Intel® RAID Technology

OEM Customization Technical Guide

For the Intel® Application Accelerator RAID Edition 3.5 Software using Intel® ICH5R

June 2003

Revision 2.1

Intel Confidential

Document Number: NDA Required

Contents

Revision History

Revision Number	Description	Revision Date
1.0	Initial Release Version	April 2003
1.1	Added Event Log Interpretation section	April 2003
2.0	Updated entire doc with IAA 3.5 new features (RAID 1, Windows 2000, Event Log reporting, & Event Monitor)	May 2003
2.1	Additional updates for RAID 1 support and fixed grammatical errors	June 2003

This page is intentionally left blank.

1 About This Document

This document was prepared to assist customers in evaluating, testing, configuring, and delivering Intel® RAID Technology on platforms using the Intel® 82801ER SATA RAID controller (found in Intel® 82801ER I/O controller hub), the *Intel® RAID Option ROM* and the *Intel® Application Accelerator RAID Edition 3.5* software. This document describes installation procedures, common usage models, and any special notes necessary to enable customers to make a timely and competitive delivery of this product.

This document was intended to be used in conjunction with the Intel® Application Accelerator RAID Edition User's Manual available on the Intel Software and Drivers website (also known as ARMs).

This page is intentionally left blank.

2 Intel® RAID Technology

Intel is delivering a RAID solution for the Microsoft Windows* XP and Microsoft Windows* 2000 operating system with the 865 and 875 series core-logic chipsets. This RAID solution supports RAID level 0 (striping), and RAID level 1 (mirroring), and is targeted for availability on systems using ICH5R. Targeted for desktops and workstations, this RAID solution addresses the high demand from PC enthusiasts, high-end gamers, tech zealots, and other users requiring high-performance platforms. RAID 0 breaks the data into blocks which are written to separate disk drives. Spreading the disk I/O load across independent channels greatly improves I/O performance. RAID 1 provides data redundancy by mirroring data between the disks and provides enhanced read performance. The RAID configuration is transparent to Windows; the RAID volume appears as a single physical disk.

Note: The RAID 0 volume appears as a single physical disk with a capacity equal to twice the size of the smaller disk. The RAID 1 volume appears as a single physical disk with a capacity equal to that of the smaller disk.

The increasing requirements for performance in desktop platforms, combined with increasing price pressures make RAID solutions extremely attractive to both system integrators and end-users. The Intel RAID Technology solution offers data striping for higher performance and data mirroring for data redundancy (RAID 0 and RAID 1, respectively). This alleviates disk bottleneck by taking advantage of the dual independent Serial ATA150 controllers integrated into the Intel® ICH5R. System integrators can offer these features to their customers through the use of only two hard disk drives and no loss of PCI resources (request/grant pair) or add-in card slot. Intel's RAID 0 solution provides end-users the performance necessary for any disk-intensive applications; these include video production and editing, image editing, and gaming applications. Intel's RAID 1 solution provides end-users with data redundancy by mirroring data between the disks.

The Intel RAID Technology solution offers a very simple design, eliminating the need for any add-in card, discrete controller, or dedicated HDD for the operating system. RAID is the perfect complement for Intel's 2003 performance core-logic chipsets.

The Intel RAID Technology product is comprised of the following three core components:

- Intel® 82801ER I/O Controller Hub (ICH5R)
- *Intel® Application Accelerator RAID Edition 3.5* software
- *Intel® RAID Option ROM*

This page is intentionally left blank.

3 Intel® Application Accelerator RAID Edition 3.5

The *Intel® Application Accelerator RAID Edition 3.5* is the major software component needed for supporting Intel RAID Technology. It will provide a RAID driver for support under Windows XP or Windows 2000 operating systems and a graphical user interface (a Win32 application). The RAID driver is designed specifically to support the 82801ER SATA RAID controller and will recognize its unique device ID. Because of this, it must be present in order to install the Windows operating system onto a RAID 0 or RAID 1 volume or onto a single SATA disk connected to the RAID controller. The RAID driver, in conjunction with the *Intel® RAID Option ROM*, will provide seamless boot support for a two drive RAID 0 solution. The RAID driver, in conjunction with the graphical user interface, will provide RAID volume management (create, delete, migrate) from within the Windows operating system. It will also display useful SATA device and RAID volume information.

This page is intentionally left blank.

4 Intel® RAID Option ROM

The *Intel RAID Option ROM* is a standard PnP option ROM that adds the Int13h services and provides a pre-OS user interface for the Intel® RAID Technology solution. The Int13h services provide the ability for a RAID volume to be used as a boot disk. They also detect any faults in the RAID volume being managed by the RAID controller. The Intel RAID Option ROM's Int13h services are used up to the point where the Intel RAID driver takes over. The *Intel RAID Option ROM* expects a BIOS Boot Specification (BBS) compliant BIOS. It exports multiple PnP headers for each non-RAID disk or RAID volume, allowing boot order to be selected from within the BIOS's setup utility. When the system BIOS detects the RAID controller, the *Intel RAID Option ROM* should be executed. The user interface integrated into the *Intel RAID Option ROM* provides the basic functionality needed to create and delete RAID volumes in a pre-OS environment. This provides the ability for the OS to be installed directly onto the volume.

The *Intel RAID Option ROM* is delivered as a single uncompressed binary image compiled for the 16-bit real mode environment. To conserve system flash space, the integrator may compress the image for inclusion into the BIOS. The uncompressed Option ROM image will be less than 64 KB in size. The run-time image that resides in BIOS compatibility space will reduce to less than 20 KB in size and consume no more than 12 KB of system memory. System memory is taken from conventional DOS memory and is not returned.

This page is intentionally left blank.

5 Intel RAID Configuration Utility

The Intel RAID Configuration utility is a 16bit DOS executable with capabilities similar to the *Intel RAID Option ROM*. Its sole purpose is to provide customers with the ability to create, delete, and manage RAID volumes on a system within a DOS environment. For ease of use, the utility supports a set of command line parameters that make it possible to perform these functions without user interaction through the use of DOS scripts or shell commands.

The RAID Configuration utility has two main modes. The first on is through the use of command line parameters. Below is a screen shot of the help text displayed when using the -? flag. It shows the usage for all supported command line flags necessary for creating, deleting, and managing RAID volumes.

The second mode of operation is console mode. If this utility is executed without any command line flags, a console interface identical to that of the *Intel RAID Option ROM* is presented and is fully functional within the DOS environment. The mode requires user interaction; however, it may be used to create, delete, and manage RAID volumes from a DOS environment when the *Intel RAID Option ROM* is unavailable.

This page is intentionally left blank.

6 Common RAID Setup Procedures

6.1 Build a SATA RAID 0 Or RAID 1 System

This is the most common setup. This configuration will have the operating system striped for RAID 0, or mirrored for RAID 1, across two SATA hard drives. This would be a configuration commonly shipped by a system vendor. To prepare for this, you will need to have the Intel RAID driver on a floppy disk. See the procedure for creating this floppy in section 11.3 of this document.

1. Assemble the system using a motherboard that supports Intel® RAID Technology and attach two SATA hard drives.

2. Enter System BIOS Setup; ensure that Intel RAID Technology is enabled. This setting may be different for each motherboard manufacturer. Consult your users manual if necessary. When done, exit Setup.

3. Upon re-boot you will see the Intel RAID BIOS status message on the screen – press CTRL-I to enter the Intel RAID Option ROM user interface. Within this UI, select option #1 'Create RAID volume. Enter a volume name, press enter, select RAID level (0 or 1), press enter; if RAID 0 is selected, select the strip size (128 KB is the default for RAID 0), (if RAID 1 is selected, the strip size will be inapplicable and will be skipped), press enter, press enter again, then press 'Y' to confirm. Once this is done, exit the Intel RAID Option ROM user interface.

   Note: Selecting the stripe size is only applicable for RAID 0.

4. Begin Windows XP or Windows 2000 Setup by booting from the installation CD.

5. At the beginning of Windows Setup, press F6 to install a third-party SCSI or RAID driver. When prompted, insert a floppy disk containing the Intel RAID driver. After reading the floppy disk, the 'Intel® 82801ER SATA RAID Controller' will be presented -- select this driver to install.

6. Finish the Windows installation and install all necessary drivers.

7. Install the *Intel® Application Accelerator RAID Edition 3.5* software via the CD-ROM included with your motherboard or after downloading it from the Internet. This will add the *Intel Application Accelerator RAID Edition 3.5* user interface utility that can be used to manage the RAID configuration.

6.2 Build a SATA "RAID Ready" System

The following steps outline how to build an Intel "RAID Ready" system with Windows XP or Windows 2000 installed on a single SATA hard drive. A "RAID Ready" system can be seamlessly upgraded to RAID 0 or RAID 1 at a later date using the RAID migration feature built into Intel Application Accelerator RAID Edition 3.5. This technology enables you to install a second SATA hard drive, and then migrate to a RAID 0 or RAID 1 volume without re-installing the operating system.

1. Assemble the system using a motherboard that supports Intel RAID Technology and attach one SATA hard drive.

2. Enter System BIOS Setup; ensure that Intel RAID Technology is enabled. This setting may be different for each motherboard manufacturer. Consult your user manual if necessary. When done, exit Setup.

3. Begin Windows Setup by booting from the installation CD.

4. At the beginning of Windows Setup, press F6 to install a third-party SCSI or RAID driver. When prompted, insert a floppy disk containing the Intel RAID driver. After reading the floppy disk, the 'Intel® 82801ER SATA RAID Controller will be presented -- select this driver to install.

5. Finish the Windows installation and install all necessary drivers.

6. Install the *Intel® Application Accelerator RAID Edition 3.5* software via the CD-ROM included with your motherboard or after downloading it from the Internet. This will add the *Intel Application Accelerator RAID Edition 3.5* user interface utility that can be used to manage the RAID configuration and to use the Intel Application Accelerator RAID Edition migration feature to migrate a "RAID Ready" configuration to a RAID 0 or RAID 1 configuration.

6.3 Migrate to RAID 0 or RAID 1 on Existing "RAID Ready" System

If you have an existing "RAID Ready" system as defined in section 6.2, then you can use the following steps to perform a migration from a single non-RAID configuration to a two drive RAID 0 or RAID 1 configuration. The resulting configuration will be identical to that created by the procedure in section 6.1. To prepare for this, you will need another SATA hard drive with a capacity equal to or greater than that currently being used as the source disk.

1. Physically attach one SATA hard drive to the SATA port not being used. Note the serial number of the hard drive already in the system; you will use this to select it as the source disk when initiating the migration.

2. Boot Windows, install IAA RAID Edition software, if not already installed, using the setup package obtained from a CD-ROM or from the Internet. This will install the necessary IAA user interface and start menu links.

3. Open the IAA user interface from the Start Menu and select 'Create from Existing Disk' by right-clicking on the volume item in the device tree. This will activate the migration wizard.

4. The migration wizard will ask you to supply a name, strip size (RAID 0 only), and RAID level for the new RAID volume created during the migration process. Click Next.

5. The wizard will then ask you to select the source disk. It will present a list of the two hard disks in the system with their serial numbers next to them. Select the disk that was originally in the system and contains your user data by selecting the serial number that you noted during step 1. The remaining disk will be used as the destination disk.

6. Once these are supplied, click through the confirmation dialogs to begin the migration. It's important to understand what will occur during the migration process because any data on the destination disk will be lost.

7. Once the migration is complete, reboot the system. If you migrated to a RAID 0 volume, use Disk Management from within Windows in order to partition and format the empty space created when the two disk capacities are combined. You may also use third-party software to extend any existing partitions within the RAID volume.

6.4 Migrate an Existing Data Disk to a RAID 0 or RAID 1 Volume

When you are booting from a PATA drive containing the operating system, you may use the 82801ER SATA RAID controller to create a RAID 0 or RAID 1 volume on two SATA drives. Furthermore, if you have a SATA disk that contains program or personal data, you may use Intel® Migration Technology to use this disk as the source disk for a migration. After the migration completes, you will have a two disk RAID 0 volume where data is striped or a two disk RAID 1 volume where the data is mirrored across the two SATA disks. To do this, the 82801ER SATA RAID controller will have to be enabled and you will need to have the Intel® Application Accelerator RAID Edition software installed.

Begin with a system where you are booting Windows XP or Windows 2000 from a PATA hard disk. Make sure the 82801ER SATA RAID controller is enabled and the Intel® Application Accelerator RAID Edition software is installed. Then do the following:

1. Physically attach one SATA hard drive to the SATA port not being used. Note the serial number of the hard drive already in the system. You will use this to select it as the source disk when initiating the migration.

2. Boot to Windows, install IAA RAID Edition software, if not already installed, using the setup package obtained from a CD-ROM or from the Internet. This will install the necessary IAA user interface and start menu links.

3. Open the IAA user interface from the Start Menu and select 'Create from Existing Disk' by right-clicking on the volume item in the device tree. This will activate the migration wizard.

4. The migration wizard will ask you to supply a name, strip size (RAID 0 only), and RAID level for the new RAID volume created during the migration process. Click Next.

5. The wizard will then ask you to select the source disk. It will present a list of the two hard disks in the system with their serial numbers next to them. Select the disk that was originally in the system and contains your user data by selecting the serial number that you noted earlier when looking at the disk itself. The remaining disk will be used as the destination disk.

6. Once these are supplied, click through the confirmation dialogs to begin the migration. It's important to understand what will occur during the migration process because any data on the destination disk will be lost.

7. Once the migration is complete, reboot the system when prompted.

Post Migration Note: After completing a migration from a "RAID Ready" configuration to a RAID 0 configuration (see user's manual for instructions), you will notice that the RAID 0 volume is now the combined capacity of the two SATA hard drives, but the migrated partition size(s) is the same. This results in empty, unformatted space at the end of the RAID 0 volume. To utilize this space, you will need to use Windows Disk Management to create another partition on the remaining empty space in the RAID 0 volume or use a third-party application to expand the migrated partition to span the entire RAID 0 volume.

6.5 Create a RAID volume on SATA While Booting to PATA

This configuration is intended for users who would like to use a RAID 0 volume as a high performance data disk or use the data redundancy properties of RAID 1. Starting with a configuration where the system is booting to a Windows XP or Windows 2000 operating system, installation on a Parallel ATA hard drive, the user can add two SATA hard drives and create a RAID volume on them.

1. Physically install two SATA hard drives to the system.

2. Enter System BIOS Setup; ensure that Intel RAID Technology is enabled. This setting may be different for each motherboard manufacturer. Consult your user manual if necessary. When done, exit Setup.

3. Boot to Windows; install IAA RAID Edition software, if not already installed, use the setup package obtained from a CD-ROM or from the Internet. This will install the necessary IAA user interface and start menu links.

4. Use the IAA user interface utility to create a RAID 0 volume on two SATA drives according to the procedure in section 11.1 of this document.

5. After the RAID volume is created, you will need to use Windows Disk Management or other third-party software to create a partition within the RAID volume and format the partition. At this point, you may begin to copy files to, or install software on, the RAID volume.

6.6 Build a RAID 0 or RAID 1 System in an Automated Factory Environment

This procedure consists of two steps. The first is to create the master image of a Windows installation. This should be the master image you would like pre-loaded on your systems to be pre-loaded with before they are delivered to the customer. The second step is to apply this image to a system with two SATA hard drives installed with a RAID 0 or RAID 1 volume present. This procedure will apply the image to the RAID volume so that the system may boot from it and the operating system will be fully striped by the RAID 0 volume or mirrored by the RAID 1 volume. The same procedure, and master image, could be applied to a single SATA hard drive to create a "RAID Ready" system.

6.6.1 Step 1: Create the Master Image

1. Build a RAID 0 or RAID 1 System as described in section 8.1 of this document.

2. Install the *Intel® Application Accelerator RAID Edition 3.5* software via the CD-ROM included with your motherboard or after downloading it from the Internet. This will add the *Intel Application Accelerator RAID Edition 3.5* user interface utility that can be used to manage the RAID configuration.

3. Use third-party software to create an image of the RAID volume as if it were a physical disk or create an image of the partition within the RAID volume containing the operating system, program and data files. Store it in a place where it can be accessed by systems on the assembly line.

6.6.2 Step 2: Apply the Master Image

1. Assemble the system using a motherboard that supports Intel® RAID Technology and attach two SATA hard drives.

2. Enter System BIOS Setup; ensure that Intel RAID Technology is enabled. This setting may be different for each motherboard manufacturer. Consult your user manual if necessary. When done, exit Setup.

3. Within a DOS environment, use the Intel RAID Configuration Utility (RAIDcnfg.exe) to create a RAID volume. The following command line will instruct the utility to create a RAID 0 volume named "OEMRAID0" with a strip size of 128 KB:

```
C:\>raidcfg.exe /C:OEMRAID0 /SS:128
```

```
The following command line will display all supported command
line parameters and their usage:
```

```
C:\>raidcfg.exe /?
```

NOTE: The system does not need to be rebooted before moving on to the next step. If there are no PATA disk drives in the system, the RAID volume created will become the boot device upon reboot.

4. Use third-party software to apply the image created in Step 1 to the RAID volume.

This page is intentionally left blank.

7 Creating a RAID Volume

RAID volumes can be created three different ways. The one most widely used by end-users is the Windows user interface utility. The second method to create a RAID volume would be to use the Intel RAID Option ROM user interface. The third way, used by OEMs only, is using the RAID Configuration Utility (RAIDcfg.exe).

7.1 Using the Windows* User Interface Utility

1. Run the Intel Application Accelerator user interface utility from the following Start menu link within Windows XP or Windows 2000:

   Start→Programs→Intel Application Accelerator RAID Edition→Intel Application Accelerator

2. Right-click the "RAID Volumes" selection in the device tree on the left side of the interface. This should present a pointer menu. Select 'Create Manually'.

3. Enter the Name you wish to use for the RAID volume in the field provided. You should see the RAID level and Strip Size selects pre-populated for RAID 0 and 128-KB strip size. This initial release of Intel Application Accelerator supports RAID 0 and uses 128 KB as the default strip size. Change the strip size setting if desired. Click Next to continue.

Note: Selecting the strip size is only applicable for RAID 0, and **not** for RAID 1.

4. The next dialog you should see shows the parameter set and asks you to confirm that you would like to create the RAID volume. Click Yes to confirm.

5. Once the RAID volume is created, you will be presented with a dialog stating that the RAID volume was successfully created. Click OK to close this dialog. Exit the UI utility.

6. After the RAID volume is created, you will need to use Windows Disk Management or other third-party software to create a partition within the RAID volume and format the partition. At this point, you may begin to copy files to, or install software on, the RAID volume.

7.2 Using the RAID Option ROM User Interface

1. Upon re-boot, you will see the Intel RAID BIOS status message on the screen – press CTRL-I to enter the Intel RAID Option ROM user interface.

2. Within this UI, select option #1 'Create RAID volume'. Enter a name you wish to use for the RAID volume, press enter when done.

3. Select the strip size (128 KB is the default for RAID 0), by using the up and down arrow keys, press enter when selected, press enter again, then press 'Y' to confirm.

Note: Selecting the strip size is only applicable for RAID 0, and **not** for RAID 1.

4. Once this is done, exit the Option ROM user interface.

7.3 Using the RAID Configuration Utility

1. Within a DOS environment, run RAIDcnfg.exe with the following command line flags to create a RAID volume. The following command line will instruct the utility to create a RAID 0 volume named “OEMRAID0” with a strip size of 128 KB:

```
C:\>raidcfg.exe /C:OEMRAID0 /SS:128
```

2. Within a DOS environment, run RAIDcnfg.exe with the following command line flags to create a RAID volume. The following command line will instruct the utility to create a RAID1 volume named “OEMRAID1”

   The following command line will display usage for all support command line parameters:

```
C:\>raidcfg.exe /?
```

Note: Selecting the strip size is only applicable for RAID 0, and **not** for RAID 1.

8 Deleting a RAID Volume

RAID volumes can be deleted in three different ways. The method most widely used by end-users is the Windows user interface utility. The second method would be to use the Intel RAID Option ROM user interface. The third way, used by OEMs only, is using the RAID Configuration Utility (RAIDcfg.exe).

8.1 Using the Windows* User Interface Utility

1. Run the Intel Application Accelerator user interface utility from the following Start menu link within Windows XP or Windows 2000:

   Start→Programs→Intel Application Accelerator RAID Edition→Intel Application Accelerator

2. Right-click the "RAID Volumes" selection in the device tree on the left side of the interface. This should present a pointer menu, select "Delete"

3. You will be presented with two confirmation dialogs. The first one will explain that all the data in the RAID volume will be lost. Click Yes to continue. The second dialog will again confirm the deletion of the RAID volume. Click Yes to continue.

8.2 Using the RAID Option ROM User Interface

1. Upon re-boot, you will see the Intel RAID BIOS status message on the screen – press CTRL-I to enter the Intel RAID Option ROM user interface.

2. Within this UI, select option #2 'Delete RAID volume'.

3. You should be presented with another screen listing the existing RAID volume. Select the RAID volume you wish to delete using the up and down arrow keys. Press the Delete key to delete the RAID volume

4. Click Y to confirm.

Note: Option #3 "Reset Disks to Non-RAID" may also be used to delete a RAID volume. This mechanism is provided as a way to reset the SATA disks to non-RAID status, essentially deleting all metadata on the disks. This has the affect of deleting any RAID volumes present. This function is provided for re-setting the disks when there is a mismatch in RAID volume information on the disks, and Option #2 cannot be used.

8.3 Using the RAID Configuration Utility

1. Within a DOS environment, run RAIDcnfg.exe with the following command line flag to delete a RAID volume. The following command line will instruct the utility to delete a RAID 0 volume named “OEMRAID0”

```
C:\>raidcfg.exe /D:OEMRAID0
```

   The following command line will display usage for all support command line parameters:

```
C:\>raidcfg.exe /?
```

2. Within a DOS environment, run RAIDcnfg.exe with the following command line flag to delete a RAID volume. The following command line will instruct the utility to delete a RAID1 volume named “OEMRAID1”

```
C:\>raidcfg.exe /D:OEMRAID1
```

9 Pre-Installation of the Intel® RAID Driver

Installation of Windows XP or Windows 2000 on a RAID volume will require that the Intel Application Accelerator RAID Edition driver be pre-installed. A RAID 0, RAID 1, or a 'RAID Ready' configuration would require this type of installation.

9.1 Pre-Installation Using F6 Method

1. Most likely, when you start the installation of Windows, you will be presented with a message stating, "Setup could not determine the type of one or more mass storage devices installed in your system". If this is the case, then you are already in the right place and are ready to supply the RAID driver. If this is not the case, then simply press F6 when prompted at the beginning of Windows setup.

2. Press the 'S' key to select 'Specify Additional Device"

3. At this point you should be prompted to insert a floppy drive containing the manufacturer-supplied driver into the A: drive. In this case, it should contain the Intel RAID driver which includes the driver binary (iastor.sys), its INF file (iastor.inf), and the txtsetup.oem file (txtsetup.oem). These should be in the root directory of the floppy. Insert this floppy and press ENTER.

4. A few seconds later, you should be presented with a list of available SCSI Adapters. It should list "Intel(r) RAID Controller". Select it and press ENTER.

5. The next screen should confirm that you have selected the Intel(r) RAID controller. Press ENTER again to continue.

6. At this point, you have successfully F6'ed in the IAA RAID driver, and Windows setup should continue. Leave the floppy disk in the floppy driver until the system reboots itself. Windows setup will need to copy the files from the floppy again after the RAID volume is formatted, and Windows setup starts copying files.

9.2 Unattended Installations of Microsoft Windows* XP

To install the RAID driver as outlined in the Microsoft document, "Deployment Guide Automating Windows NT* Setup" use the supplied TXTSETUP.OEM file included in this package and insert the lines below into the UNATTEND.TXT file. This method is available for Microsoft Windows XP operating system. For Windows XP, the iaStor.inf, iaStor.sys, iaStor.cat, and Txtsetup.oem files need to be extracted. To extract these files, use the method described in section 11.3 of this document

For Microsoft Windows XP, insert the following text into the UNATTEND.TXT file:

```
[MassStorageDrivers]

"Intel(R) 82801ER SATA RAID Controller" = OEM
```

```
[OEMBootFiles]

iaStor.inf

iaStor.sys

iaStor.cat

Txtsetup.oem
```

9.3 Creating a Floppy Disk Containing the Intel® RAID Driver

This procedure should be used to create a floppy disk containing the Intel RAID driver for use in installing the RAID driver using the F6 method described in section 8.1.

1. On a system running Windows, download the Intel RAID package or obtain it from your Intel representative.

2. Insert a blank, formatted floppy disk onto the a: drive.

3. Unpack the individual driver files using the following command line flags. There are four listed below since the IAA team at Intel releases the IAA RAID Edition software in four different installation packages. These include: one English only executable (iata_enu.exe), one multi-language executable (iata_cd.exe), one English only zip package (iata_enu.zip), and one multi-language executable (iata_cd.zip).

   ```
   C:\>setup.exe -a -p c:\RAIDdriver
   ```

   Used for setup.exe within the English only and multi-language .zip files)

   ```
   C:\>iata_enu.exe -a -a -p c:\RAIDdriver

   C:\>iata_cd.exe -a -a -p c:\RAIDdriver
   ```

   **Where `c:\RAIDdriver` is an already existing folder on the c: drive

4. Once this is done, copy the RAID driver binary (iastor.sys), its INF file (iastor.inf), and the txtsetup.oem file (txtsetup.oem) from `c:\RAIDdriver\WinXP` to the root directory of the floppy.

10 Determining the Software Versions of the Components

10.1 Determining the Version of the RAID Driver

There are two ways to do this. The first is to use the Intel Application Accelerator user interface utility. It reports the current version of the RAID Driver installed. The second is to locate the RAID driver (iaStor.sys) itself and view its properties.

10.1.1 Using the Microsoft Windows* User Interface Application

1. Run the UI Application from the following Start Menu path:

   Start→All Programs→Intel Application Accelerator RAID Edition→Intel Application Accelerator

2. Click the “Device Information” Tab.

3. Single left-click the “Intel(R) 82801ER SATA RAID Controller” item in the Devices tree.

4. Look for a parameter in the Parameters list box entitled “Driver Version”. It should have a number in the following format:

   3.5.0.xxxx

5. This is the current version of the user interface utility installed on your system. The 3.5.0 portion is the product release number; the xxxx portion is the build number.

10.1.2 Using the RAID Driver File Properties

1. Locate the file “iaStor.sys” within the following path:

   <System Root>\Windows\System32\Drivers

2. Right Click on “iaStor.sys” and select Properties

3. Select the “Version” tab

4. Located at the top of this tab’s view should be a parameter called “File version”. Next to it is the RAID Driver currently installed on your system. It should have the same format and version obtained using the method above.

10.2 Determining the Version of the Option ROM

There is only one way to determine the version of the Intel RAID Option ROM integrated into the system BIOS. Use the following procedure to determine the version.

1. Early in system boot-up, during post, or when you see the “Intel(R) RAID for Serial ATA” status screen output, type CTRL-I. This will open the Option ROM user interface.

2. Located in the top right corner you should see a number in the following format:

   V3.5.0.xxxx

3. This is the version of the Intel RAID Option ROM currently installed on your system. The 3.5.0 portion is the product release number; the xxxx portion is the build number.

11 Un-installation

Un-installation of the RAID driver could potentially cause an end-user to lose access to important data within a RAID volume. This is because it's the only driver that can provide functionality for the 82801ER SATA RAID controller. Therefore, Intel does not provide a way to permanently remove it from the system. However, there are steps for disabling the SATA RAID Controller thereby causing the operating system to simply not use the RAID driver. The un-installation application that is provided when installing the Intel Application Accelerator RAID Edition software via the installer package does provide a means of removing all components except the RAID driver (i.e. UI application, Start Menu links, Control Panel Applet, etc.). Use the following procedures to remove the Intel Application Accelerator software or to disable the SATA RAID controller:

11.1 Uninstalling the Intel® Application Accelerator RAID Edition Software Except the RAID Driver

1. Run the Uninstall program from the following start menu link:

   Start→Programs→Intel Application Accelerator→Uninstall

2. The first dialog that appears gives you the option of un-installing all components of the Intel Application Accelerator RAID Edition software except the RAID driver. Click OK to do so.

3. The next dialog is simply a confirmation that you would like to un-install all components of the software except the driver. Click Yes to confirm.

4. At this point, all components of the software will be un-installed except the RAID driver. You should no longer see start menu links to the UI application or a control panel applet for IAA. However, the RAID configuration should still function normally.

11.2 Disabling the use of the RAID Driver by Disabling the RAID Controller

1. Enter System BIOS Setup and disable Intel RAID Technology. This setting may be different for each motherboard manufacturer. Consult your user manual if necessary. When done, exit Setup.

2. Reboot the system. You should no longer see the RAID Option ROM status screen during boot, and you should no longer see the 82801ER SATA RAID controller in device manager.

3. At this point, Windows will no longer be using the RAID driver and you will not have Intel RAID functionality. Any data contained in existing RAID volumes will no longer be accessible. To re-enable Intel RAID functionality, re-enter System BIOS Setup and re-enable Intel RAID Technology.

Uninstall Note: End-Users can use this same procedure to disable the SATA RAID Controller if necessary. In fact, the un-install program used in section 11.1 of this document will display a text file with a similar procedure. Simply run the Uninstall Program, click Cancel when presented with the first dialog, then click Yes at the second dialog to view the text document containing the procedure.

12 Event Log Interpretation

12.1 Event Log Overview

This section describes the correct interpretation of an event log provided by the Intel Application Accelerator RAID Edition software upon the completion of the following key events: when a volume is created, when a command, such as a read or write, returns with an error or a non-zero retry count, or when an event log is lost due to meta-data disk read error. This section is not intended to be a usage guide for the Intel® Application Accelerator RAID Edition software.

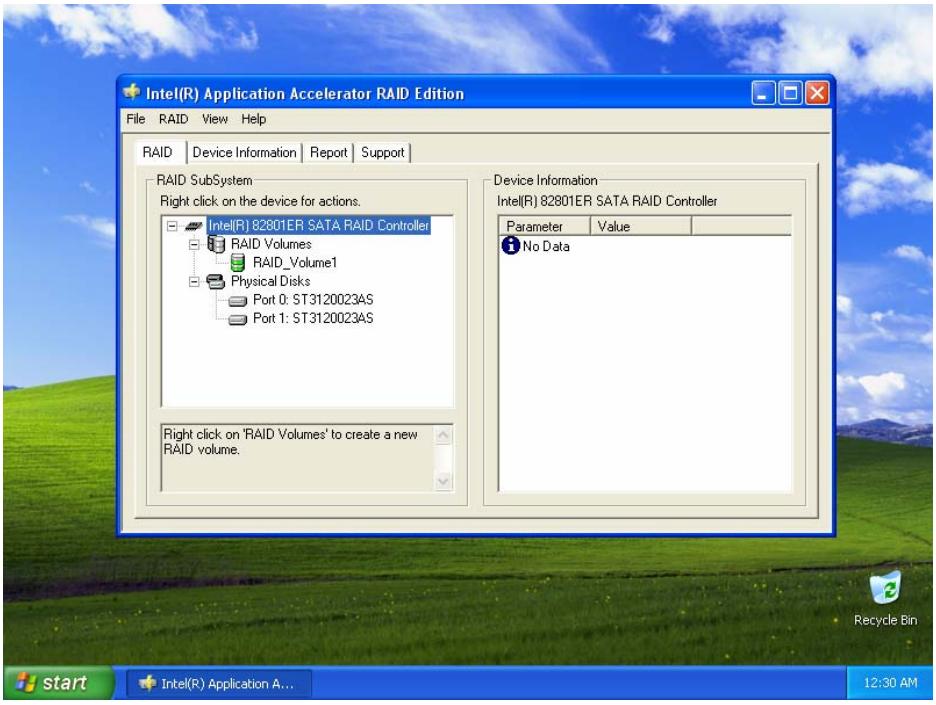
This section assumes that the customer is using Intel RAID on platforms using the 82801ER SATA RAID controller, Intel RAID Option ROM, and the Intel Application Accelerator RAID Edition software. The event log can only be viewed after the software has been installed.

12.1.1 Event Log Purpose

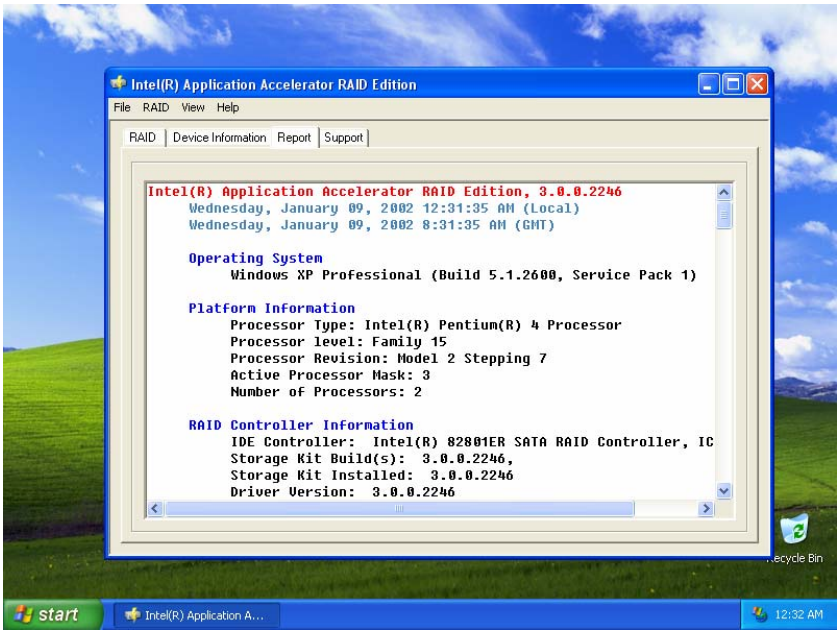
The Intel Application Accelerator RAID Edition software uses the event log to display certain event information. (The event log is a separate entity and should not be confused with the Windows Event Viewer.) There are three occurrences that can cause an event to be logged. These events include the creation of a volume, when an event log is lost due to a meta-data disk read error, or when a host generated command, such as a read or write, receives an error status or a non-zero retry count. These events are logged and available across boots. However, the RAID subsystem takes no functional actions based on any event log analysis. This information is solely provided for user monitoring purposes.

12.1.2 Locating the Event Log

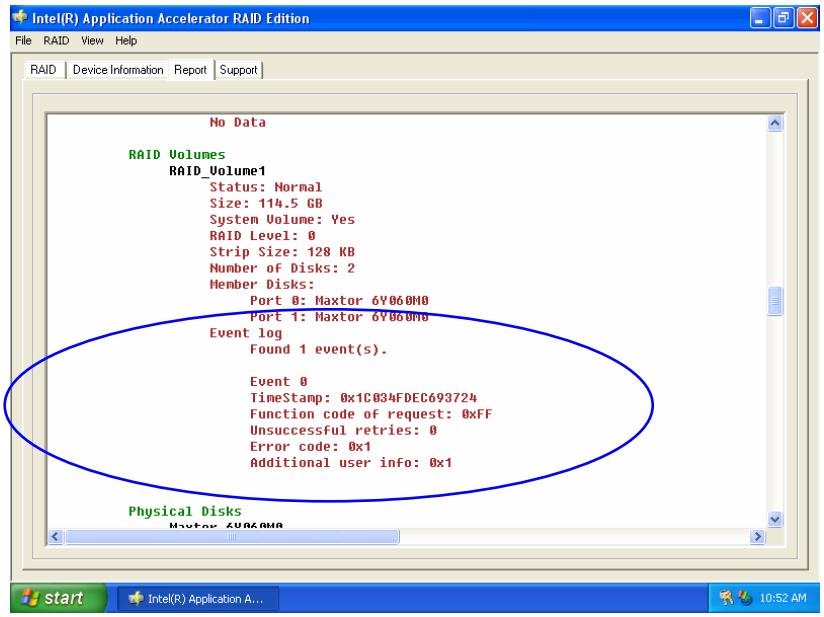
After installing the driver, start the software from the following Start Menu path: Start→All Programs→Intel® Application Accelerator RAID Edition→Intel Application Accelerator. The following screen will be seen.



Press and hold down the ALT key, and then type “OEM” while Windows’ focus is placed on the UI application. A popup window will appear stating that you are entering OEM mode. OEM mode exposes a larger subset of product functionality, and is intended for system OEM engineers, IT managers, and other advanced users. The event log is only available in this mode. Clicking on the Report tab will result in the following display.



Use the vertical bar on the right hand side of the screen to scroll down to display the RAID volume. The event log will be displayed after the serial numbers of the member disks of the RAID volume as shown in the following figure.



12.2 Event Log Entry Fields

The Event Log contains several different fields, each of which contains important information for deciphering the logged events. Leading zeros are dropped in each of the entry fields.

12.2.1 Time Stamp

The event time stamp is a hexadecimal count of 100-nanosecond intervals from the first nanosecond of January 1st, 1601 GMT to the event, according to the system clock.

12.2.2 Function Code of Request

For events resulting from errors on host generated commands, the function code of request field describes the SCSI command. The function field returns a value other than "0xFF" for a host generated command failure. A function field value of "0xFF" is a reserved code as described below.

12.2.3 Unsuccessful Retries

The unsuccessful retries field is a retry count that tallies the total retries attempted.

12.2.4 Error Code

The error code field is used to describe the I/O event being logged and is specific to the function code of request. This error code can specify a recovered error. The retry count will tell how many attempts affected the recovery.

The following table displays the event information when the Function code of request returns a value other than "0xFF".

Event	Error Code	Additional Information
DEVICE_FAILURE	0x3	The target disk(s) needed to complete a host command are known to be failed or a host command targeted a deleted volume.
DEVICE_NOT_READY	0x4	Selection timeout status was received on a target disk read or write.
MEDIA_FAILURE	0x7	The target disk(s) necessary to complete a host command have returned failing status.
PROTOCOL_FAILURE	0x8	The target disk received an invalid command from the host.
BUS_FAILURE	0x9	The target disk command generated a status parity error.
TIMEOUT	0xE	The target disk command generated a status timeout error.
MEMORY_ALLOC_FAILURE	0xF	Insufficient resources were available to complete the command.
MISSING	0x81	The target disk was removed during a power management state.
OTHER_ERROR	0x83	All other errors.

The following table displays the event information when the Function code of request is "0xFF".

Event	Error Code	Additional Information
EVENT_LOG_DET_STATUS_RAIDDEV_CREATED	0x1	A RAID device was created (not from within the OROM tools).
EVENT_LOG_DET_STATUS_LOG_LOST	0x2	The event log was lost due to a disk media or other failure. This is also the event that will be received for volumes are created from with the OROM.

Any event not specifically listed in these tables is to be considered as an Intel Reserved Event.

12.2.5 Additional User Information

The least significant byte of the additional user information functions as an occurrence counter. The occurrence counter is set to one for the initial event occurrence and is incremented for each additional occurrence of the event. In any instance where the function code of request is not "0xFF" (any host generated command failure) up to four bytes of data may be associated with the additional user information field if the event is associated with a target disk failure. In any instance where the function code of request is "0xFF" (non-host generated command failures) the additional user information will only have a one byte occurrence counter.

In the case of a target disk failure, the most significant byte of this field will be the disk number as it appears in the GUI menus. The second and third most significant bytes will display an error code value for the target disk failure. This value may or may not match the error code field mentioned above. These two bytes within the additional user information field are associated with the target disk error while the error code field is associated with the I/O error received. These bytes are meant to give more target disk specific information, if it is available. The least significant byte will still be an occurrence counter. If any information is not specifically known for a target disk issue then it is set to zero.

12.3 Logging Strategy

If a new event is to be logged but a similar event for that volume already exists, the new event is omitted with the occurrence count incremented in the logged event. As previously mentioned, the occurrence count is the least significant byte of the additional user information field. The occurrence count is only incremented when a new event matches a previous event in the function code of request, error code, and additional user information fields. If the new event does not match a previous event in all three fields, then the new event is added to the event log and the occurrence count is not incremented. The time stamp for the previously logged event is not updated when the occurrence count is incremented.

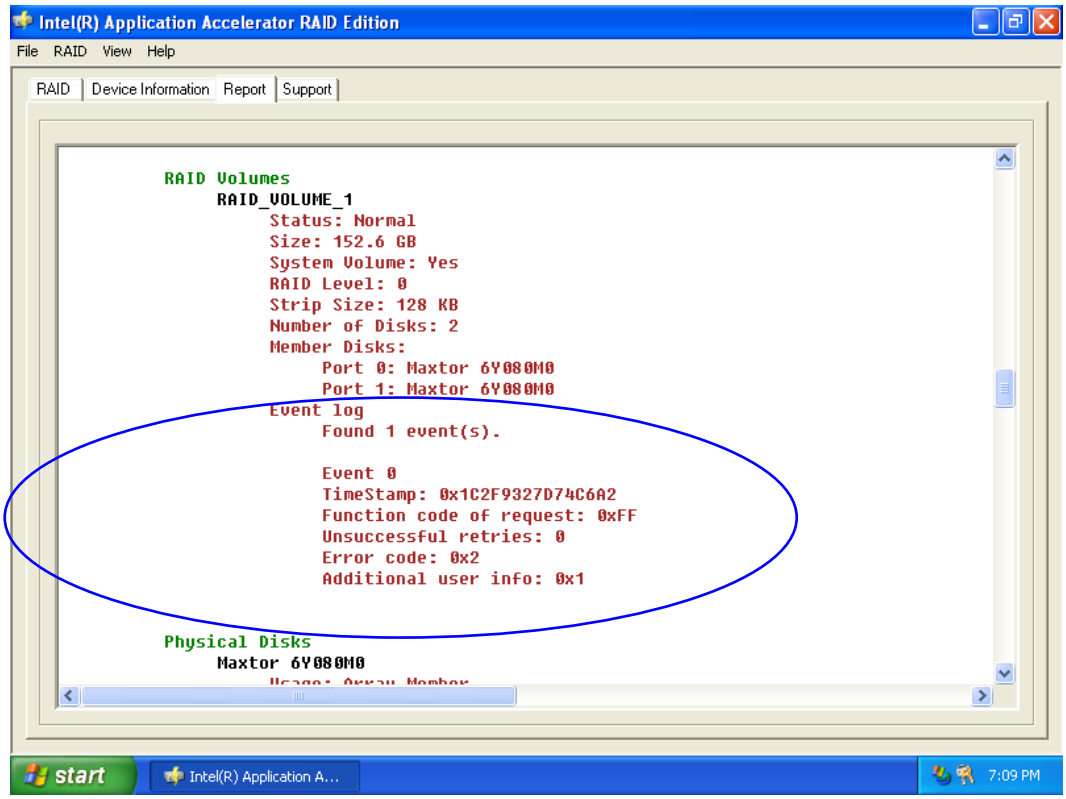
Each volume has a maximum of 16 entries in its log. Once an event is logged, it never ages out of the event log and the log cannot be cleared. If there is not room for a new event it is not logged with old events preserved. The event log will be cleared when the RAID volume is deleted.

Due to size limitations, the OROM does not use the event log. It will not log any events including volume creations and I/O failures. The OROM allows no user access to the event log. Although the OROM does not handle the event log, there is a prevention mechanism in place to ensure that the event log from a volume deleted in the OROM will not get carried over to a newly created volume. Volumes that are created from within the OROM will have the log "lost" event because the OROM cannot create a valid event log for the volume.

In the driver, the event log is read at boot-up. If the read succeeds and the data is determined to be valid, then the event log will be consistent with the last power down. Event log entries can be lost due to a power failure. In addition, if there is a read error or the data is determined to be invalid, then the event log is reset to a valid configuration containing only a single 'event log lost' entry.

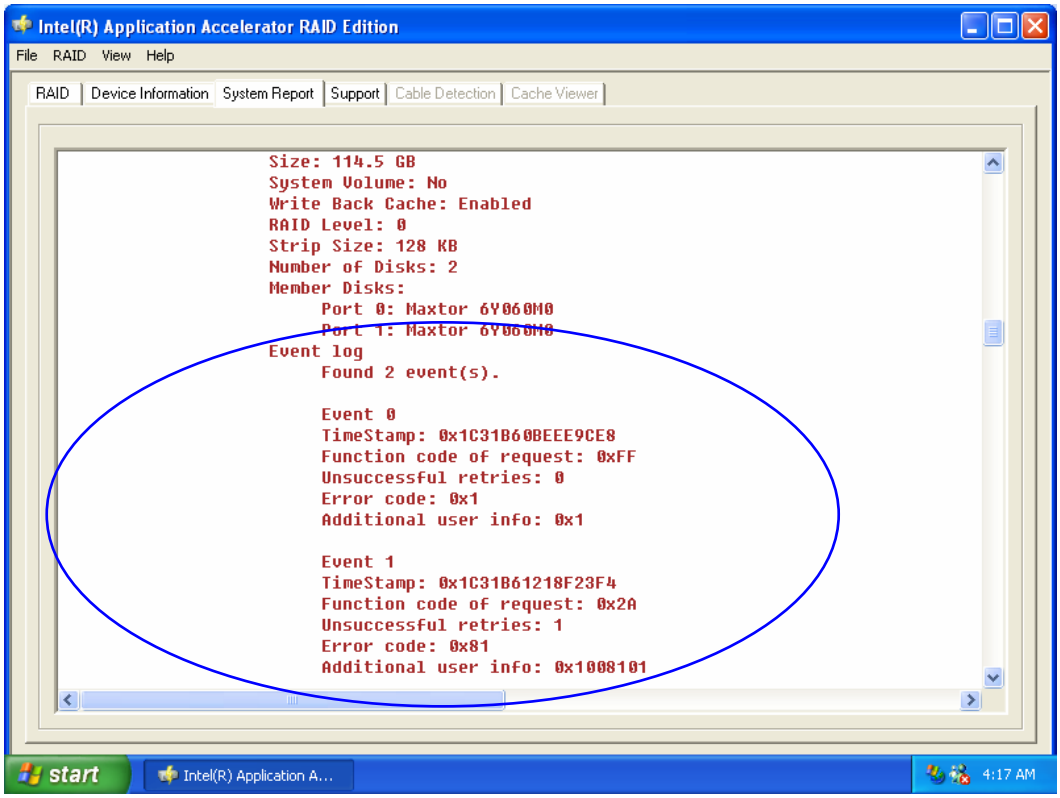
12.4 Logging Examples

Example1: The following example will interpret the Event Log for the non-host generated event shown below.



There is only one event in this event log, as indicated by the "`Found 1 event(s).`" text. Since the events are chronologically numbered, this event is number 0. The time stamp for this event is "`0x1C2F9327D74C6A2`". This is the hexadecimal number of 100 nanosecond intervals that have passed since January 1, 1601. Examining the "0xFF" function code of request and the error code of "`0x2`" in the above tables locates the event of EVENT_LOG_DET_STATUS_LOG_LOST. The event log was either lost due to a failure, or the volume was created within the OROM. The unsuccessful retries field states that no retries were attempted for this event. The additional user info field is set to "`0x1`". This means that the least significant byte is set to 1 and therefore the occurrence counter is one. An occurrence counter of one signifies that only the initial event has occurred.

Example 2: The following example will interpret the Event Log for the host generated event shown below.



There are two events in this event log, as indicated by the "`Found 2 event(s).`" text. Examining the first event reveals the following information. The time stamp for the first event is "`0x1C31B60BEEE9CE8`". This is the hexadecimal number of 100 nanosecond intervals that have passed since January 1, 1601. Examining the "`0xFF`" function code of request and the Error Code of "0x1" in the above tables locates the event of `EVENT_LOG_DET_STATUS_RAIDDEV_CREATED`. This event occurs when a RAID device is created. Since the OROM does not log events, this event specifies that the volume was created from within the Windows environment. The unsuccessful retries field states that no retries were attempted for this event. The additional user info field is set to "0x1". This means that the occurrence counter is one. An occurrence counter of one signifies that only the initial event has occurred.

Examining the second event reveals the following information. The time stamp for this event is "`0x1C31B61218F23F4`". This is the hexadecimal number of 100 nanosecond intervals that have passed since January 1, 1601. Examining the "`0x2A`" function code of request and the Error Code of "`0x81`" in the above tables locates the event of `MISSING`. This event indicates that a target disk has been removed. The unsuccessful retries field states that one retry was attempted for this event. The additional user info field is set to "`0x1008101`". The least significant byte is set to "`0x01`" which indicates an occurrence counter of 1. This signifies that only the initial event has occurred. The most significant byte of the additional user information is set to "`0x1`". This

indicates that the target disk issue is specific to the disk on port 1. The second and third most significant bytes of the additional user information are set to "0x0081". In this example, this field displays the same information presented in the error code, the target disk is missing.

This page is intentionally left blank.

13 Glossary

Term	Definition
ATA	Advanced Technology Attachment
BIOS	Basic Input / Output System
BOM	Bill Of Materials
CD	Compact Disc
Chipset	Term used to define a collection of integrated components required to make a PC function.
Disks	Physical disks attached to a RAID controller
DOS	Disk Operating System
GB	Giga-byte
HDD	Hard Disk Drive
I/O	Input/Output
ICH	I/O Controller Hub
ICH5R	Intel® 82801ER I/O Controller Hub
IDE	Integrated Drive Electronics
INF	Information file (.inf) used by Microsoft operating systems that support the Plug&Play feature. When installing a driver, this file provides the OS needed information about driver filenames, driver components, and supported hardware.
Intel® Option ROM (OROM)	Standard PnP option ROM that provides a pre-operating system user interface for the Intel® RAID implementation.
MB	Mega-byte
Migration	Term used to describe the movement of data from one configuration or usage model to another.
OEM	Original Equipment Manufacturer
Option ROM	A code module built into the System BIOS that provides extended support for a particular piece of hardware. For this product, the Option ROM provides boot support for RAID 0 and RAID 1 volumes, and provides a user interface for configuring and managing RAID 0 and RAID 1 volumes.
OS	Operating System
PATA	Parallel ATA
PCI	Peripheral Components Interface
PFW	Package for the Web
PIO	Programmed Input Output
PnP	Plug and Play
Port 0	Term used to describe the point at which a SATA drive is physically connected to the SATA Controller. Port 0 is the first of two on ICH5(R) systems.

Term	Definition
Port 1	Term used to describe the point at which a SATA drive is physically connected to the SATA Controller. Port 1 is the second of two on ICH5(R) systems.
RAID	Redundant Array of Independent Disks
RAID 0	A RAID level where data is striped across multiple physical disks (aka striping)
RAID 1	A RAID level where data is mirrored between disks to provide data redundancy (aka mirroring)
RAID volume	A block of capacity allocated from a RAID Array and arranged into a RAID topology. Operating Systems typically interpret a RAID volume as a physical disk.
RAM	Random Access Memory. Usually refers to the system's main memory
ROM	Read Only Memory
SATA	Serial ATA
SCSI	Small Computer Systems Interface
SP#	Service Pack (number)
Strip	Grouping of data on a single physical disk within a RAID volume
Stripe	The sum of all strips in a horizontal axis across physical disks within a RAID volume
UI	user interface