USER'S GUIDE

Intel® Embedded Server RAID Technology

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Preface

Package Contents

You should have received the following:

- *Intel® Embedded Server RAID Technology* (this document)
- software license agreement
- CD/diskette(s) with the software for the Embedded Server RAID Technology

This book is the primary reference and user's guide for Embedded Server RAID Technology. Customer-specific documentation may be included as well.

The Embedded Server RAID Technology supports four serial ATA ports, providing a cost-effective way to achieve higher transfer rates and reliability. The RAID levels supported are RAID 0, 1, and 10.

Audience

This document was prepared for users of the Embedded Server RAID Technology. It is intended to provide a description of the product, the configuration software utilities, and the operating system installation.

Organization

This document has the following chapters:

- Chapter 1, **Overview**, provides an overview of features and benefits of the Embedded Server RAID Technology.
- Chapter 2, **RAID Levels**, describes the RAID levels supported.

- Chapter 3, **BIOS Configuration Utility**, explains how to configure SATA and arrays, assign RAID levels, plan the array configuration, optimize storage, and use the IDE Setup Utility.
- Chapter 4, **Operating System Installation**, contains the procedures for installing the Windows* 2000, 2003, and XP, Red Hat* Linux, SuSE* Linux, and Novell NetWare* operating systems when using the Embedded SATA Software RAID Technology.
- Chapter 5, **Spy Service**, describes the Spy Service program, which looks for errors, failed drives, and status changes in the hard drives.
- Chapter 6, **Troubleshooting**, describes the problems you might encounter and suggests solutions.

Conventions Used in This Manual

The following table describes the notational conventions used throughout this manual:

Notation	Example	Meaning and Use
courier typeface	`.nwk` file	Names of commands, directories, filenames, and on-screen text are shown in courier typeface.
bold typeface	**fd1sp**	In a command line, keywords are shown in bold, non-italic typeface. Enter them exactly as shown.
italics	*module*	In command lines and names, italics indicate user variables. Italicized text must be replaced with appropriate user-specified items. Enter items of the type called for, using lower case.
italic underscore	*full_pathname*	When an underscore appears in an italicized string, enter a user-supplied item of the type called for with no spaces.
Initial Capital letters	Undo Edit Apply	Names of menu commands, options, check buttons, text buttons, options buttons, text boxes, list boxes, etc., are shown in text with Initial Capital lettering to avoid misreading. These elements may appear on your screen in all lower case.
brackets	[*version*]	You may, but need not, select one item enclosed within brackets. Do not enter the brackets.
ellipses	option...	In command formats, elements preceding ellipses may be repeated any number of times. Do not enter the ellipses. In menu items, if an ellipsis appears in an item, clicking that item brings up a dialog box.

Notation	Example	Meaning and Use
vertical dots	. . .	Vertical dots indicate that a portion of a program or listing has been omitted from the text.
semicolon and other punctuation		Use as shown in the text.

Chapter 1
Overview

This manual describes the Intel® Embedded Server RAID Technology. This chapter provides an overview of this product and contains the following sections:

The Embedded Server RAID Technology supports four Serial ATA ports, providing a cost-effective way to achieve higher transfer rates and reliability. Embedded Server RAID Technology supports

- RAID level 0 data striping for improved performance
- RAID level 1 data mirroring for improved data reliability
- RAID level 10 data striping and mirroring for high data transfer rates and data redundancy

1.1 RAID Benefits

RAID has gained popularity because it can improve I/O performance or increases storage subsystem reliability. RAID 0 provides better performance, while RAID 1 provides better reliability through fault tolerance and redundant data storage. RAID 10 combines both striping and mirroring to provide high data transfer rates and data redundancy.

1.1.1 Improved I/O

Although hard drive capabilities have improved drastically, actual performance has improved only three to four times in the last decade. Computing performance has improved over 50 times during the same time period. RAID 0 and RAID 10 allow you to access several disks simultaneously.

1.1.2 Increased Reliability

The electromechanical components of a disk subsystem operate more slowly, require more power, and generate more noise and vibration than electronic devices. These factors reduce the reliability of data stored on disks.

RAID 1 and RAID 10 systems improve data storage reliability and fault tolerance compared to single-drive computers. The additional drive in each RAID 1 array makes it possible to prevent data loss from a hard drive failure. You can reconstruct missing data from the remaining data drive to a replacement drive.

1.2 Product Features

1.2.1 SATA Ports

The Embedded Server RAID Technology can support up to six ports. Refer to your server board documentation for the number of ports supported.

1.2.2 BIOS Features

The BIOS features include

- RAID support before the operating system loads
- automatic detection and configuration of disk drives
- ability to handle configuration changes
- support for Interrupt 13 and Enhanced Disk Drive Specification
- support for RAID levels 0, 1, and 10
- special handling of error log and rebuilding
- ROM option size of 64 Kbyte
- automatic resume of rebuilding and check consistency
- support for BIOS Boot Specification (BBS) (If available in system BIOS, this allows the user to select the adapter from which to boot. Specification v1.01, January 11, 1996)
- co-existence with SCSI and CD devices

- 48-bit LBA support for read, write, and cache flush functions
- independent stripe size configuration on each logical drive
- ability to select a logical drive as boot device
- support for power-on self test (POST) Memory Management (PMM) for the BIOS memory requirement (Specification v1.01, November 21, 1997)
- enhanced disk drive support (Specification 2.9, revision 08, March 12, 1998)
- Industry-standard EBDA
- Self-monitoring analysis and reporting technology (S.M.A.R.T.) notification at POST
- run-time BIOS support for device insertion or removal
- independent support for WC, RC, and UDMA (direct memory access)
- support for Stop On Error during bootup
- support to disable/enable BIOS state

1.2.3 Driver Features

The driver features include

- special interface for configuration information, configuration changes, and manageability
- optimized disk access
- support for RAID levels 0, 1, and 10
- support for Stand-by and Hibernation in Windows 2000, XP, and 2003

  Note: The following items require Spy Service to be running in order to work.

- error logging in the operating system event log and on disks
- support for online mirror rebuilding
- support for check consistency for mirrored disks
- bootable RAID 0, 1, and 10 support

- customized messages specific for OEM (original equipment manufacturer)
- soft bad block management

1.2.4 Manageability/Disk Console

The features you can use to manage the logical and physical disks in the system include

- configuration information display (in BIOS Configuration Utility and Hyper Configuration Utility)
- support for RAID levels 0, 1, and 10
- online mirror rebuilding (in BIOS Configuration Utility)
- online consistency checks (in BIOS Configuration Utility)
- array management software
- error logging and notification
- support for power management features
- support for hot device insertion and removal
- automatic resume of rebuilding on restart
- support for manual rebuild
- physical drive roaming
- independent stripe size configuration per logical drive
- ability to create up to eight logical drives per array
- auto-configuration support of newly added physical drive
- support for hotspares
- support for disk coercion
- array initialization support (fast and normal)
- offline data (RAID 1) verfication with auto-recovery mechanism
- ability to prioritize configurable tasks (for online rebuild, check consistency, migration, and expansion)
- logical drive availability immediately after creation
- variable stripe size options from 8 Kbyte to 128 Kbyte

Chapter 2
RAID Levels

Intel Embedded Server RAID Technology supports RAID levels 0, 1, and 10. These RAID levels are discussed in the following sections:

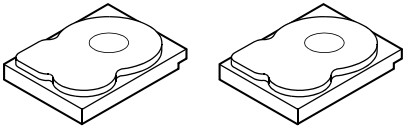
2.1 RAID 0

RAID 0 (Figure 2.1) provides disk striping across all configured drives in the RAID subsystem. RAID 0 does not provide any data redundancy, but does offer the best performance of any RAID level. RAID 0 breaks up data into smaller segments, then stripes the data segments across each drive in the array as shown in Figure 2.1. The size of each data segment is determined by the stripe size parameter, which is set during the creation of the RAID set.

By breaking up a large file into smaller segments, Embedded Server RAID Technology can use both IDE ports and drives to read or write the file faster. This makes RAID 0 ideal for applications that require high bandwidth but do not require fault tolerance.

Uses	Provides high data throughput, especially for large files. Any environment that does not require fault tolerance.
Strong Points	Provides increased data throughput for large files. No capacity loss penalty for parity.
Weak Points	Does not provide fault tolerance. All data lost if any drive fails.
Drives	One to two

Figure 2.1 RAID 0 Array



Segment 1	Segment 2
Segment 3	Segment 4
Segment 5	Segment 6
Segment 7	Segment 8

2.2 RAID 1

RAID 1 (Figure 2.2) duplicates all data from one drive to a second drive. RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity.

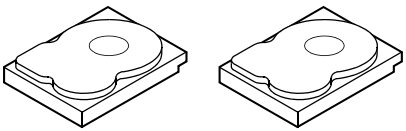
Uses Databases or any other mission critical environment that requires fault tolerance.

Strong Points Provides complete data redundancy. RAID 1 is ideal for any application that requires fault tolerance.

Weak Points Requires twice as many hard drives. Performance is impaired during drive rebuilds.

Drives Two

Figure 2.2 RAID 1 Array



Segment 1	Segment 1 Duplicated
Segment 2	Segment 2 Duplicated
Segment 3	Segment 3 Duplicated
Segment 4	Segment 4 Duplicated

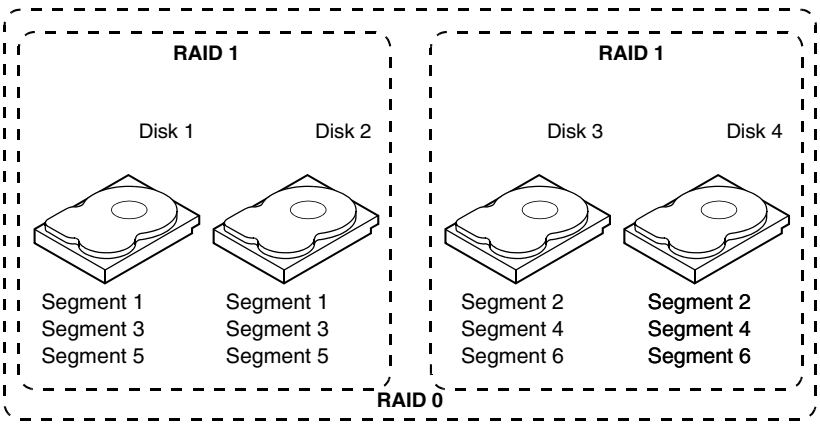
2.3 RAID 10

RAID 10 is a combination of RAID 1 and RAID 0. RAID 10 has mirrored drives. It breaks up data into smaller blocks, then stripes the blocks of data to each RAID 1 RAID set. Each RAID 1 RAID set then duplicates its data to its other drive. The size of each block is determined by the stripe size parameter, which is set during the creation of the RAID set. RAID 10 can sustain one drive failure in each array while maintaining data integrity.

Uses	Works best for data storage that must have 100% redundancy of RAID 1 (mirrored arrays) and that also needs the enhanced I/O performance of RAID 0 (striped arrays). RAID 10 works well for medium-sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity.
Strong Points	Provides both high data transfer rates and complete data redundancy.
Weak Points	Requires twice as many drives..
Drives	4

Figure 2.3 shows a RAID 10 array with four disk drives.

Figure 2.3 RAID 10 Array



Chapter 3
BIOS Configuration Utility

This chapter explains how to configure Intel Embedded Server RAID Technology and arrays, assign RAID levels, plan the array configuration, optimize storage, and use the IDE Setup Utility. This information is presented in the following sections:

3.1 Configuring Arrays

Configure the physical disk drives in arrays. An array can consist of one to four physical disk drives, depending on the RAID level. A RAID 0 array can consist of one to four physical drives, while a RAID 1 array consists of two. A RAID 10 array consists of four drives.

3.2 Configuration Strategies

You have two choices when creating a RAID array.

- **Maximizing Fault Tolerance**

  You can maximize fault tolerance to protect against loss of data by using mirroring. Use mirror configuration (RAID 1) to attain this objective.

- **Maximizing Logical Drive Performance**

  You can maximize logical drive performance by using striping. Select striping configuration (RAID 0) to attain this objective.

  RAID 10 combines both striping and mirroring to provide high data transfer rates and data redundancy.

3.3 Assigning RAID Levels

Only one RAID level can be assigned to each array. Table 3.1 displays the drives required per RAID level.

Table 3.1 Physical Drives Required per RAID Level

RAID Level	Minimum Number of Physical Drives	Maximum Number of Physical Drives
0	One	Four
1	Two	Two
10	Four	Four

The factors you need to consider when selecting a RAID level are listed in Table 3.2.

Table 3.2 Physical Drives Required per RAID Level

Level	Description and Use	Pros	Cons	Number of Drives	Fault Tolerant
0	Data divided in blocks and distributed sequentially (pure striping). Use for non-critical data that requires high performance.	High data throughput for large files	No fault tolerance. Data is lost if a drive fails.	One to four	No
1	Data duplicated on another disk (mirroring). Use for read-intensive, fault-tolerant systems.	100 percent data redundancy, providing fault tolerance.	More disk space required. Reduces usable disk space to the size of the smallest drive. Reduced performance during rebuilds.	Two	Yes
10	A combination of RAID 1 (data mirroring) and RAID 0 (data striping). Use for medium-sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity.	Provides both high data transfer rates and complete data redundancy.	More disk space required. Reduces usable disk space to the size of the smallest drive. Reduced performance during rebuilds.	Four	Yes

3.4 Performing a Quick Configuration

This section provides quick installation steps for users that are familiar with configuration utilities and tools. Refer to Section 3.5, "Configuring Arrays and Logical Drives," for detailed configuration instructions. To ensure best performance, select the optimal RAID level for the logical drive you create.

Perform the following steps to configure arrays and logical drives using the Configuration Utility (CU):

Step 1. Boot the system.

Step 2. Start the CU by pressing <Ctrl><E>.

Step 3. Select a configuration method.

Step 4. Create arrays using the available physical drives.

Step 5. Define the logical drive(s) using the space in the arrays.

Step 6. Initialize the new logical drive(s).

3.5 Configuring Arrays and Logical Drives

This section provides detailed instructions for configuring the logical disks and arrays.

3.5.1 Starting the BIOS Configuration Utility

During bootup, the following BIOS banner displays the following:

```
Press Ctrl-E to run LSI Logic Embedded SATA RAID Setup
Utility
```

Hold down the <Ctrl> key while you press <E>. The main menu for the utility displays.

3.5.2 Selecting a Configuration Method

Section 3.5.3, "Configuring Physical Arrays and Logical Drives," provides detailed instructions for using each configuration method.

3.5.3 Configuring Physical Arrays and Logical Drives

This subsection provides instructions for using the Easy Configuration, New Configuration, and View/Add Configuration to configure arrays and logical drives.

LSI Logic recommends using drives with the same capacity in a specific array. If you use drives with different capacities in an array, the CU treats all these drives as if they have the capacity of the smallest drive.

The number of physical drives in a specific array determines the possible RAID levels that you can implement with the array. RAID 0 requires one to four physical drives, RAID 1 requires two physical drives, and RAID 10 requires four physical drives.

3.5.3.1 Physical Drive Parameters

You can change the write policy and read policy in the physical drives, but not the logical drives.

3.5.3.2 Logical Drive Parameters

For the logical drive you can change the RAID level and stripe size. Table 3.3 contains descriptions of the logical drive parameters.

Table 3.3 Logical Drive Parameters and Descriptions

Parameter	Description
RAID Level	The number of physical drives in a specific array determines the RAID levels that can be implemented with the array. RAID 0 requires one or two physical drives. RAID 1 requires exactly two physical drives. RAID 10 requires exactly four physical drives.
Stripe Size	The stripe size parameter specifies the size of the segment written to each disk in a RAID configuration. You can set the stripe size to 4, 8, 16, 32, 64, or 128 Kbytes. The default is 64 Kbytes. A larger stripe size produces higher read performance. If your computer regularly performs random read requests, choose a smaller stripe size.

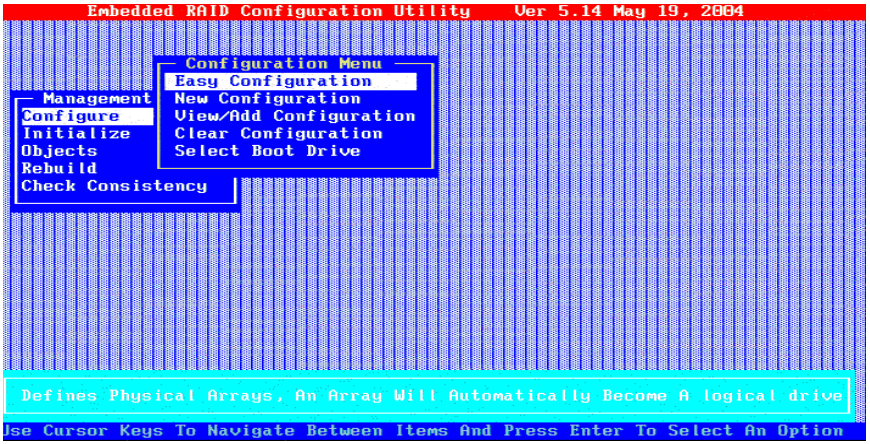
3.5.3.3 Easy Configuration

In Easy Configuration, the CU associates each hard drive with a single logical drive. If logical drives have already been configured, the CU does not change their configuration. Perform the following steps to create arrays using Easy Configuration:

Step 1. Select Configuration→Easy Configuration at the main menu.

The Configuration Menu screen displays, as shown in Figure 3.1.

Figure 3.1 Configuration Menu Screen



Step 2. Press the spacebar to associate the selected physical drives with the current array.

The indicator for the selected drives changes from `READY` to `ONLIN A[`*`array number`*`]-[`*`drive number`*`]`. For example, `ONLIN A1-3` means array 1 with disk drive 3.

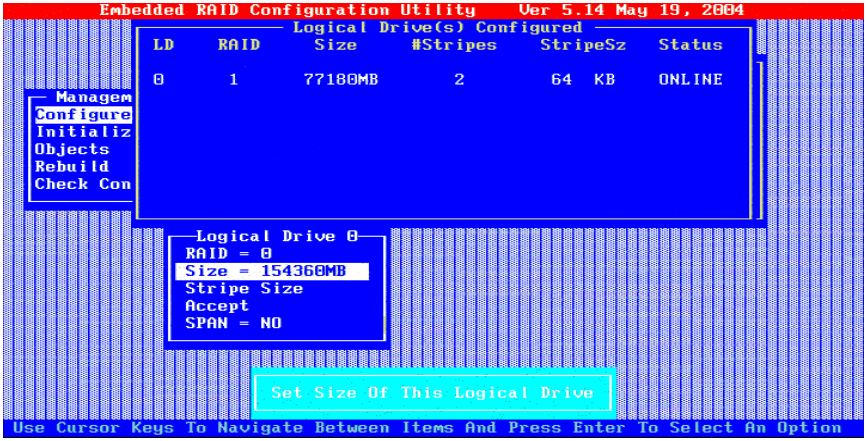
Step 3. Press <Enter> after you finish creating the current array.

Step 4. Press <F10> to select configurable arrays.

Step 5. Press the spacebar to select the array.

The logical drive configuration screen displays, as shown in Figure 3-2. The logical drive configuration screen displays the logical drive number, RAID level, logical drive size, the number of stripes in the physical array, the stripe size, and the state of the logical drive.

Figure 3.2 Logical Drive Configuration Screen



Step 6. Set the RAID level for the logical drive by highlighting RAID and pressing <Enter>.

The available RAID levels for the current logical drive display.

Step 7. Select a RAID level and press <Enter>.

Step 8. Set the RAID logical drive size and stripe size.

Step 9. When you have defined the current logical drive, select Accept and press <Enter>.

Step 10. Repeat step 7 to step 10 to configure additional logical drives.

Step 11. Save the configuration when prompted and press <Esc> to return to the Management Menu.

Step 12. Initialize the logical drives.

Refer to Section 3.5.4, “Initializing Logical Drives,” for detailed instructions.

3.5.3.4 New Configuration and View/Add Configuration

New Configuration and View/Add Configuration associate logical drives with partial and/or multiple physical arrays. New Configuration deletes the existing configuration and replaces it with the configuration that you specify. View/Add Configuration lets you display or modify an existing configuration.

Caution: **The New Configuration option erases the existing configuration data when you save the new array**

configuration. If you do not want to delete the existing configuration data, use View/Add Configuration.

Perform the following steps to configure a disk array using New Configuration or View/Add Configuration:

Step 1. Select Configure→View/Add Configuration from the CU Management Menu.

The CU displays an array selection window.

Step 2. Select the physical drives to include in the array by pressing the arrow keys to select specific physical drives.

Step 3. Press the spacebar to associate the selected physical drive with the current array.

The indicator for the selected drive changes from `READY` to `ONLIN A[`*`array number`*`]-[`*`drive number`*`]`. For example, `ONLIN A1-3` means array 1 with disk drive 3.

Step 4. Press <Enter> after you finish creating the current array.

Step 5. Press <F10> to configure logical drives.

Step 6. Set the RAID level for the logical drive by highlighting RAID and pressing <Enter>.

A list of the available RAID levels for the current logical drive appears.

Step 7. Set the logical drive size by moving the cursor to Size and pressing <Enter>.

By default, the logical drive size associates the available space in the array(s) with the current logical drive.

Step 8. Set the stripe size.

Step 9. After you define the current logical drive, select Accept and press <Enter>.

Step 10. Save the configuration when the CU prompts you to do so.

Step 11. Initialize the logical drives you configured. Section 3.5.4, "Initializing Logical Drives," provides detailed instructions.

3.5.4 Initializing Logical Drives

You can initialize the logical drives using individual initialization, which initializes a single logical disk.

There are two methods to initialize a logical drive using the individual initialization procedure using the CU.

For the first method, perform the following steps to initialize a logical drive using the Initialize menu.

Step 1. On the Management Menu, select Initialize.

Step 2. Use the space bar to highlight the logical drive to initialize.

The logical drive name is highlighted in yellow. To de-select the logical drive, press the space bar again.

Step 3. Press <F10>.

Step 4. Select Yes at the prompt and press <Enter> to begin the initialization.

A graph shows the progress of the initialization until it is complete.

Step 5. After the initialization is complete, press <Esc> to return to previous menus.

If you press <Esc> while initialization is in progress, the following options display:

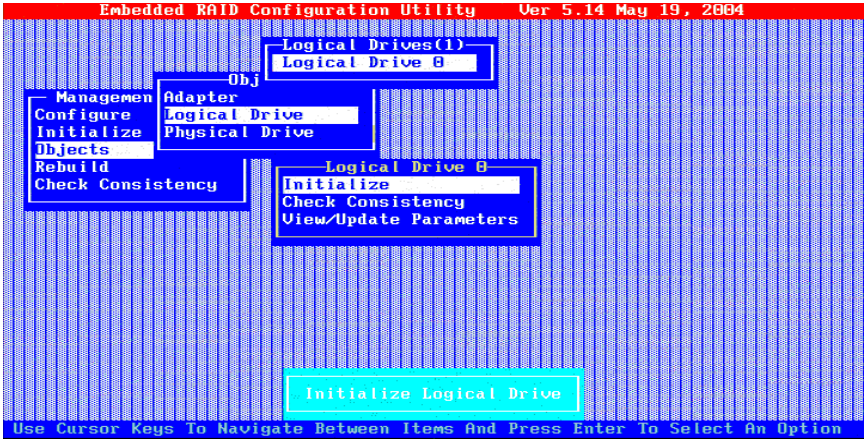
- ◊ Stop: The CU stores the percentage of the initialization already completed. When you restart initialization, it continues from the last percentage completed rather than from zero percent.
- ◊ Continue: initialization continues normally.
- ◊ Abort: The initialization is completely aborted. If you restart initialization, it begins at zero percent.

For the second method, perform the following steps to initialize a logical drive using the Objects menu.

Step 1. From the Management Menu, select Objects→Logical Drive submenu, as shown in Figure 3.3.

The configured logical drives display.

Figure 3.3 Logical Drive Submenu



Step 2. Select a logical drive, if there is more than one configured. and press <Enter>.

Step 3. Select Initialize from the submenu and press <Enter>.

Step 4. Select Yes at the prompt and press <Enter>.

The CU displays a bar graph showing the initialization progress.

Step 5. When initialization completes, press <Esc> to return to the previous menu.

If you press <Esc> while initialization is in progress, the options Stop, Continue, and Abort display, as explained on the previous page.

3.6 Rebuilding Failed Disks

A manual rebuild is used to rebuild failed drives. The CU allows manual rebuild for an individual drive. Perform the following steps to rebuild a drive:

Step 1. Select Rebuild from the CU Management Menu.

The CU displays a device selection window that marks the failed drives with FAIL indicators.

Step 2. Press the arrow keys to highlight the drive to be rebuilt.

Step 3. Press the spacebar to select the highlighted physical drive for rebuild.

Step 4. After selecting the physical drive, press <F10> and select Yes at the confirmation prompt.

The indicators for the selected drive changes to REBLD.

Step 5. When rebuild is complete, press any key to continue.

Step 6. Press <Esc> to display the Management Menu.

A second way to perform a manual rebuild on an individual drive is as follows:

Step 1. Select the option from the CU→Objects→Physical Drive submenu.

Step 2. Press the arrow keys to select the physical drive to be rebuilt and press <Enter>.

Step 3. Select the Rebuild option from the action menu and respond to the confirmation prompt.

Step 4. When rebuild completes, press any key to display the previous menu.

3.6.1 Inserting a Previously Removed Drive from a RAID 1 Array

If you have auto-rebuild selected in the BIOS, the rebuild begins as soon as you enter the BIOS CU. If auto-rebuild is disabled, you can choose whether to rebuild. If you decide to rebuild the drive, follow the procedure in Section 3.6, “Rebuilding Failed Disks,” page 3-10.

3.7 Checking Data Consistency

The Check Consistency feature verifies the correctness of the redundancy data in the selected logical drive and causes the CU to automatically correct any differences found in the data.

This feature can be used only on a RAID 1 logical drive, to verify the data consistency between the mirrored physical drives. When a data inconsistency is found, the CU can either only report the inconsistency or report and fix the inconsistency, depending upon the option selected in Adapter settings.

In the CU, perform the following steps to check consistency:

Step 1. On the Management Menu select Check Consistency and press <Enter>.

The configured logical drives display.

Step 2. Use the space bar to select a logical drive to check for consistency.

Note that the logical drive should be at a RAID 1 level to start check consistency. If you select a RAID 0 logical drive, a message displays stating that a check consistency cannot be performed. To de-select a logical drive, press the space bar again.

Step 3. Press <F10>.

Step 4. At the prompt, select Yes to start check consistency and press <Enter>.

If you press <Esc> while the check consistency is in progress, the following options display:

- ◊ Stop: The CU stores the percentage of the check consistency already completed. When you restart the check consistency, it continues from the last percentage completed rather than from zero percent.
- ◊ Continue: Check consistency continues normally.
- ◊ Abort: The check consistency is completely aborted. If you restart check consistency, it begins at zero percent.

3.8 Using a Pre-loaded System Drive

Loading an operating system on a stand-alone drive and then attempting to add that drive to a RAID array will cause a blue screen upon reboot.

Chapter 4
Operating System Installation

This chapter contains the procedures for installing the Windows* 2000, 2003, and XP, Red Hat* Linux, SuSE* Linux, and Novell NetWare* operating systems when using the Intel Embedded Server RAID Technology. The chapter contains the following sections:

4.1 Windows 2000/2003/XP Driver Installation

Perform the following steps to install the Windows 2000 or 2003 driver onto the RAID-configured drives.

Step 1. Boot the system with the Windows 2000 or 2003 Boot Installation CD or diskette.

The following message displays:

```
Setup is inspecting your computers hardware
configuration.
```

Next, a prompt displays.

Step 2. At the prompt, press <F6> to install the RAID/SCSI adapter driver.

Step 3. When installation prompts for a key after copying some files, press <S> to add the SATA RAID driver.

You are prompted for the driver diskette.

Step 4. Insert the Embedded SATA Software RAID driver floppy diskette and press <Enter>.

Step 5. Scroll down the list until the appropriate selection for your system which contains the Embedded SATA Software RAID and for your operating system displays, then click <OK>.

Step 6. Continue with the normal installation procedure.

4.1.1 Updating the Windows 2000/2003/XP Driver

Perform the following steps to update the Windows 2000 or 2003 driver or install the Windows 2000 or 2003 driver into an existing system booted from a standard IDE drive.

Step 1. Click the Windows Start button.

The Windows menu displays.

Step 2. Select Settings.

The Settings menu displays to the right.

Step 3. Click Control Panel.

The Control Panel window displays.

Step 4. Select Adapters.

Step 5. Select the Drivers tab.

Step 6. Scroll down the list until the appropriate selection for your system which contains the Embedded SATA Software RAID and for your operating system displays, then click <OK>.

Step 7. Select it, then remove it by clicking the Remove button.

Step 8. Click the Add button.

Step 9. Select the Have Disk button.

Step 10. Insert the diskette into the floppy drive.

Step 11. Select drive letter A: and click on <OK>.

Step 12. Select LSI Logic Embedded SATA Controller and click OK.

Step 13. After Windows NT or Windows 2000 copies the driver, reset the system.

4.1.2 Confirming the Windows 2000/2003/XP Driver Installation

Perform the following steps to confirm that the Windows 2000, 2003, or XP driver is installed properly.

Step 1. Click the Windows Start button.

The Windows menu displays.

Step 2. Select Settings.

The Settings menu displays to the right.

Step 3. Click Control Panel.

The Control Panel window displays.

Step 4. Select Adapters.

Step 5. Select the Drivers tab.

The controller appears in the list as LSI Logic Embedded SATA Controller.

Step 6. Select the Devices tab.

One or more entries display as LSI Logic Embedded SATA #xx under LSI Logic Embedded SATA Controller.

4.2 DOS Driver Installation

For DOS, no driver installation is required. The ROM BIOS contains the low-level driver that is necessary for MS-DOS.

4.3 Linux Driver Installation

This section explains how you can make fresh installations of Red Hat and SuSE Linux operating systems with the Linux Embedded Software Stack driver.

4.3.1 Obtaining the Driver Image File

The driver is offered in the form of a driver update disk. The required file is `dud-<driver version>.img`, which is the driver update disk for the Embedded Server RAID Technology stack.

You can obtain the latest driver files from the Download Center on the LSI Logic web site at: http://www.lsilogic.com.

4.3.2 Preparing the Installation Disk(s) for Linux

This section describes how to prepare the installation disk(s) from the obtained driver image files using the Windows- or Linux-based operating systems. Refer to this section when necessary during installation of Windows and Linux operating systems.

4.3.2.1 Using a Windows Operating System

Under Windows, you can use the rawrite floppy image writer utility to create disk images from image files. The image writer can be downloaded from the Internet. Perform the following steps to build installation diskettes.

Step 1. Copy the driver update disk image `dud-<driver version>.img` and the file `rawrite.exe` to a directory.

Step 2. Confirm that the files are in the selected directory.

Step 3. After you confirm the files, you might need to change the filename of the driver update disk to a smaller name with less than eight characters.

Step 4. Copy `dud-<driver version>.img dud.img`.

Step 5. Type the following command to create the two installation diskettes:

```
RAWRITE
```

then press <Enter>.

You are prompted to enter the name of the boot image file.

Step 6. Type:

```
dud.img
```

You are prompted for the target drive diskette.

Step 7. Insert a floppy diskette into the floppy drive and type:

```
A:
```

then press <Enter>.

Step 8. After the command prompt returns and the floppy disk drive LED goes out, remove the diskette.

Step 9. Label the diskette with the image name.

4.3.2.2 Using a Linux Operating System

Under Red Hat and SuSE Linux, you can use a driver diskette utility to create disk images from image files. Perform the following steps create the driver update disk:

Step 1. Copy the driver update disk image `dud-<driver version>.img` to a Linux system.

Step 2. Insert a blank floppy diskette into the floppy drive.

Step 3. Confirm that the files are in the selected directory.

Step 4. Create the driver update diskette using the following command:

```
dd if=dud-<driver version>.img of=/dev/fd0
```

Step 5. After the command prompt returns and the floppy disk drive LED goes out, remove the diskette.

Step 6. Label the diskette with the image name.

4.3.3 Red Hat Linux Driver Installation on a New System

This section describes the fresh installation of the device driver on new Linux Red Hat 3.0, 8.0, 9.0, and AS2.1 systems with the Embedded Software RAID Stack. After you prepare the installation disks with the driver image, perform the following steps to install the driver:

Step 1. Boot to CD-ROM (Disk 1).

The Red Hat introductory screen displays.

Step 2. Type the following at the boot prompt:

```
linux dd
```

Step 3. Press <Enter>.

The prompt asks whether you have a driver disk.

Step 4. Use the arrow key to select Yes, then press <Enter>.

Step 5. Select fd0 to indicate you have a floppy diskette with the driver on it.

Step 6. Insert the floppy diskette in the A:/ drive and press <Enter>.

The installer locates and loads the driver for your device. The message “Loading megaide driver...” displays.

The prompt at the next screen asks whether you have another driver.

Step 7. Follow the Red Hat Linux installation procedure to complete the installation.

Step 8. Reboot the system.

4.3.4 SuSE Linux 9.0 Driver Installation on a New System

This section describes the fresh installation of a Linux SuSE 9.0 system with the Embedded Software RAID Stack. Prepare installation disks with the driver image, then perform the following steps to install the driver:

Step 1. Boot your system using the SuSE 9.0 CD 1.

Step 2. At the prompt, press <F3> to confirm that you have a driver diskette.

Step 3. Highlight Installation on the menu using the arrow keys, then press <Enter>.

You are prompted for the diskette.

Step 4. Insert the driver update disk in the A:/ drive and press <Enter>.

The message “Driver Updates added” displays.

Step 5. Press <Enter>.

You are prompted to select the Driver Update Medium.

Step 6. Select Back and press <Enter>.

This returns you to the installation.

Step 7. Press <Accept>.

The driver installation begins.

Step 8. Press <Accept> again.

A warning screen displays to make sure you want to continue the installation with these settings.

Step 9. Select Yes and complete the installation

Important: **After all the selected packages are installed, a prompt displays and gives you 10 seconds to reply. If you do not reply within 10 seconds, you will have to start the installation process over.**

Step 10. Select Stop before the 10 seconds are up.

Step 11. Press <Ctrl> <Alt> <F2>.

This opens a terminal you can use to run a script.

Step 12. At the prompt, type:

```
cd update/000/install
```

Step 13. Press <Enter>.

Step 14. Next, type:

```
./update.post
```

Step 15. Press <Enter>.

Step 16. At the prompt, press <Ctrl> <Alt> <F7>.

The YaST screen displays.

Step 17. Select <OK>, then press <Enter>, and reboot the system.

4.3.5 SuSE 8.2 Driver Installation

This section describes a fresh installation on a Linux SuSE 8.2 system with the Embedded Software RAID Stack. Prepare installation disks with the driver image, then perform the following steps to install the driver:

Step 1. Create a RAID array using the BIOS.

Step 2. Boot your system using the SuSE Disk 1.

Step 3. When the first screen displays, press <F3> and select the installation menu option.

Step 4. Insert the driver update disk when prompted.

Step 5. Complete the installation process and reboot the system.

4.3.6 SuSE SLES8 Driver Installation

This section describes a fresh installation on a Linux SuSE SLES8.0 system with the Embedded Software RAID Stack. Prepare installation

disks with the driver image, then perform the following steps to install the driver:

Step 1. Create a RAID array using the BIOS.

Step 2. Boot your system using the SuSE SLES8 1.0 Disk 1.

Step 3. When the first screen displays, press <Alt> and select the installation menu option.

Step 4. Insert the driver update disk when prompted.

Step 5. Complete the installation process and reboot the system.

4.4 Novell NetWare Driver Installation

The section provides installation instructions for the Novell Netware driver.

4.4.1 Novell NetWare Driver Files Description

The Novell NetWare driver and utilities support logical drives configured on the controller.

Important: The logical drives configured on the host adapter are registered with the operating system as separate logical units.

All utilities and spy.nlm expect the driver to pass the requests to the adapter. You must load the .HAM driver files first, so that it can load the .NLM files.

4.4.2 New Novell NetWare System Driver Installation

Follow the instructions in the *Novell NetWare Installation Guide* to install NetWare on the server. Follow these steps to install Novell NetWare using the controller as a primary adapter:

Step 1. Boot with the NetWare 6.5 CD-ROM.

Step 2. Follow the instructions on the screen to select the language and accept the license.

The Welcome screen displays. The screen message `Is this a default install or manual install?` displays.

Step 3. Highlight Default using the arrow keys, then press <Enter> to change the option to Manual.

Step 4. Highlight Continue and press <Enter>.

The screen used to prepare the boot partition displays.

Step 5. Highlight Free Space, then press <Enter>.

Step 6. Accept the default (500 MB) or modify as desired, then press <Enter>.

Step 7. Highlight Continue, then press <Enter>.

The Server Settings screen displays. You can modify the settings before going to the next screen.

Step 8. Highlight Continue, then press <Enter>.

The system goes through device driver detection, then the screen displays the device type and driver name. You can modify the device type and driver name.

Step 9. Press Continue, then press <Enter>.

The driver names display.

Step 10. Select Storage adapters using the arrow keys and press <Enter>.

Step 11. Highlight `IDEATA.HAM Standard ATA/IDE RAID Adapter Controller` in the list of files.

Step 12. Press <Delete> to remove the highlighted filename.

Note: Do not highlight `IDEATA.HAM Standard ATA/IDE/ATAPI Adapter Controller` in the list of files; it is needed for the ATAPI CD-ROM drive to operate.

Step 13. Press <Insert> to add a driver.

Step 14. Press <Insert> again.

Step 15. If you have the driver on a diskette, insert it in the A:/ drive.

The install program automatically searches for the driver on the A:/ drive.

Step 16. If you do not have the driver on a diskette, enter the path for the file.

Step 17. Press <Enter>.

The Intel RAID controller displays. There is one driver per controller to remove or add.

Step 18. Press <Esc> twice.

Step 19. Select Continue and press <Enter>.

The storage devices and driver names display so you can match the drivers to the hardware devices.

Step 20. Select Continue and press <Enter>.

Step 21. Select Continue and press <Enter> again.

The message “Loading driver” displays, then the screen Create Sys Volume displays.

Step 22. Select Create and press <Enter>.

The Main Menu displays.

Step 23. Select Continue Installation and press <Enter>.

The File Copy Status displays to confirm that the driver files are installed, then a GUI prompt displays.

Step 24. Select Customized and press <Next>.

Step 25. Continue the normal operating system installation.

4.4.3 Existing Novell NetWare System Driver Installation

Follow these steps to add the NetWare driver to an existing installation.

Step 1. For NetWare 5.1 and higher, type the following at the root prompt:

```
nwconfig
```

Step 2. Press <Enter>.

Step 3. The Configuration Options screen displays.

Step 4. Select Drive Options and press <Enter>. A window displays.

Step 5. Select Configure Disk and Storage Device Options and press <Enter>.

Step 6. Select one of the following options that display in the window:

- ◊ Discover and Load an Additional Driver
- ◊ Select an Additional Driver

Step 7. If you select Discover and Load an Additional Driver, the system discovers the extra unit and prompts you to select a driver from the list.

Step 8. Press <Insert> to insert the driver.

This completes the procedure.

If you choose Select an Additional Driver, the Select a Driver screen displays. Perform the following steps to select an additional driver.

Step 1. Press <Insert>, then follow the instructions that appear.

Step 2. Insert a diskette into the A:/ drive and press <Enter>.

The system finds the driver and installs it.

Chapter 5
Spy Service

This chapter describes the Spy Service program and contains the following sections

The Spy Service program looks for errors, failed drives, and status changes. It can mark drives as failed after the error threshold is reached and start automatic rebuilds. It runs in the background of the Embedded SATA Console.

When operating under Windows, Spy enables the self-monitoring analysis and reporting technology (S.M.A.R.T.) on all of the hard drives at startup and polls for any status changes in the drives every 60 minutes. S.M.A.R.T. monitors hard drives for drive failures.

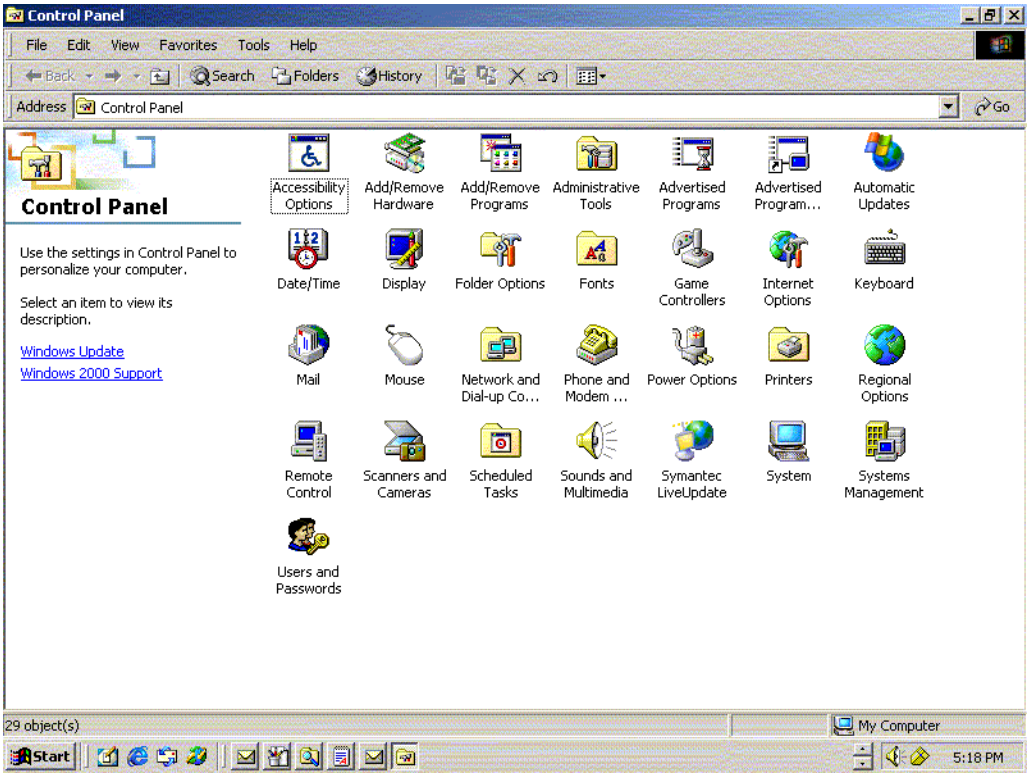
5.1 Starting or Stopping Spy Service under Windows 2000, XP, or 2003

You can use the Control Panel to access the option to start or stop Spy Service. Perform the following steps to start or stop Spy Service.

Step 1. Click on Start > Settings > Control Panel.

The screen shown in Figure 5.1 displays.

Figure 5.1 Control Panel Screen



Step 2. Click on Administrative Tools→Services icon→Spy Ser.

A dialog window displays with the start and stop options.

Step 3. Click on the Start or Stop button.

This starts or stops the Spy Service program, depending on your selection.

Note: You can right-click on the Spy Service icon and select “Stop Spy” to stop the Spy program. The Spy icon displays on the right side of the taskbar. See Section 5.5, “Spy Service Icon” for more information about the icon.

5.2 Installing Spy Service under Linux

Perform the following steps to install Spy Service under Linux. Spy Service runs in the background after installation.

Note: You must have “GNOME” libraries installed before you install Spy Service.

Step 1. Log in to GUI mode.

Step 2. At the Linux prompt, type:

```
$ rpm -ivh spy.x.x.x.i386.rpm
```

Step 3. Press <Enter>.

The rpm is extracted and the necessary files installed and started,

5.3 Installing and Running Spy Service under Novell NetWare

Perform the following steps to install Spy Service under Novell NetWare.

Step 1. Unzip the file `Spy-x.x Novell.zip` from the installation CD to a floppy diskette in the A:/ drive.

Step 2. Go to the Novell server prompt and type:

<Nov-server>`:a:install`

Messages display when the files are copied.

Step 3. Reboot to complete the installation.

Step 4. After reboot, you can type the following to see whether Spy is running:

<Nov-server>`:modules spy`

Step 5. Press <Enter>.

The information shows whether Spy is running.

5.4 Uninstalling Spy Service

Perform the following steps to uninstall Spy Service.

Step 1. Stop the Spy Service program.

See “Section 5.1, “Starting or Stopping Spy Service under Windows 2000, XP, or 2003” for instructions on stopping Spy Service.

Step 2. Click on Start→Control Panel.

The Control Panel displays.

Step 3. Click on Add/Remove Programs.

The list of currently installed programs displays.

Step 4. Click on the Spy Service program and select Remove.

5.5 Spy Service Icon

The icon for the Spy Service displays in the bottom right corner of the Embedded Server RAID Technology Console screen (in the tray bar). The icon is a round figure wearing sunglasses.

The icon is color-coded. Green means that there are no problems. Yellow means that there is a rebuild in progress or there are media errors and a possible drive failure. Red warns of a critical problem that could cause the system to fail.

Hold the cursor over the icon (“mouseover”) and a short text displays that describes the system status. Right click on the icon and the following options display:

Stop monitor media error	The program stops searching for media errors.
Erase error log	The program deletes the errors that were recorded on the error log.
Stop Spy	This stops the program and deletes the icon from the taskbar. You can start the program again using the instructions in “Section 5.1, “Starting or Stopping Spy Service under Windows 2000, XP, or 2003”

Do the following to place the Spy icon on the Taskbar when operating under Windows 2000:

Click on Start→Programs→MegaRAID IDE→MegaRAID IDE Spy.

This places the Spy icon on the Taskbar.

Note: The Spy icon displays on the Taskbar automatically under the Windows Server 2003 operating system.

Chapter 6
Troubleshooting

6.1 Problems and Suggested Solutions

Table 6.1 describes possible problems you might encounter, along with suggested solutions.

Table 6.1 Problems and Suggested Solutions

Problem	Suggested Solution
Drives are not detected OR The system hangs when the adapter ROM for Embedded SATA Software RAID scans the SATA ports.	• Make sure that the cable ends are connected properly. • Make sure that the power cables to the drives are connected properly. • Change cables. • If everything fails, change the drive(s).
Operating system does not boot.	Check the system BIOS configuration for PCI interrupt assignments. Make sure some Interrupts are assigned for PCI. Make sure that you have properly selected the Boot Device in the system BIOS setup (CMOS Setup).
An error occurs while reading the configuration data on a drive.	The drive is bad and needs to be replaced.
There is no existing RAID configuration on any of the drives connected to the system and the message “Intel Embedded Server RAID Technology Not Configured” displays.	Press any key to enter the BIOS Configuration Utility (Ctrl-E), then select a configuration method and configure the drive(s).
BIOS reports that a mirrored array is in degraded mode.	Make sure all physical drives are properly connected and are powered on. Reconnect, replace, or rebuild any drive that has failed.

Table 6.1 Problems and Suggested Solutions

Problem	Suggested Solution
One of the hard drives in a mirrored (RAID 1) array has failed.	Replace the failed drive with another drive that has the same or greater capacity.
You insert a new drive with no configuration into the slot which is already part of a mirrored (RAID 1) array.	Press any key to enter the BIOS Configuration Utility (Ctrl-E) to configure the new drive. Mark the drive as one of the following: • Failed - If the AutoRebuild option is disabled in the configuration utility • Rebuilding - If the AutoRebuild option is enabled in the configuration utility
You insert a new drive with no configuration into the slot which is already part of a striped (RAID 0) array or there is a striped (RAID 0) array by itself in the system.	Press any key to enter the BIOS Configuration Utility (Ctrl-E) to configure the new drive.