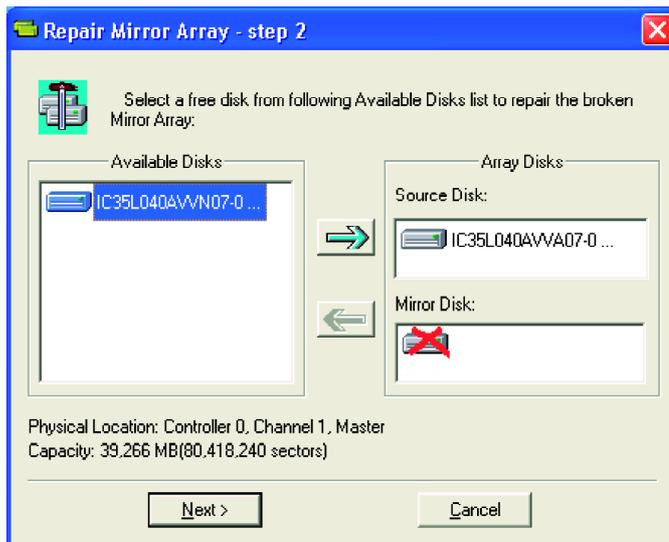
4. A warning message will appear. If you want to rebuild the RAID using the disk driver that you selected in the previous step, click **Next**.
   Warning: All the data on the selected disk drive will be lost
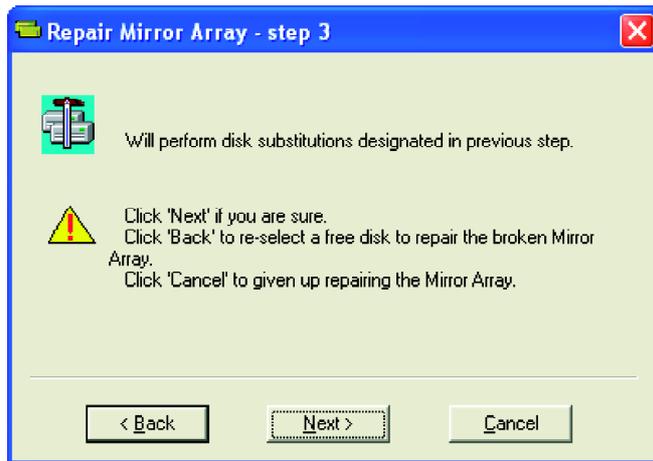
5. Reboot the system
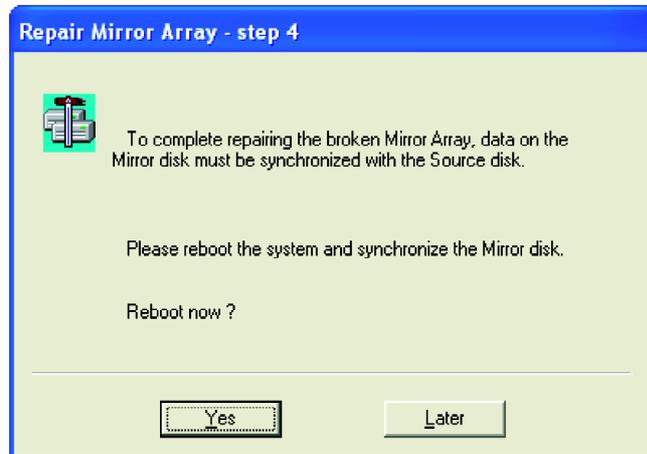
6. This RAID is marked as a critical RAID. The RAID software will duplicate this critical RAID 1 process.

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 windowpance.

Normal Disk Array

Disk Array with Warning ststus

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