

USER'S GUIDE

Integrated RAID

July 2003

Version 1.0 - Preliminary

This document is preliminary. As such, it contains data derived from functional simulations and performance estimates. LSI Logic has not verified either the functional descriptions, or the electrical and mechanical specifications using production parts.

This document contains proprietary information of LSI Logic Corporation. The information contained herein is not to be used by or disclosed to third parties without the express written permission of an officer of LSI Logic Corporation.

LSI Logic products are not intended for use in life-support appliances, devices, or systems. Use of any LSI Logic product in such applications without written consent of the appropriate LSI Logic officer is prohibited.

Document DB15-000292-00, Version 1.0 (July 2003)

This document describes LSI Logic Corporation's Integrated RAID (IR) software product and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

LSI Logic Corporation reserves the right to make changes to any products herein at any time without notice. LSI Logic does not assume any responsibility or liability arising out of the application or use of any product described herein, except as expressly agreed to in writing by LSI Logic; nor does the purchase or use of a product from LSI Logic convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual property rights of LSI Logic or third parties.

Copyright © 2003 by LSI Logic Corporation. All rights reserved.

TRADEMARK ACKNOWLEDGMENT

LSI Logic, the LSI Logic logo design, Fusion-MPT, Integrated Mirroring, and Integrated Striping are trademarks or registered trademarks of LSI Logic Corporation. ARM is a registered trademark of ARM Ltd., used under license. Windows and Windows NT are registered trademarks of Microsoft Corporation. Linux is a registered trademark of Linus Torvalds. SuSE is a registered trademark of SuSE Linux AG. RED HAT is a registered trademark of Red Hat, Inc. All other brand and product names may be trademarks of their respective companies.

KL

To receive product literature, visit us at <http://www.lsilogic.com>.

For a current list of our distributors, sales offices, and design resource centers, view our web page located at

<http://www.lsilogic.com/contacts/index.html>

Preface

This user's guide explains how to configure and use the components of the LSI Logic Integrated RAID (IR) software product.

Audience

This user's guide assumes that you have some familiarity with installing and configuring software programs and that you are familiar with computer storage devices in general. The people who benefit from this document are:

- VARs and OEMs who are evaluating the LSI Logic IR software components or who are using the IR software product in their computer systems
- End users who are using the IR software product to configure mirrored or striped volumes.

Organization

This document has the following chapters and appendixes:

- [Chapter 1, Introduction to Integrated RAID](#), provides an overview of Integrated RAID, its features, and its benefits.
- [Chapter 2, Integrated Mirroring \(IM\) Overview](#), This chapter provides an overview of the LSI Logic Integrated Mirroring™ (IM) feature.
- [Chapter 3, Setting Up Integrated Mirroring](#), describes how to set up Integrated Mirroring (IM) using the BIOS-based configuration utility.
- [Chapter 4, Integrated Striping \(IS\) Overview](#), provides an overview of the LSI Logic Integrated Striping™ (IS) feature.

- [Chapter 5, Setting Up Integrated Striping](#), describes how to set up Integrated Striping (IS) using the BIOS-based configuration utility.
- [Chapter 6, CIM Solution](#), describes the Fusion-MPT™ Common Information Model (CIM) Solution and explains how it is used to monitor storage components, including mirrored and striped volumes, in multiple systems on a network.
- [Appendix A, Using the DOS-Based Configuration Utility](#), describes how to set up Integrated Mirroring or Integrated Striping volumes using the DOS-based configuration utility (for manufacturing use only).

Related Publications

LSI Logic Documents

*Fusion-MPT Device Management User's Guide, Version 2.0,
DB15-000186-02*

LSI Logic World Wide Web Home Page

www.lsillogic.com

Conventions Used in This Manual

The first time a word or phrase is defined in this manual, it is *italicized*.

Hexadecimal numbers are indicated by the prefix “0x” —for example, 0x32CF. Binary numbers are indicated by the prefix “0b” —for example, 0b0011.0010.1100.1111.

Revision History

Revision	Date	Remarks
Preliminary Version 1.0	6/2003	Initial release of document.

Contents

Chapter 1

Introduction to Integrated RAID

1.1	Introduction	1-1
1.2	Integrated RAID Benefits and Features	1-2
1.3	Using this Manual	1-2

Chapter 2

Integrated Mirroring (IM) Overview

2.1	Introduction	2-1
2.2	Features	2-2
2.3	Description	2-3
2.4	Integrated Mirroring Firmware	2-5
2.4.1	Host Interface	2-5
2.4.2	Resynchronization with Concurrent Host I/O Operation	2-5
2.4.3	Meta Data Support	2-5
2.4.4	Hot Swap	2-6
2.4.5	SMART Support	2-6
2.4.6	Floating Hot Spare	2-6
2.4.7	Media Verification	2-7
2.4.8	SCSI ID Assignment	2-7
2.4.9	Disk Write Caching	2-7
2.4.10	NVSRAM Usage	2-7
2.5	Fusion-MPT Support	2-8
2.5.1	BIOS ROM	2-8
2.5.2	OS Drivers	2-8

Chapter 3

Setting Up Integrated Mirroring

3.1	IM Configuration Overview	3-1
3.2	Configuring IM with the BIOS-Based CU	3-2
3.2.1	Quick IM Configuration Procedure	3-2
3.2.2	Configuration Screen Overview	3-4
3.2.3	Detailed IM Configuration Procedure	3-5
3.2.4	Other BIOS-Based CU Screens	3-11
3.3	Troubleshooting	3-14
3.3.1	RAID Properties Menu Item Disabled	3-14
3.3.2	IM Volume Uses Extra SCSI ID	3-14
3.3.3	Configuration Utility Disables Selection of Disk	3-15

Chapter 4

Integrated Striping (IS) Overview

4.1	Introduction	4-1
4.2	IS Features	4-2
4.3	IS Description	4-2
4.4	Integrated Striping Firmware	4-4
4.4.1	Host Interface	4-4
4.4.2	Meta Data Support	4-4
4.4.3	SMART Support	4-4
4.4.4	SCSI ID Assignment	4-4
4.4.5	Disk Write Caching	4-5
4.5	Fusion-MPT Support	4-5
4.5.1	BIOS ROM	4-5
4.5.2	OS Drivers	4-5

Chapter 5

Setting Up Integrated Striping

5.1	IS Configuration Overview	5-1
5.2	Configuring IS with the BIOS-Based CU	5-2
5.2.1	Quick IS Configuration Procedure	5-2
5.2.2	Configuration Screen Overview	5-3
5.2.3	Detailed IS Configuration Procedure	5-4
5.2.4	Other BIOS-Based CU Screens	5-9
5.3	Troubleshooting	5-11

5.3.1	RAID Properties Menu Item Disabled	5-11
5.3.2	Configuration Utility Disables Selection of Disk	5-12

Chapter 6 CIM Solution

6.1	Description	6-1
6.1.1	Features	6-2
6.1.2	Installation and System Requirements	6-3
6.2	CIM Browser Window Description	6-4
6.2.1	Connect Menu Options	6-4
6.2.2	Hardware Device Tree Options	6-4
6.3	CIM Installation Instructions for Windows	6-8
6.3.1	Installing the CIM Solution	6-8
6.3.2	Uninstalling the CIM Solution	6-8
6.4	CIM Installation Instructions for Linux	6-9
6.4.1	Installing the CIM Solution	6-9
6.4.2	Uninstalling the CIM Solution	6-9

Appendix A Using the DOS-Based Configuration Utility

A.1	Configuration Overview	A-1
A.2	Running the DOS-Based CU	A-2
A.3	Rules for Command Line Options	A-3
A.4	Configuring an IM Volume with the DOS-Based CU	A-3
A.4.1	Command Line Options	A-4
A.4.2	Making Manufacturing Settings Read Only	A-7
A.4.3	IM Parameter Defaults for Fusion-MPT SCSI Controllers	A-7
A.4.4	Examples of Command Line Usage	A-8
A.5	Configuring an IS Volume with the DOS-Based CU	A-10
A.5.1	Command Line Options	A-10
A.5.2	Making Manufacturing Settings Read Only	A-12
A.5.3	IS Parameter Defaults for Fusion-MPT SCSI Controllers	A-13
A.5.4	Examples of Command Line Usage	A-13

Customer Feedback

Figures

2.1	Typical Mainboard Implementation	2-3
2.2	Integrated Mirroring with Two Disks	2-4
2.3	Integrated Mirroring with More than Two Disks	2-4
3.1	Screen Field Definitions	3-4
3.2	Main Screen	3-5
3.3	Adapter Properties Screen	3-6
3.4	RAID Properties Screen: No IM Volume Configured	3-7
3.5	RAID Properties Screen: One IM Volume Configured	3-10
3.6	Global Properties Screen	3-11
3.7	Boot Adapter List Screen	3-12
3.8	Device Properties Screen	3-13
4.1	Integrated Striping Example	4-3
4.2	Integrated Striping - Logical and Physical Views	4-3
5.1	Screen Field Definitions	5-3
5.2	Main Screen	5-4
5.3	Adapter Properties Screen	5-5
5.4	RAID Properties Screen: No IS Volume Configured	5-6
5.5	RAID Properties Screen: One IS Volume Configured	5-8
5.6	Global Properties Screen	5-9
5.7	Boot Adapter List Screen	5-10
5.8	Device Properties Screen	5-11
6.1	Hardware Device Tree Structures	6-6

Tables

6.1	Connect Menu Option Description	6-4
6.2	Device Tree Description	6-7

Chapter 1

Introduction to Integrated RAID

This chapter provides an overview of Integrated RAID, its features, and its benefits. The chapter includes these sections:

- [Section 1.1, "Introduction," page 1-1](#)
 - [Section 1.2, "Integrated RAID Benefits and Features," page 1-2](#)
 - [Section 1.3, "Using this Manual," page 1-2](#)
-

1.1 Introduction

The LSI Logic Integrated RAID solution provides cost benefits for the server or workstation market where the extra performance, storage capacity, and/or redundancy of a RAID configuration are required. The two components of Integrated RAID are:

- **Integrated Mirroring (IM)**, which provides features of RAID 1 and RAID 1E
- **Integrated Striping (IS)**, which provides features of RAID 0

By simplifying the IM and IS configuration options and by providing firmware support in its host adapters, LSI Logic can offer the Integrated RAID solution at a lower cost than a full-blown RAID implementation.

LSI Logic CIM interface software is used to continuously monitor IM volumes and IS volumes and to report status and error conditions as they arise.

IM and IS are supported by different versions of Fusion-MPT firmware. Therefore, either IM or IS can be implemented on a system with a Fusion-MPT based controller, but IM and IS cannot be used concurrently on the same system.

1.2 Integrated RAID Benefits and Features

- Low cost single-volume RAID fills the needs of most internal RAID installations
- Easy to use - installation and configuration are not complex
- System can boot from an IM or IS volume
- No special OS-specific software required
- High reliability and data integrity
 - Non-volatile write journaling
 - Physical disks not visible to OS or to application software
- Low host CPU and PCI bus utilization
- Fusion-MPT architecture provides processing power
 - 160 MHz ARM966 processors provide maximum processing capacity
 - Shared memory architecture minimizes external memory requests
 - Functionality is contained in device hardware and firmware

1.3 Using this Manual

- Chapters 2 and 3 of this *User's Guide* explain how to configure an Integrated Mirroring (IM) volume.
- Chapters 4 and 5 explain how to configure an Integrated Striping (IS) volume.
- Chapter 6 explains how to install CIM and how to use it to monitor IM and IS volumes.
- Appendix A explains how to use the DOS-based configuration utility to configure IM and IS volumes in the manufacturing environment.

Chapter 2

Integrated Mirroring (IM)

Overview

This chapter provides an overview of the LSI Logic Integrated Mirroring (IM) feature and includes these sections:

- [Section 2.1, "Introduction," page 2-1](#)
 - [Section 2.2, "Features," page 2-2](#)
 - [Section 2.3, "Description," page 2-3](#)
 - [Section 2.4, "Integrated Mirroring Firmware," page 2-5](#)
 - [Section 2.5, "Fusion-MPT Support," page 2-8](#)
-

2.1 Introduction

As a result of the shift towards Network Attached Storage (NAS), ISPs need a cost effective, fault-tolerant solution to protect the operating systems on small form factor, high-density, rack-mountable servers. The LSI Logic Integrated Mirroring (IM) feature provides data protection for the system boot volume to safeguard critical information such as the operating system on servers and high performance workstations. This new Integrated Mirroring feature gives customers a robust, high-performance, fault-tolerant solution that is less expensive than a dedicated RAID controller.

The IM feature provides simultaneous mirroring on configurations of two to six disk disks, to assure fault tolerant, high availability data. If a disk fails, the hot swap capability allows the system to be easily restored by simply swapping disks. The system then automatically re-mirrors the swapped disk. Additionally, the hot spare feature keeps one disk ready to automatically replace a failed disk in the volume, making the system even more fault-tolerant.

The IM feature uses the same device drivers as the standard Fusion-MPT based controllers, providing seamless and transparent fault tolerance. This eliminates the need for complex backup software or expensive RAID hardware. The IM feature operates independently from the operating system, in order to conserve system resources. The BIOS-based configuration utility makes it easy to configure a mirrored volume.

The IM feature is currently available as an optional component of the new Fusion-MPT architecture on all LSI Logic Ultra320 SCSI integrated I/O controller products.

2.2 Features

This section lists the key features of Integrated Mirroring.

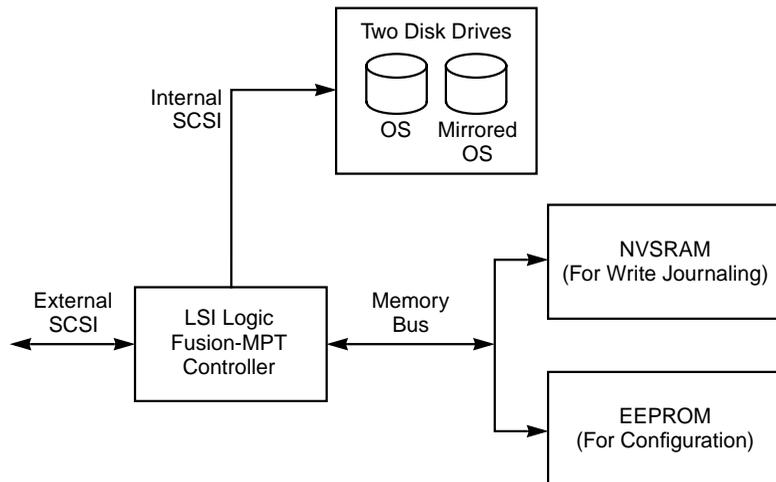
- Supports configurations of two to six mirrored disks on the same channel
- Mirrored volume runs in optimal mode or degraded mode (that is, if one mirrored disk fails)
- (Optional) Supports configuration of a hot spare
- Hot swap capability
- Presents a single virtual drive to the OS
- Support for disks of different types and capacities
- Fusion-MPT architecture
- Easy-to-use BIOS-based configuration utility (and DOS-based configuration utility for manufacturing use only)
- Support for greater volume capacity by integrating more disks
- Error notification
 - OS-specific event log
 - Errors displayed on CIM browser
- SAF-TE drive status LED support for Integrated Mirroring disks
- Write journaling, which allows automatic synchronization of potentially inconsistent data after unexpected power-down situations
- Meta data used to store volume configuration on mirrored disks

- Automatic background resynchronization while host I/Os continue
- Media verification

2.3 Description

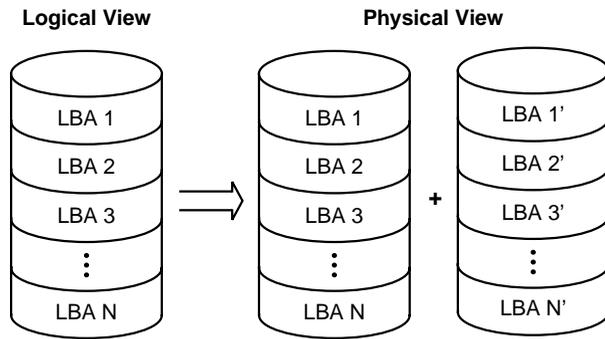
The LSI Logic Integrated Mirroring (IM) feature provides mirroring for the boot volume, as shown in [Figure 2.1](#). This is accomplished through the firmware of an LSI Logic controller that supports the standard Fusion-MPT interface. The runtime mirroring of the boot disk is transparent to the BIOS, drivers, and operating system. Host-based status software monitors the state of the mirrored disks and reports any error conditions. In [Figure 2.1](#) the system is configured with a second disk as a mirror of the first (primary) disk.

Figure 2.1 Typical Mainboard Implementation



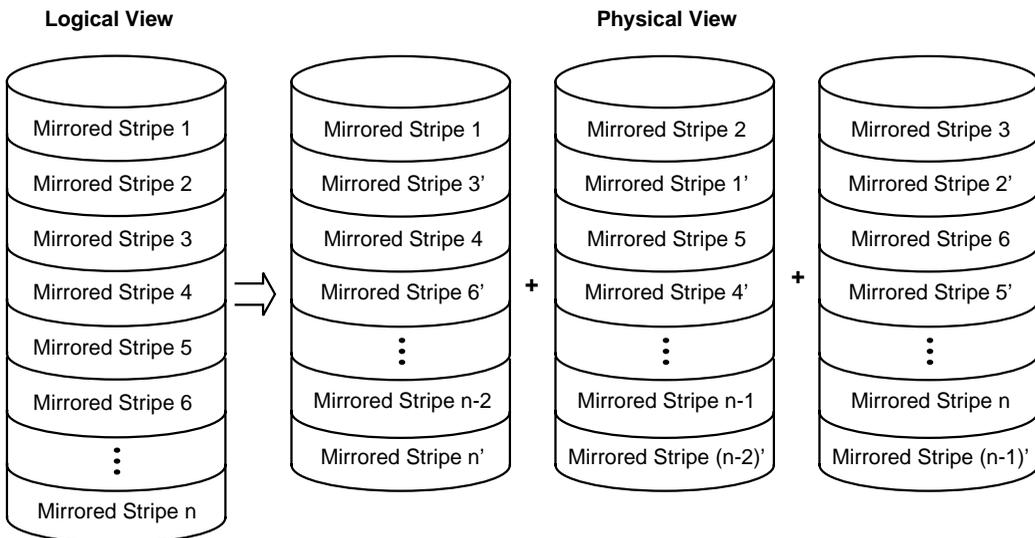
[Figure 2.2](#) shows the logical view and physical view of the mirroring configuration when there are two disks in the mirrored volume.

Figure 2.2 Integrated Mirroring with Two Disks



Mirroring can also be configured with up to 6 mirrored disks, or 5 mirrored disks and a hot spare. [Figure 2.3](#) shows the logical view and physical view of the mirroring configuration with more than two disks in the mirrored volume. Each “mirrored stripe” is written to a disk and is mirrored to an “adjacent” disk. This is commonly referred to as RAID 1E.

Figure 2.3 Integrated Mirroring with More than Two Disks



LSI Logic provides the BIOS-based configuration utility to enable the user to configure the mirroring attributes during initial setup and to reconfigure them in response to hardware failures or changes in the

environment. (A DOS-based configuration utility is also provided for manufacturing use only.)

2.4 Integrated Mirroring Firmware

This section describes features of the LSI Logic Integrated Mirroring (IM) firmware.

2.4.1 Host Interface

The IM host interface uses the “Message Passing Interface” as described in the Fusion-MPT specification, including Integrated Mirroring of SCSI host adapters. Through the Fusion-MPT interface, the host OS has access to the logical IM drive as well as the physical disks. This allows support for domain validation and Ultra320 SCSI expander configuration.

2.4.2 Resynchronization with Concurrent Host I/O Operation

The IM firmware uses queue tagged I/Os to allow SCSI I/Os to continue on the IM volume while the volume is being re-synchronized in the background. The host driver may optionally suspend the resynchronization operation while performing domain validation or while configuring Ultra320 SCSI expanders. Resynchronization is attempted after the firmware has been reset, or after a “hot swap” has occurred to one of the physical IM disks.

The IM volume can be partially resynchronized, if the logging information in NVSRAM indicates that this is necessary. It usually takes less than a second for the firmware to complete a partial resynchronization. Like full synchronization, partial resynchronization is performed in the background.

2.4.3 Meta Data Support

The firmware supports Meta data describing the IM logical drive configuration stored on each member disk. When the firmware is initialized, each member disk is queried to read the stored Meta data for consistency checking. The usable disk space for each IM member disk is adjusted down to leave room for this data.

2.4.4 Hot Swap

The IM firmware supports *hot swapping*. The hot-swapped disk is automatically resynchronized in the background, without any host or user intervention. The hot-swapped disk must be at the same physical SCSI ID as one of the physical disks configured in the IM volume. The firmware detects “Hot Swap” removal and disk insertion.

Following a “hot swap” event, the firmware readies the new physical disk by spinning it up and verifying that it has enough capacity for the IM volume. The IM firmware resynchronizes all hot-swapped disks that have been removed, even if the same disk is re-inserted. In a two-disk mirrored volume, the IM firmware marks the hot-swapped disk as the secondary disk and marks the other mirrored disk as the primary disk. The firmware resynchronizes all data from the primary disk onto the new secondary disk.

2.4.5 SMART Support

The IM firmware enables Mode 6 SMART on the IM member disks. Mode 6 SMART requires each physical disk to be polled once per minute. If a SMART ASC/ASCQ code is detected on a physical IM disk, the firmware processes the SMART data, and the last received SMART ASC/ASCQ is stored in non-volatile memory. The IM volume does not support SMART directly, since it is just a logical representation of the physical disks in the volume.

2.4.6 Floating Hot Spare

One disk can be configured as the *floating hot spare disk*. If the IM firmware fails one of the mirrored disks, the firmware automatically replaces it with the hot spare disk. The IM firmware then resynchronizes the mirrored data. The SCSI ID of the failed disk is periodically polled to determine if the disk has been replaced. If so, the firmware automatically establishes that disk as the new “floating hot spare.”

2.4.7 Media Verification

The IM firmware supports a background *media verification feature* that runs once per minute when the IM volume is in optimal mode. The media verification feature issues a SCSI Verify command to a segment of the disk. If the command fails for any reason, the other disk's data for this segment is read and written to the failing disk in an attempt to refresh the data. The current Media Verification Logical Block Address is written to non-volatile memory occasionally to allow Media Verification to continue approximately where it left off prior to a power-cycle.

2.4.8 SCSI ID Assignment

A single logical drive is presented as the combination of a set of physical member disks. Each individual member disk is hidden and returns a "selection timeout" when accessed. The SCSI Target ID of the IM logical drive is assigned when the logical drive is created. The lowest SCSI ID of the selected disks is used.

2.4.9 Disk Write Caching

The IM firmware disables disk write caching. This is done to increase data integrity, so that the disk write log stored in NVSRAM is always valid. If disk write caching were enabled (not recommended), the disk write log could be invalid.

2.4.10 NVSRAM Usage

IM firmware requires a 32 Kbyte NVSRAM in order to perform write journaling. Write journaling is used to verify that the mirrored disks in the IM volume are synchronized with each other. The NVSRAM also stores additional code and data used for error and exception handling, and it stores IM configuration information during serial EEPROM updates. The disk write log uses approximately 4 Kbytes of the NVSRAM.

2.5 Fusion-MPT Support

The LSI Logic Fusion-MPT architecture provides the interface to the SCSI chip/firmware to allow Integrated Mirroring.

2.5.1 BIOS ROM

The BIOS uses the Fusion-MPT interface to communicate to the SCSI chip/firmware to allow Integrated Mirroring. This includes reading the Fusion-MPT configuration to gain access to the SCSI parameters that are used to define behavior between the adapter and its devices.

2.5.2 OS Drivers

The Fusion-MPT drivers for all supported operating systems implement the Fusion-MPT interface to communicate with the SCSI chip/firmware. To allow Integrated Mirroring, the host OS driver implements domain validation and supports Ultra320 expander configurations.

Chapter 3

Setting Up Integrated Mirroring

This chapter describes how to set up Integrated Mirroring (IM) using the BIOS-based configuration utility (CU). The chapter includes these topics:

- [Section 3.1, “IM Configuration Overview”](#)
- [Section 3.2, “Configuring IM with the BIOS-Based CU”](#)
- [Section 3.3, “Troubleshooting,” page 3-14](#)

3.1 IM Configuration Overview

The following constraints were made in order to simplify the IM configuration.

- The BIOS-based CU allows you to create one mirrored volume per Fusion-MPT controller.
- The mirrored volume can have two to six disks, or two to five disks if an optional hot spare disk is used.
- Disks in a mirrored volume must be connected to the same channel of the same Fusion-MPT controller, and the controller must be in the BIOS boot order.
- Disks in an IM volume must be non-removable, single-LUN disks that support 512-byte sectors, wide synchronous transfers, Qtag'd I/Os, and a unit serial number. The disks must support SMART, and they must be minimally compliant with the SCSI-2 standard.
- Disks of different size are allowed in mirrored volumes, but the smallest disk determines the “logical” size of each disk in the volume. The excess space of larger member disks is not used.

3.2 Configuring IM with the BIOS-Based CU

The BIOS-based configuration utility (CU) is part of the Fusion-MPT BIOS. When the BIOS loads during boot and you see the message about the LSI Logic Configuration Utility, press **Ctrl-c** to start the utility. After you do this, the message changes to:

"Please wait, invoking LSI Logic Configuration Utility..."

3.2.1 Quick IM Configuration Procedure

Follow the steps below to configure an Integrated Mirroring (IM) volume with the BIOS-based CU. For a more complete explanation of this procedure, including detailed descriptions of the configuration screens, see [Section 3.2.3, "Detailed IM Configuration Procedure," page 3-5](#).

The configuration procedure assumes that the system already has the required SCSI controller(s) and disks. You can configure one IM volume per Fusion-MPT controller.

1. On the Main menu screen of the BIOS-based CU, use the arrow keys to select an adapter.
2. Press **Enter** to go to the Adapter Properties screen.
3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** on the screen.
4. Press **Enter** to go to the RAID Properties screen. *Continue with step 5* to configure a two-disk mirrored volume. *Skip to step 6* to configure a mirrored volume with three to six disks.
5. To configure a two-disk mirrored volume, with an optional hot spare disk:
 - a. In the RAID Properties screen, use the arrow keys to select the primary disk for the IM volume (the disk with the data you want to mirror).
 - b. Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value.
 - c. When the "Keep Data/Erase Disk" message appears, press **F3** to keep the data that is currently on this disk. The value in the Array Disk column changes to **Primary**.

- d. Use the arrow keys to select the secondary (mirrored) disk for the IM volume. Select **Yes** as the value for the Array Disk column.

If partitions are defined on this disk, a message warns you that data on the disk will be lost when the mirrored volume is created. Press **Delete** to confirm erasing data from the disk, or press any other key to deselect the disk. Continue with step 7.

6. To configure a mirrored volume with three to six disks, or three to five disks with an optional hot spare disk:
 - a. In the RAID Properties screen, use the arrow keys to select the first disk for the IM volume.
 - b. Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value.
 - c. When the “Keep Data/Erase Disk” message appears, press **Delete** to erase the disk.
 - d. Use the arrow keys to select the next disk for the IM volume. Select **Yes** as the value for the Array Disk column.

If partitions are defined on this disk, a message warns you that data on the disk will be lost when the mirrored volume is created. Press **Delete** to confirm erasing data from the disk, or press any other key to deselect the disk.

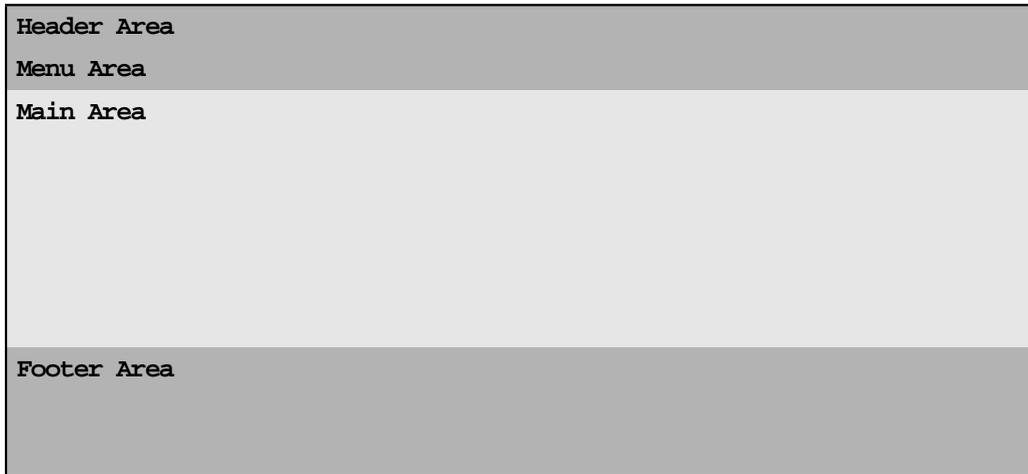
- e. Repeat the previous step to select up to four more disks for the IM volume. (Or select up to three more disks if you want to configure a hot spare disk for the volume.)
7. (Optional) Use the arrow keys to select a hot spare disk for the IM volume. Select **Yes** as the value for the Hot Spare column.
8. When you have selected all disks for the IM volume, press **Esc** and select **Save changes, then exit this menu**. (If you do not want to create the IM volume, select **Discard changes, then exit this menu**.)

The IM volume exists as soon as you save the changes. The RAID Properties screen now displays the IM volume properties and status.

3.2.2 Configuration Screen Overview

All of the BIOS-based CU screens are partitioned into the areas shown in [Figure 3.1](#).

Figure 3.1 Screen Field Definitions



- **Header Area:** Shows the product title and version.
- **Menu Area:** Shows the currently defined menu, if any. Press **F2** to move to the menu area. Select a menu item by moving the cursor to it with the right and left arrow keys and then pressing **Enter**.
- **Main Area:** Shows information about the Fusion-MPT controllers and attached devices. Some of the characteristics can be configured. You can scroll horizontally and vertically to view and select items that do not fit on one screen. Horizontal and vertical scroll bars are displayed here.
- **Footer Area:** Lists the valid keys that invoke actions. Items that allow you to change their value have square brackets enclosing the value. Items that allow you to “execute an action” are enclosed by angle brackets.

3.2.3 Detailed IM Configuration Procedure

This section provides more detail on the BIOS-based CU screens that are used to configure an IM volume. See [Section 3.2.4, "Other BIOS-Based CU Screens," page 3-11](#) for descriptions of the other BIOS-based CU screens that are not used for this task.

Note: Your system may have a different version of the Fusion-MPT BIOS. Therefore, the screens that you see may be slightly different from the examples shown here.

3.2.3.1 Main Screen

[Figure 3.2](#) shows an example of the Main screen that appears when the BIOS-based CU starts.

Figure 3.2 Main Screen

```
LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX
<Boot Adapter List>      <Global Properties>
LSI Logic Host Bus Adapters
Adapter      PCI Bus  Dev/Func  Port Number  IRQ  NVM  Boot Order  LSI Logic Control  RAID Status
<LSI1030    0      A0>      6100        15  Yes  0           Enabled           --
<LSI1030    0      A1>      6200         9  Yes  1           Enabled           --

Esc=Abort/Exit      Arrow Keys=Select Item      -/+ = Change [Item]
Home/End=Select Item  Enter=Execute <Item>

F2 =Menu
```

This screen shows information about all Fusion-MPT controllers installed in the system. The RAID Status column gives an overall status of the Mirrored volume, once it is created. The possible values for this field are **Optimal**, **Degraded**, **Resyncing**, **Failed**, or No value. No value, indicated by a dash, means there is no mirrored volume on this adapter. **Degraded** usually means that one of the mirrored disks is missing or has failed.

To configure an IM volume, use the arrow keys to select an adapter, and press **Enter** to go to the Adapter Properties screen.

Note: You can also access the Global Properties screen and the Boot Adapter List screen by selecting the options in the menu area. (These screens are not used to define an IM volume.) For more information about them, see [Section 3.2.4, “Other BIOS-Based CU Screens,” page 3-11](#).

3.2.3.2 Adapter Properties Screen

You access the Adapter Properties screen by selecting one of the adapters from the Main menu screen ([Figure 3.2](#)). [Figure 3.3](#) shows an example of the Adapter Properties screen.

Figure 3.3 Adapter Properties Screen

```

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX

Adapter Properties
Adapter  PCI      Dev/
        Bus      Func
LSI1030  0         A0

  <Device Properties>
  <RAID Properties>
  Host SCSI ID           [7]
  SCSI Bus Scan Order   [Low to High (0.. Max)]
  Removable Media Support [None]
  CHS Mapping           [SCSI Plug and Play Mapping]
  Spinup Delay (Secs)   [2]
  Secondary Cluster Server [No]
  Termination Control   [Auto]
  <Restore Defaults>

Esc=Abort/Exit   Arrow Keys=Select Item   -/+ = Change [Item]
                  Home/End=Select Item   Enter=Execute <Item>
  
```

On the Adapter Properties screen, use the arrow keys to select **RAID Properties** and then press **Enter** to go to the RAID Properties screen, which is shown in [Figure 3.4](#).

After an IM volume is configured, you can select **Synchronize Whole Mirror** on the Adapter Properties screen to force a resynchronization of all blocks in the IM volume. The default is to resynchronize only the blocks that are out of sync in the volume, as indicated by log entries.

3.2.3.3 RAID Properties Screen

[Figure 3.4](#) shows the RAID Properties screen as it appears before an IM volume is configured.

Figure 3.4 RAID Properties Screen: No IM Volume Configured

```

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX
RAID Properties  Array:-----  SCSI ID:--  Size (MB):---

SCSI  Device Identifier  Array  Hot  Status  Predict  Size
ID    Device Identifier  Disk?  Spare  Status  Failure  (MB)
0     Seagate xxxxxxxxxx  [No]   [No]  ----   ---     8683
1     Seagate xxxxxxxxxx  [No]   [No]  ----   ---     8683
2     Seagate xxxxxxxxxx  [No]   [No]  ----   ---     8683
3     -----             ---    ---   ----   ---
4     -----             ---    ---   ----   ---

Esc=Abort/Exit  Arrow Keys=Select Item  -/+ = Change [Item]
                  Home/End=Select Item      Enter=Execute <Item>
  
```

The RAID Properties screen displays information about disks connected to the controller selected from the Main screen. The fields under the Array Disk column are enabled for hard disks only.

Configuring a two-disk mirrored volume –

Use the arrow keys to select the primary disk for the IM volume (the disk with the data you want to mirror). Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value.

When the “Keep Data/Erase Data” message appears, press **F3** to keep the data that is currently on this disk. The value in the Array Disk column changes to **Primary**.

Use the arrow keys to select the secondary (mirrored) disk for the IM volume. Select **Yes** as the value for the Array Disk column. If partitions are defined on this disk, a message warns you that data on the disk will be lost when the mirrored volume is created. Press **Delete** to confirm erasing data from the disk, or press any other key to deselect the disk.

(Optional) Use the arrow keys to select a hot spare disk for the IM volume. Select **Yes** as the value for the Hot Spare column.

Press **Esc** and select **Save changes, then exit this menu**. (If you do not want to create the IM volume, select **Discard changes, then exit this menu**.) The IM volume is created when you save the changes, and synchronization of the mirrored disk(s) starts immediately.

Configuring a mirrored volume with three to six disks –

Use the arrow keys to select the first disk for the IM volume. Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value.

When the “Keep Data/Erase Data” message appears, press **Delete** to erase the disk.

Use the arrow keys to select the next disk for the IM volume. Select **Yes** as the value for the Array Disk column. If partitions are defined on this disk, a message warns you that data on the disk will be lost when the mirrored volume is created. Press **Delete** to confirm erasing data from the disk, or press any other key to deselect the disk.

Repeat the previous step to select up to four more disks for the IM volume. (Or select up to three more disks if you want to configure a hot spare disk for the volume.)

(Optional) Use the arrow keys to select a hot spare disk for the IM volume. Select **Yes** as the value for the Hot Spare column.

Press **Esc** and select **Save changes, then exit this menu**. (If you do not want to create the IM volume, select **Discard changes, then exit this menu**.) The IM volume is created when you save the changes, and synchronization of the mirrored disk(s) starts immediately.

Other RAID Properties Screen Information –

After the IM volume is created, the *SCSI ID* field shows which SCSI ID the operating system uses to access the IM volume. This addressing information stays the same unless the volume is reconfigured with disks that have different SCSI IDs. The IM volume addressing information will also change if the SCSI ID is changed for the physical disk whose SCSI ID is being used for the IM volume.

The *Size* field shows the capacity of the IM volume. The volume size is slightly less than half of the combined capacity of the mirrored disks, because the utility rounds the size down to increase compatibility in case a disk of the volume must be replaced. (Even if replacement disks are of the same size class, they may differ slightly in actual capacity.)

You can use the RAID Properties screen to reconfigure the IM volume after it has been created. You can change the disks in the IM volume back to standard disks by changing the values under the Array Disk column to **No**. When this is done, the virtual IM volume is “turned off” and the operating system can see the physical disks. You can do this if you no longer want the mirrored volume.

The screen shows the properties and status of each disk in the IM volume. The *Status* field may show any of these values: **OK**, **disk missing**, **incompatible**, **offline**, **out of sync**, or **disk initializing**.

The *Predict Failure* field displays SMART information. A SMART enabled disk can predict when the disk is about to fail. When **Yes** appears in this column (failure is predicted), the disk should be replaced.

[Figure 3.5](#) shows an example of the RAID Properties screen after a two-disk IM volume with a hot spare has been configured.

Figure 3.5 RAID Properties Screen: One IM Volume Configured

```

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX
<Next Array>      <Delete Array>      <Add/Delete Hot Spare>      <Activate Array>
RAID Properties   Array:Mirrored      SCSI ID:0                    Size (MB):8620

SCSI              Device Identifier    Array      Hot      Status   Predict   Size
ID                xxxxxxxxxxxx         Disk?     Spare
0                Seagate xxxxxxxxxxxx  [Primary] [No]     OK       NO       8683
1                Seagate xxxxxxxxxxxx  [Yes]     [No]     OK       NO       8683
2                Seagate xxxxxxxxxxxx  [Yes]     [Yes]    OK       NO       8683

Esc=Abort/Exit   Arrow Keys=Select Item      -/+ = Change [Item]
                  Home/End=Select Item         Enter=Execute <Item>
    
```

The RAID Properties screen shows information about one IM volume at a time. Only one volume can be *active* at a time. Here is an explanation of the menu options on the screen in [Figure 3.5](#).

- Select **<Next Array>** to display the next array (IM volume) on the same SCSI channel.
 - Note:** Although you cannot directly configure a second IM volume on the same SCSI channel or Fusion-MPT controller, you could take the member disks of a volume from another controller and connect them to this controller. Then the firmware would detect two IM volumes on the same controller.
- Select **<Delete Array>** to delete the IM volume currently displayed on the screen. The member disks will be converted back to stand-alone disks.
- Select **<Add/Delete Hot Spare>** to add a hot spare if the volume does not already have one or to delete a hot spare if the volume does have one. If you are adding a hot spare, the CU redisplay the RAID Properties screen with only the applicable choices in the Hot Spare column enabled.

- Select **<Activate Array>** to make this IM volume the *active* array (volume) on the system. Activating an array deactivates all other arrays on the Fusion-MPT controller.

3.2.4 Other BIOS-Based CU Screens

The BIOS-based CU screens described in this section are not directly used to configure an IM volume.

3.2.4.1 Global Properties Screen

You use the Global Properties screen to modify global properties, such as the boot information display mode, and to restore default settings. This screen is invoked by selecting **Global Properties** from the Main screen (Figure 3.2). Figure 3.6 shows the Global Properties screen.

Figure 3.6 Global Properties Screen

```

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX
Global Properties

Pause When Boot Alert Displayed      [No]
Boot Information Display Mode         [Terse]
Negotiate With Devices                [Supported]
Video Mode                            [Color]
Support Interrupt                     [Hook interrupt, the Default]
Disable Integrated RAID               [No]
<Restore Defaults>

Esc=Abort/Exit  Arrow Keys=Select Item  -/+ = Change [Item]
Home/End=Select Item  Enter=Execute <Item>

```

Press the <Esc> key to exit this screen.

3.2.4.2 Boot Adapter List Screen

The Boot Adapter List screen is invoked by selecting **Boot Adapter List** from the top-level screen shown in [Figure 3.2](#). Only devices connected to one of the SCSI boot adapters can be used to boot. [Figure 3.7](#) shows the Boot Adapter List screen.

Figure 3.7 Boot Adapter List Screen

```
LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX

Boot Adapter List
Insert=Add an adapter          Delete=Remove an adapter
Adapter      PCI  Dev/   Boot      Current   Next
              Bus  Func  Order     Status    Boot
LSI1030      0   48    [0]       On        [On]

Hit Insert to select an adapter from this list
LSI1030      0   50

Esc=Abort/Exit      Arrow Keys=Select Item  -/+ = Change [Item]
                    Home/End=Select Item    Enter=Execute <Item>
```

The Boot Adapter List screen shows up to four boot adapters in the top list. Adapters in the bottom list can be added to the boot adapter list as long as there are currently less than four boot adapters. The SCSI BIOS saves information on the adapters shown in the top list into non-volatile memory. On the next boot, this information is used to determine which disk or IM volume to boot.

The cursor starts on the top adapter in the top list. Follow these steps to add an adapter to the top list:

1. Press the **Insert** key to move the cursor to the bottom adapter list.
2. Use the up and down arrows to select the desired adapter.
3. When the cursor is highlighting an adapter that is connected to a disk you want to use for the IM boot volume, press **Enter**.

To remove an adapter from the top list, use the up and down arrows to select the adapter. Then press the **Delete** key. Press the **Esc** key to exit this screen.

3.2.4.3 Device Properties Screen

As shown in [Figure 3.8](#), the Device Properties screen displays virtual, as well as physical, device identifiers for disks that are part of an IM volume. (“LSILOGIC1030 IM1000” is a virtual identifier, “Seagate xxxxxxxxx” is a physical identifier.)

Figure 3.8 Device Properties Screen

```

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IME-X.XX.XX
Device Properties
SCSI ID  Device Identifier  Restore Defaults  MT/sec  MB/sec  Data Width  Scan ID  Scan Luns >0
0      LSILOGIC1030 IM1000  <Defaults>  [160]  320    [16]  [Yes]  [Yes]
1      LSILOGIC1030 IM1000  <Defaults>  [160]  320    [16]  [Yes]  [Yes]
2      Seagate xxxxxxxxx  <Defaults>  [160]  320    [16]  [Yes]  [Yes]

Esc=Abort/Exit  Arrow Keys=Select Item  -/+ = Change [Item]
Home/End=Select Item  Enter=Execute <Item>
  
```

[Figure 3.8](#) shows the initial default options. Other device options can be accessed by scrolling the screen horizontally. These include SCSI Disconnect, SCSI Timeout, and Queue Tags.

3.3 Troubleshooting

The following sections provide some suggestions for troubleshooting.

3.3.1 RAID Properties Menu Item Disabled

Problem: The RAID Properties menu item is disabled

Solution: Check the following:

- Is the adapter in the boot adapter list?
- Does the LSI adapter have Integrated Mirroring (IM) firmware?
- Is an IM volume already created on each Fusion-MPT adapter in the system?
- Is "Disable Integrated RAID" set to **Yes** in the Global Properties screen?
- Are there at least two disks on the selected SCSI bus?

3.3.2 IM Volume Uses Extra SCSI ID

Problem: The IM volume with two mirrored disks uses an extra SCSI ID off the bus (that is, none of the physical disks of the IM volume has the same SCSI ID as the IM volume), and the configuration utility won't allow the disk at the ID currently defined as the volume ID to be configured.

Solution: To change the IM volume configuration so it does not use an extra SCSI ID but also keeps the same volume ID, do the following:

1. Go to the RAID Properties screen. Note which SCSI ID the primary disk is using and which SCSI ID the volume is using. Also note the SCSI IDs of the remaining disks of the IM volume.
2. Set the IM volume disks to "No" and save the configuration (in other words, break the volume).
3. Return to the RAID Properties screen and reconfigure the IM volume as follows:
 - Primary disk at same ID as before
 - Secondary disk at ID used previously by the volume
 - Hot spare at SCSI ID used previously by the secondary disk

4. Save the configuration by pressing **Esc** and following the on-screen instructions. This creates the IM volume and triggers an automatic resync.

3.3.3 Configuration Utility Disables Selection of Disk

Problem: The configuration utility does not allow a disk to be selected for an IM volume.

Solution: To determine why the disk cannot be selected, press **F4** on the RAID Properties screen to display diagnostic codes for each disk under the Size column. Code definitions are as follows:

- 0 Good status
- 1 Could not get serial number from disk
- 2 Can't confirm that disk has SMART capability
- 3 Maximum disks already configured for volume
- 4 Inquiry data returned says disk does not support wide, qtags, disconnects, or sector size is not 512 bytes
- 5 User disabled qtags or Disconnects for disk on device properties screen
- 6 Partitions on disk exceed size that can be mirrored by an already selected secondary or hot spare disk
- 7 Disk is not large enough to mirror partitions contained on selected primary disk
- 8 Hot spare detected while no IM volume exists. Must delete hot spare and save that configuration
- 9 Disk partition uses some or all of the last 32 sectors of the disk (16 Kbytes). The last 32 sectors are required for IR (Integrated RAID) internal processing.
- 10 Disk has sector size other than 512 bytes
- 11 Device is not a compatible device type. Must be non-removable disk.
- 12 Hot Spare too small to mirror volume
- 13 Maximum disks already configured for volume

Chapter 4

Integrated Striping (IS)

Overview

This chapter provides an overview of the LSI Logic Integrated Striping (IS) feature. It includes these sections:

- [Section 4.1, "Introduction"](#)
 - [Section 4.2, "IS Features"](#)
 - [Section 4.3, "IS Description"](#)
 - [Section 4.4, "Integrated Striping Firmware"](#)
 - [Section 4.5, "Fusion-MPT Support," page 4-5](#)
-

4.1 Introduction

The LSI Logic Integrated Striping (IS) feature is targeted at applications that require the faster performance and increased storage capacity of striping. The IS feature is a low-cost solution with many of the features of a more expensive RAID striping solution. A single IS logical drive may be configured as the boot disk or as a data disk.

The IS feature is implemented with host adapter firmware that supports the Fusion-MPT Interface. IS provides better performance and more capacity than individual SCSI disks without burdening the host CPU. The firmware splits host I/Os over multiple disks and presents the disks as a single logical drive, which appears as a physical device. In general, striping is transparent to the BIOS, drivers, and operating system.

The Fusion-MPT BIOS Configuration Utility (CU) is used to configure the IS volume, which can use from two to six disk disks. The BIOS and drivers support SCSI Domain Validation to the physical member disks associated with a striped logical drive. Host-based CIM software monitors the state of the physical disks and reports error conditions as they arise.

4.2 IS Features

Following is a list of some key features of Integrated Striping:

- Striping with 2 to 6 disks on the same channel, allowing greater volume capacity
- A single virtual drive is presented to the OS
- Support for disks of different types and capacities
- Fusion-MPT architecture
- Easy-to-use BIOS-based configuration utility (and DOS-based configuration utility for manufacturing use only)
- Error notification
- Meta data is used to store volume configuration on disks
- OS-specific event log
- Error display on CIM browser
- SAF-TE drive status LED support for IS disks
- Support for domain validation
- Supports fresh install only - no migration of data on an existing disk

4.3 IS Description

The IS feature writes data across multiple disks instead of onto one disk. This is accomplished by partitioning each disk's storage space into 64 Kbyte stripes. These stripes are interleaved round-robin, so that the combined storage space is composed alternately of stripes from each disk.

For example, as shown in [Figure 4.1](#), segment 1 is written to disk 1, segment 2 is written to disk 2, segment 3 is written to disk 3, etc. When the system reaches the end of the disk list, it starts writing at the next available segment of disk 1.

Figure 4.1 Integrated Striping Example

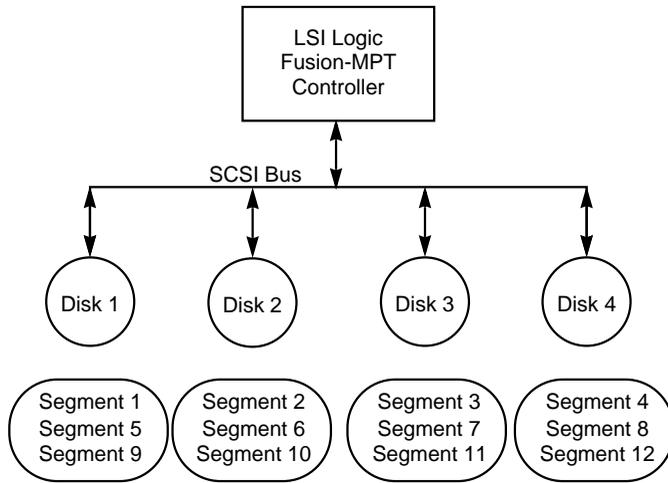
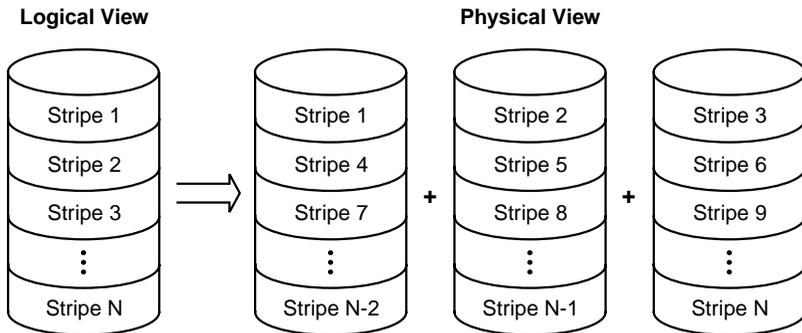


Figure 4.2 shows a logical view and a physical view of integrated striping configuration.

Figure 4.2 Integrated Striping - Logical and Physical Views



The primary advantage of IS is speed, because it transfers data to or from multiple disks at once. However, there is no data redundancy; therefore, if one disk fails, that data is lost.

4.4 Integrated Striping Firmware

This section describes features of the LSI Logic Integrated Striping (IS) firmware.

4.4.1 Host Interface

The IS host interface uses the “Message Passing Interface,” as described in the Fusion-MPT specification, including Integrated Striping. Through the Fusion-MPT interface, the host operating system has access to the logical IS drive as well as the physical disks. This allows support for domain validation and Ultra320 SCSI expander configuration.

4.4.2 Meta Data Support

The firmware supports Meta data describing the IS logical drive configuration stored on each member disk. When the firmware is initialized, each member disk is queried to read the stored Meta data for consistency checking. The usable disk space for each IS member disk is adjusted down to leave room for this data.

4.4.3 SMART Support

The IS firmware enables Mode 6 SMART on the IS member disks. Mode 6 SMART requires each physical disk to be polled once per minute. If a SMART ASC/ASCQ code is detected on a physical IS disk, the firmware processes the SMART data, and the last received SMART ASC/ASCQ is stored in non-volatile memory. The IS volume does not support SMART directly, since it is just a logical representation of the physical disks in the volume.

4.4.4 SCSI ID Assignment

A single logical drive is presented as the combination of a set of physical member disks. Each individual member disk is hidden and returns a “selection timeout” when accessed. The SCSI Target ID of the IS logical drive is assigned when the logical drive is created. The lowest SCSI ID of the selected disks is used.

4.4.5 Disk Write Caching

Disk write caching is enabled in IS volumes.

4.5 Fusion-MPT Support

The LSI Logic Fusion-MPT architecture provides the interface to the SCSI chip/firmware to allow Integrated Striping.

4.5.1 BIOS ROM

The BIOS uses the Fusion-MPT interface to communicate to the SCSI chip/firmware to allow Integrated Striping. This includes reading the Fusion-MPT configuration to gain access to the SCSI parameters that are used to define behavior between the adapter and its devices.

4.5.2 OS Drivers

The Fusion-MPT drivers for all supported operating systems implement the Fusion-MPT interface to communicate with the SCSI chip/firmware. To allow Integrated Striping, the host OS driver implements domain validation and supports Ultra320 expander configurations.

Chapter 5

Setting Up Integrated Striping

This chapter describes how to set up Integrated Striping (IS) using the BIOS-based configuration utility (CU). The chapter includes these topics:

- [Section 5.1, “IS Configuration Overview”](#)
 - [Section 5.2, “Configuring IS with the BIOS-Based CU”](#)
 - [Section 5.3, “Troubleshooting,” page 5-11](#)
-

5.1 IS Configuration Overview

The following restrictions were made in order to simplify the IS configuration.

- The BIOS-based CU allows you to create one Integrated Striped volume per Fusion-MPT controller.
- An IS volume can have from two to six disks.
- Disks in an IS volume must be non-removable, single-LUN disks that support 512-byte sectors, wide synchronous transfers, Qtag'd I/Os, and a unit serial number. The disks must support SMART, and they must be minimally compliant with the SCSI-2 standard.
- Disks in an IS volume must be connected to the same channel of the same Fusion-MPT controller, and the controller must be in the BIOS boot order.
- Disks of different size are allowed in IS volumes, but the smallest disk determines the “logical” size of each disk in the volume. The excess space of larger member disks is not used.
- Usable disk space for each IS member disk is adjusted down to leave room for Meta data. Usable disk space may be further reduced to maximize the ability to interchange disks in the same size classification.

- The supported stripe size is 64 Kbytes.

5.2 Configuring IS with the BIOS-Based CU

The BIOS-based configuration utility (CU) is part of the Fusion-MPT BIOS. When the BIOS loads during boot and you see the message about the LSI Logic Configuration Utility, press **Ctrl-c** to start the utility. After you do this, the message changes to:

“Please wait, invoking LSI Logic Configuration Utility...”

5.2.1 Quick IS Configuration Procedure

Follow the steps below to configure an Integrated Striping (IS) volume with the BIOS-based CU. For a more complete explanation of this procedure, including detailed descriptions of the configuration screens, see [Section 5.2.3, “Detailed IS Configuration Procedure,” page 5-4](#).

The configuration procedure assumes that the system already has the required SCSI controller(s) and disks. You can configure one IS volume per Fusion-MPT controller.

1. On the Main menu screen of the BIOS-based CU, use the arrow keys to select an adapter.
2. Press **Enter** to go to the Adapter Properties screen.
3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** on the screen.
4. Press **Enter** to go to the RAID Properties screen.
5. In the RAID Properties screen, use the arrow keys to select the first disk for the IS volume. Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value for this column.

If partitions are defined on the selected disk, a message appears warning you that data on the disk will be lost when the striped volume is created. You can then deselect that disk, if desired, or erase the disk and continue.

6. Repeat the previous step to select up to five more disks for the striped volume.

If partitions are defined on the selected disks, a message appears warning you that data on the disk will be lost when the striped volume is created. You can then deselect that disk, if desired, or erase the disk and continue.

7. When you have selected all disks for the IS volume, press **Esc** and select **Save changes, then exit this menu**. (If you do not want to create the volume, select **Discard changes, then exit this menu**.)

The IS volume exists as soon as you save the changes. The RAID Properties screen now displays the IS volume properties and status.

5.2.2 Configuration Screen Overview

All BIOS-based CU screens have the areas shown in [Figure 5.1](#).

Figure 5.1 Screen Field Definitions



- **Header Area:** Shows the product title and version.
- **Menu Area:** Shows the currently defined menu, if any. Press **F2** to move to the menu area. Select a menu item by moving the cursor to it with the right and left arrow keys and then pressing **Enter**.
- **Main Area:** Shows information about the Fusion-MPT controllers and attached devices. Some of the characteristics can be configured. You can scroll horizontally and vertically to view and select items that do not fit on one screen. Horizontal and vertical scroll bars are displayed here.

- **Footer Area:** Lists the valid keys that invoke actions. Items that allow you to change their value have square brackets enclosing the value. Items that allow you to “execute an action” are enclosed by angle brackets.

5.2.3 Detailed IS Configuration Procedure

This section provides more detail on the BIOS-based CU screens that are used to configure an IS volume. See [Section 5.2.4, “Other BIOS-Based CU Screens,” page 5-9](#) for descriptions of the other BIOS-based CU screens that are not used for this task.

Note: Your system may have a different version of the Fusion-MPT BIOS. Therefore, the screens that you see may be slightly different from the examples shown here.

5.2.3.1 Main Screen

[Figure 5.2](#) shows an example of the Main screen that appears when the BIOS-based CU starts.

Figure 5.2 Main Screen

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX								
<Boot Adapter List>				<Global Properties>				
LSI Logic Host Bus Adapters								
Adapter	PCI Bus	Dev/Func	Port Number	IRQ	NVM	Boot Order	LSI Logic Control	RAID Status
<LSI1030	0	A0>	6100	15	Yes	0	Enabled	--
<LSI1030	0	A1>	6200	9	Yes	1	Enabled	--
Esc=Abort/Exit		Arrow Keys=Select Item			-/+ = Change [Item]			
		Home/End=Select Item			Enter=Execute <Item>			
F2 =Menu								

This screen shows information about all Fusion-MPT controllers installed in the system. The RAID Status column gives an overall status of the IS volume, once it is created. The possible values of this field are **Optimal**,

Failed, Inactive, Disabled, Degraded, or No value. No value, indicated by a dash, means there is no IS volume on this adapter.

To configure an IS volume, use the arrow keys to select an adapter, and press **Enter** to go to the Adapter Properties screen.

Note: You can also access the Global Properties screen and the Boot Adapter List screen by selecting the options in the menu area. These screens are not used to define an IS volume. For more information about them, see [Section 5.2.4, “Other BIOS-Based CU Screens,”](#) page 5-9.

5.2.3.2 Adapter Properties Screen

You access the Adapter Properties screen by selecting one of the adapters from the Main menu screen ([Figure 5.2](#)). [Figure 5.3](#) shows an example of the Adapter Properties screen.

Figure 5.3 Adapter Properties Screen

```
LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX

Adapter Properties
Adapter  PCI      Dev/
        Bus      Func
LSI1030  0          A0

  <Device Properties>
  <RAID Properties>
Host SCSI ID                      [7]
SCSI Bus Scan Order                [Low to High (0.. Max)]
Removable Media Support            [None]
CHS Mapping                         [SCSI Plug and Play Mapping]
Spinup Delay (Secs)                [2]
Secondary Cluster Server            [No]
Termination Control                [Auto]
  <Restore Defaults>

Esc=Abort/Exit   Arrow Keys=Select Item   -/+ = Change [Item]
                  Home/End=Select Item   Enter=Execute <Item>
```

On the Adapter Properties screen, use the arrows to select **RAID Properties** and then press **Enter** to go to the RAID Properties screen, which is shown in [Figure 5.4](#).

5.2.3.3 RAID Properties Screen

[Figure 5.4](#) shows the RAID Properties screen before an IS volume is configured.

Figure 5.4 RAID Properties Screen: No IS Volume Configured

```

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX
RAID Properties   Array:--- SCSI ID:---   Size(MB):-----

SCSI   Device Identifier      Array   Status   Predict   Size
ID     Device Identifier      Disk?   Status   Failure   (MB)
0      Seagate xxxxxxxxxxxx     [No]    -----   ----      8683
1      Seagate xxxxxxxxxxxx     [No]    -----   ----      8683
2      Seagate xxxxxxxxxxxx     [No]    -----   ----      8683
3      -----                  ----    -----   ----
4      -----                  ----    -----   ----

Esc=Abort/Exit   Arrow Keys=Select Item   -/+ = Change [Item]
                  Home/End=Select Item      Enter=Execute <Item>
                                                    F4=Diagnostic
  
```

The RAID Properties screen displays information about disks connected to the controller selected from the Main screen. The fields under the Array Disk column are enabled for hard disks only.

Use the arrow keys to select the first disk for the IS volume. Use the arrow keys to move to the Array Disk column for this disk, and use the + and - keys to select **Yes** as the value for this column.

If partitions are defined on the selected disk, a message appears warning you that data on the disk will be lost when the striped volume is created. You can then deselect that disk, if desired, or continue and delete the data.

Repeat the previous step to select up to five more disks for the IS volume. If partitions are defined on these disks, a message appears warning you that data on the disk will be lost when the striped volume is created. You can then deselect that disk, if desired, or continue and delete the data.

When you have selected all disks for the IS volume, press the **Esc** key and select **Save changes, then exit this menu**. (If you do not want to create the IS volume, select **Discard changes, then exit this menu** instead.) The IS volume is created when you save the changes.

Other RAID Properties Screen Information –

After the IS volume is created, the *SCSI ID* field shows which SCSI ID the operating system uses to access the volume. This addressing information stays the same unless the volume is reconfigured with disks that have different SCSI IDs. The IS volume addressing information will also change if the SCSI ID is changed for the physical disk whose SCSI ID is being used for the IS volume.

The *Size* field shows the capacity of the IS volume.

Each disk's properties are shown along with its status. The *Status* field may show any of these values: **OK**, **disk missing**, **incompatible**, **offline**, or **initializing**.

The *Predict Failure* field displays SMART information. A SMART enabled disk can predict when the disk is about to fail. When **Yes** appears in this column (failure is predicted), the disk should be replaced.

[Figure 5.5](#) shows an example of the RAID Properties screen after a three-disk IS volume has been configured.

Figure 5.5 RAID Properties Screen: One IS Volume Configured

LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX						
<Next Array>		<Delete Array>		<Activate Array>		
RAID Properties		Array:IS SCSI ID:0		Size(MB):25800		
SCSI ID	Device Identifier	Array Disk?	Status	Predict Failure	Size (MB)	
0	Seagate xxxxxxxxxx	[Yes]	OK	NO	8683	
1	Seagate xxxxxxxxxx	[Yes]	OK	NO	8683	
2	Seagate xxxxxxxxxx	[Yes]	OK	NO	8683	
Esc=Abort/Exit		Arrow Keys=Select Item		-/+ = Change [Item]		
		Home/End=Select Item		Enter=Execute <Item>		
F4=Diagnostic						

The RAID Properties screen shows information about one IS volume at a time. Only one volume can be *active* at a time. Here is an explanation of the menu options on the screen in [Figure 5.5](#).

- Select **<Next Array>** to display the next array (IS volume) on the same SCSI channel.
 - Note:** Although you cannot directly configure a second IS volume on the same SCSI channel or Fusion-MPT controller, you could take the member disks of a volume from another controller and connect them to this controller. Then the firmware would detect two IS volumes on the same controller.
- Select **<Delete Array>** to delete the IS volume currently displayed on the screen. The member disks will be converted back to stand-alone disks.
- Select **<Activate Array>** to make this IS volume the *active* array (volume) on the system. Activating an array deactivates all other arrays on the Fusion-MPT controller.

5.2.4 Other BIOS-Based CU Screens

These BIOS-based CU screens are not directly used to configure an IS volume.

5.2.4.1 Global Properties Screen

You use the Global Properties screen to modify global properties, such as the boot information display mode, and to restore default settings. This screen is invoked by selecting **Global Properties** from the Main screen (Figure 5.2). Figure 5.6 shows the Global Properties screen.

Figure 5.6 Global Properties Screen

```
LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX

Global Properties

Pause When Boot Alert Displayed      [No]
Boot Information Display Mode         [Terse]
Negotiate With Devices                [Supported]
Video Mode                            [Color]
Support Interrupt                     [Hook interrupt, the Default]
Disable Integrated RAID               [No]
<Restore Defaults>

Esc=Abort/Exit  Arrow Keys=Select Item  -/+ = Change [Item]
Home/End=Select Item  Enter=Execute <Item>
```

Press the <Esc> key to exit this screen.

5.2.4.2 Boot Adapter List Screen

The Boot Adapter List screen is invoked by selecting **Boot Adapter List** from the top-level screen shown in Figure 5.2. Only devices connected to one of the SCSI boot adapters can be used to boot a striped volume. Figure 5.7 shows the Boot Adapter List screen.

Figure 5.7 Boot Adapter List Screen

```
LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX

Boot Adapter List
Insert=Add an adapter          Delete=Remove an adapter

  Adapter      PCI  Dev/   Boot      Current   Next
                Bus  Func   Order     Status    Boot
  LSI1030      0   48    [0]       On        [On]

Hit Insert to select an adapter from this list
  LSI1030      0   50

Esc=Abort/Exit      Arrow Keys=Select Item  -/+ = Change [Item]
                    Home/End=Select Item      Enter=Execute <Item>
```

The Boot Adapter List screen shows up to four boot adapters in the top list. Adapters in the bottom list can be added to the boot adapter list as long as there are currently less than four boot adapters. The SCSI BIOS saves information on the adapters shown in the top list into non-volatile memory. On the next boot, this information is used to determine which disk or IS volume to boot.

The cursor starts on the top adapter in the top list. Follow these steps to add an adapter to the top list:

1. Press the **Insert** key to move the cursor to the bottom adapter list.
2. Use the up and down arrows to select the desired adapter.
3. When the cursor is highlighting an adapter that is connected to a disk you want to use for the IS boot volume, press **Enter**.

To remove an adapter from the top list, use the up and down arrows to select the adapter. Then press the **Delete** key. Press the **Esc** key to exit this screen.

5.2.4.3 Device Properties Screen

As shown in [Figure 5.8](#), the Device Properties screen displays virtual, as well as physical, device identifiers for disks that are part of an IS volume. (“LSILOGIC1030 IS” is a virtual identifier, “Seagate xxxxxxxx” is a physical identifier.)

Figure 5.8 Device Properties Screen

```
LSI Logic MPT SCSI Setup Utility Version MPTBIOS-IS-X.XX.XX
```

SCSI ID	Device Identifier	Restore Defaults	MT/sec	MB/sec	Data Width	Scan ID	Scan Luns >0
0	LSILOGIC1030 IS1000	<Defaults>	[160]	320	[16]	[Yes]	[Yes]
1	LSILOGIC1030 IS1000	<Defaults>	[160]	320	[16]	[Yes]	[Yes]
2	Seagate xxxxxxxx	<Defaults>	[160]	320	[16]	[Yes]	[Yes]

Esc=Abort/Exit Arrow Keys=Select Item -/+ = Change [Item]
Home/End=Select Item Enter=Execute <Item>

[Figure 5.8](#) shows the initial default options. Other device options can be accessed by scrolling the screen horizontally. These include SCSI Disconnect, SCSI Timeout, and Queue Tags.

5.3 Troubleshooting

The following sections provide some suggestions for troubleshooting.

5.3.1 RAID Properties Menu Item Disabled

Problem: The RAID Properties menu item is disabled

Solution: Check the following:

- Is the adapter in the boot adapter list?
- Does the LSI adapter have Integrated Striping (IS) firmware?

- Is an IS volume already created on each Fusion-MPT adapter in the system?
- Is “Disable Integrated RAID” set to **Yes** in the Global Properties screen?
- Are there at least two disks on the selected SCSI bus?

5.3.2 Configuration Utility Disables Selection of Disk

Problem: The configuration utility does not allow a disk to be selected for an IS volume.

Solution: To determine why the disk cannot be selected, press **F4** on the RAID Properties screen to display diagnostic codes for each disk under the Size column. Code definitions are as follows:

- 0 Good status
- 1 Could not get serial number from disk
- 2 Can't confirm that disk has SMART capability
- 3 Maximum disks already configured for volume
- 4 Inquiry data returned says disk does not support wide, qtags, disconnects, or sector size is not 512 bytes
- 5 User disabled qtags or Disconnects for disk on device properties screen
- 6 Partitions on disk exceed size that can be mirrored by an already selected secondary or hot spare disk
- 9 Disk partition uses some or all of the last 32 sectors of the disk (16 Kbytes). The last 32 sectors are required for IR (Integrated RAID) internal processing.
- 10 Disk has sector size other than 512 bytes
- 11 Device is not a compatible device type. Must be non-removable disk.
- 13 Maximum disks already configured for volume

Chapter 6

CIM Solution

This chapter describes the Fusion-MPT Common Information Model (CIM) Solution and explains how it is used to monitor storage components, including mirrored and striped volumes, in multiple systems on a network. This chapter contains the following sections:

- [Section 6.1, “Description”](#)
 - [Section 6.2, “CIM Browser Window Description”](#)
 - [Section 6.3, “CIM Installation Instructions for Windows”](#)
 - [Section 6.4, “CIM Installation Instructions for Linux”](#)
-

6.1 Description

The CIM Solution enables the storage system administrator to monitor storage components in multiple systems on a network. The administrator can use the easy-to-navigate CIM interface to quickly detect storage device failures. The CIM Solution also provides information about the topology of the storage network, controllers, and storage devices. The CIM Solution supports IM and IS volumes and the underlying physical disks in these volumes.

The LSI Logic CIM Solution is a CIM-compliant management application for Fusion-MPT mass storage elements. The CIM Solution allows you to connect with devices through a TCP/IP based network and to manage the attached Fusion-MPT controllers, devices, and device drivers. The CIM Solution supports many of LSI Logic SCSI and Fibre Channel controllers and their associated host adapters. These include the LSI53C1020, LSI53C1030, LSI53C1035, LSIFC919, LSIFC919X, LSIFC929, and LSIFC929X.

The latest version of the CIM Solution is available at this LSI Logic web site:

<http://support.megaraid.com/support/dloadcenter.html>

Follow these steps to download it:

1. Select **SCSI Adapters** from the drop-down list and click the arrow to the right of the list.
2. On the next screen, select **LSI20320-R**, **LSI21320-R**, or **LSI22320-R** from the drop-down list.
3. Select **Miscellaneous** for the file type, and click **Next>**.
4. When the next screen appears, click on the highlighted entry to download the latest version of the CIM Solution.

6.1.1 Features

The CIM Solution offers the following features:

- Provides visual alerts of component failures
- Displays current information about each controller and its attached storage devices
- Monitors the current status of Fusion-MPT IM and IS volumes
- Supports remote management of multiple systems over a TCP/IP based network
- Provides a graphical representation of Fusion-MPT storage elements
- Displays device and adapter hierarchy as a device tree
- Implements a highly portable user interface
- Provides a context-sensitive online Help system
- Launches the LSI Logic CIM Browser as a stand-alone application
- Launches the LSI Logic CIM Provider automatically

6.1.2 Installation and System Requirements

The installation and system requirements for the CIM installation are:

- For Windows systems:
 - Windows NT version 4.0, service pack 6 or above
 - Windows 2000, service pack 2 or above
 - Windows XP
 - Windows Server 2003
 - Windows .NET
- For Linux systems:
 - SuSE Linux version 7.0 or 8.0
 - SuSE Linux Enterprise Server version 7
 - Red Hat Linux versions 7.3, 8.0, or 9.0
 - Red Hat Advanced Server version 2.1
- 20 Mbytes of available disk space for Windows installations;
40 Mbytes of available disk space for Linux installations
- TCP/IP protocol installed and enabled
- Video card support for at least 256 colors
- Desktop area of 800 x 600 pixels or greater (1024 x 768 pixels recommended)

On Linux-based systems, LSI Logic recommends viewing under KDE or GNOME. For installation instructions, see [Section 6.3, “CIM Installation Instructions for Windows,”](#) page 6-8, and [Section 6.4, “CIM Installation Instructions for Linux,”](#) page 6-9.

6.2 CIM Browser Window Description

This section describes the CIM Browser window.

6.2.1 Connect Menu Options

The Connect menu is in the upper left corner of the CIM Browser window. [Table 6.1](#) describes the Connect menu options.

Table 6.1 Connect Menu Option Description

Option	Description
Connect	Connects the computer running the CIM Browser to a single computer that is running the CIM Provider. Enter either the IP address or the host name of the computer to which you want to connect.
Connect to Local Host	Connects the CIM Browser to the local host.
Advanced Connections	Connects the computer running the CIM Browser to multiple systems that are running the CIM Provider. When you select this window, the CIM Browser displays an “Advanced Connection” window. The Advanced Connection window allows you to select a range of IP addresses for the CIM Browser to scan using either the “IP Address” option or the “IP Subnet” option. The “Allow Selection of Systems” option allows the user to select manually which CIM-enabled system to manage. The “Connect to all Addresses” option automatically connects the CIM Browser to all systems that have an enabled CIM Provider. If there are more than 50 systems to scan, the CIM Browser displays a message telling how long it will take to scan those systems.
Disconnect	Allows you to disconnect from the host. This option is only available when you click on the host in the host tree.

6.2.2 Hardware Device Tree Options

The hardware device tree provides an easily navigated list of the devices being monitored by the CIM Browser. You click on a device in the tree to view information about the device. [Figure 6.1](#) shows the structure of the hardware device tree for SCSI, SCSI with IM/IS, and FC systems. [Table 6.2](#) describes each level in the device trees.

The status of each device is indicated by a green, yellow, or red status icon that appears in the right-hand window.

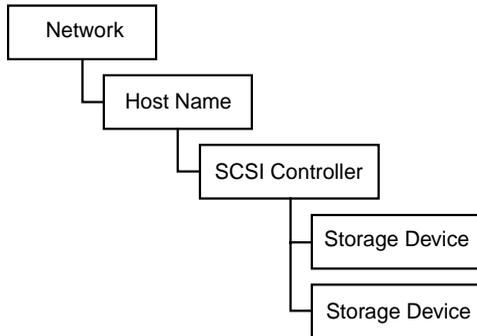
- A green status icon indicates that the device is functioning properly.

- A yellow *exclamation mark* icon indicates that the device has encountered a problem and its status is shown in the “status” text label. A yellow *question mark* icon indicates that the device has encountered a problem and its status cannot be determined.
- A red status icon indicates that the device has encountered a severe error condition.

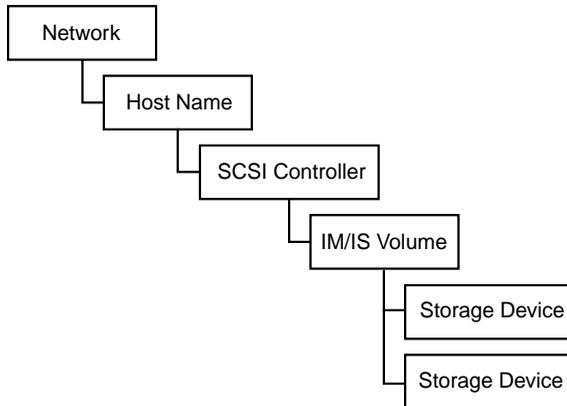
On the IM/IS Volume and Physical Disk levels, the CIM Browser displays a floppy disk icon if the media is present. If the media is not present, as could be the case with removable media such as CD-ROMs or tape drives, the CIM Browser displays a floppy drive with an “X.”

Figure 6.1 Hardware Device Tree Structures

a) SCSI Hardware Device Tree



b) SCSI with IM/IS Hardware Device Tree



c) FC Device Tree

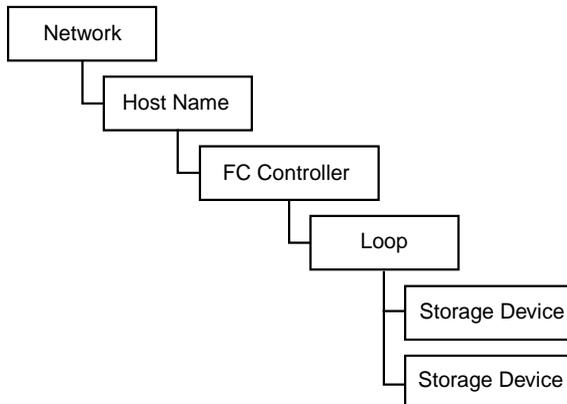


Table 6.2 Device Tree Description

Device Tree Level	Description
Network	This level displays the CIM Browser welcome window.
Host Name	<p>This level displays the name of the system that the CIM Provider is running on and that the CIM Browser is monitoring. The CIM Browser displays a window that provides information about the system that the CIM Provider is running on.</p> <p>The “System Connection” option usually reads “ok.” However, if the system is too busy to respond, this option reads “Provider is busy” and the devices connected to the system do not appear in the device tree.</p>
FC or SCSI Controller	This level displays information concerning the controller. The CIM Browser displays a separate entry for each channel.
IM/IS Volume	<p>This level describes the logical IM or IS volume. The CIM Browser includes this level in the device tree only if an IM or IS volume is present on the monitored system.</p> <p>The Status field describes the status of the IM or IS volume: Ok means that the volume is completely operational. Unknown means that there is problem with the volume that the CIM Browser cannot identify. Failed means that the volume encountered a severe error and the data could not be recovered.</p> <p><i>IM Volumes Only:</i> The “Redundancy Status” field describes the status of the IM volume redundancy: Fully Redundant means that the IM volume is functioning properly and that the data is fully redundant. In Degraded Mode usually means that a single disk has failed. Redundancy is Lost means that the redundant data is lost. A possible cause is the failure of multiple disks.</p> <p>The “Additional Redundancy Information” field options are Resync in progress or Resync not in progress. When resynchronization is in progress, the CIM Browser displays a status bar showing the approximate percent completion and an estimate of the time until completion.</p>
Loop	This level provides information on the FC loop configuration.
Physical Disk	This level provides information on the physical disks in the system. Physical disks have a “Physical Disk State” field with information about the status of the physical disk.
Storage Device	This field provides information on the storage device.

6.3 CIM Installation Instructions for Windows

This section describes a Windows installation of the CIM Solution.

6.3.1 Installing the CIM Solution

Follow these steps to install the CIM Solution

1. Double-click on the `install.htm` program that you downloaded from the LSI Logic web site.

A “Security Warning” window appears. You must grant additional privileges to the InstallAnywhere so that it can complete the installation.

2. Click on **Yes**.
3. Click on **Start Installer for Windows...**

InstallAnywhere begins.

4. Follow the instructions and steps in InstallAnywhere.

To verify the installation of the CIM Provider, click on the Start button and select **Settings-->Control Panel-->Services**. Confirm that the CIM Provider is listed with a status of *Started*. To verify the installation for the CIM Browser, launch the application from the Start Menu.

6.3.2 Uninstalling the CIM Solution

To uninstall the CIM Solution, follow these steps:

1. Exit from the LSI Logic CIM Browser.
2. Click on the **Start** button.
3. Select **Settings-->Control Panel-->Add/Remove Programs**.
4. Remove the LSI Logic CIM Solution program to uninstall it.

6.4 CIM Installation Instructions for Linux

This section describes a Linux installation of the CIM Solution.

6.4.1 Installing the CIM Solution

Follow these steps to install the CIM Solution:

1. Unzip the CIM package after downloading it.
2. Double-click on the `install.htm` program that you downloaded from the LSI Logic web site.

A "Security Warning" window appears. You must grant additional privileges to the InstallAnywhere to complete the installation.

3. Click on **Yes**.
4. Click on **Start Installer for Linux...**

InstallAnywhere begins.

5. Follow the instructions and steps in InstallAnywhere.

If this button does not appear in the browser, launch a terminal window and type `./install.bin` from the directory that accesses the CD-ROM.

To verify the installation for the CIM Browser, launch the application from `/usr/local/bin/LSICim` prompt by typing: `./CIMLSIBrowser`

6.4.2 Uninstalling the CIM Solution

To uninstall the CIM Solution, follow these steps:

1. Exit the CIM Browser.
2. Change the directory by typing:

```
cd /usr/local/bin/LSICim/UninstallerData
```
3. At the command prompt, type:

```
./Uninstall_CIM_Solution
```
4. Click the **Uninstall** button in the InstallAnywhere window.

Appendix A

Using the DOS-Based Configuration Utility

This appendix describes how to use the DOS-based configuration utility (CU) to create Integrated Mirroring (IM) and Integrated Striping (IS) volumes. Although the same utility is used to set up both IM and IS volumes, the two kinds of configuration are explained in separate sections (A.4 and A.5). This is done because IM configuration and IS configuration use somewhat different command line options and have different default settings.

The appendix includes these topics:

- [Section A.1, “Configuration Overview”](#)
- [Section A.2, “Running the DOS-Based CU”](#)
- [Section A.3, “Rules for Command Line Options”](#)
- [Section A.4, “Configuring an IM Volume with the DOS-Based CU”](#)
- [Section A.5, “Configuring an IS Volume with the DOS-Based CU”](#)

Note: The DOS-based CU is intended for use *only in the manufacturing environment*. End users can use the BIOS-based configuration utility to create IM and IS volumes. (See [Chapter 3, “Setting Up Integrated Mirroring”](#) and [Chapter 5, “Setting Up Integrated Striping”](#).)

A.1 Configuration Overview

The following general information applies to creating both IM and IS volumes with the DOS-based CU.

- Only one IM or IS volume can be created per Fusion-MPT controller.
- An IM or IS volume can have two to six disks. (An IM volume can have from two to five disks if an optional hot spare disk is used.)

- Member disks of an IM or IS volume must be connected to the same channel of the same Fusion-MPT controller, and the controller must be in the BIOS boot order.
- Member disks must be non-removable, single-LUN disks that support 512-byte sectors, wide synchronous transfers, Qtag'd I/Os, and a unit serial number. The disks must support SMART, and they must be minimally compliant with the SCSI-2 standard.
- Member disks can be of different sizes, but the smallest disk determines the "logical" size of each disk in the volume. The excess space of larger member disks is not used.
- The usable disk space for each volume member disk is adjusted down to leave room for Meta data. Usable disk space may be further reduced to maximize the ability to interchange disks in the same size classification.
- Default settings are provided for all modifiable fields. (See [Section A.4.3, "IM Parameter Defaults for Fusion-MPT SCSI Controllers,"](#) page A-7 and [Section A.5.3, "IS Parameter Defaults for Fusion-MPT SCSI Controllers,"](#) page A-13.)

A.2 Running the DOS-Based CU

The name of the DOS-based CU executable file is `mptpsir.exe`. Follow these steps to run the utility:

Note: You *cannot* run `mptpsir` in a virtual DOS window from within Windows.

1. Copy `mptpsir.exe` to a DOS bootable diskette that also contains `dos4gw.exe`.
2. Insert the diskette into drive "a:" and boot the system to the DOS prompt `a:\>`
3. Type `mptpsir` followed by the desired command line options, then press Enter.

After it executes the command line options, the DOS-based CU displays status messages that indicate whether the configuration completed successfully.

The DOS-based CU can use DOS input redirection to read configuration commands from a file specified on the command line. It can also use DOS output redirection to write status messages to a file instead of displaying them on the monitor.

A.3 Rules for Command Line Options

Here are some general rules for using the DOS-based CU command line options:

- Each command line must start with `mptpsir` and must include at least one option.
- No spaces are allowed between an option and an option value.
- A slash (/) cannot be used for an option value.
- The `/i` option must be used for DOS input redirection, and the `/o` option must be used for DOS output redirection. When using DOS input redirection, command line options must be entered in a file as a contiguous block of text, with no inserted carriage returns.
- The same option cannot be disabled and enabled on the same command line.
- The delete (`/d`) option cannot be used at the same time as an option to create a volume.

A.4 Configuring an IM Volume with the DOS-Based CU

There are several ways to create an IM volume with the DOS-based CU (Create options are explained in Section [A.4.1.1](#), and specific command line examples are included in [Section A.4.4, "Examples of Command Line Usage," page A-8](#)):

- Have the CU create the volume automatically (`/a` option).
- Create a "custom" two-disk mirrored volume by specifying a SCSI controller (`/c` option) and the SCSI target IDs of two or three disks (`/t` option for each disk - the optional third disk is the hot spare).

- Create a “custom” three- to six-disk mirrored volume, including an optional hot spare (**/rte** option, followed by **/c** for SCSI controller and **/t** for each disk).

Note: You must list the **/rte** option first to indicate that the volume will have three or more mirrored disks.

A.4.1 Command Line Options

This section lists and explains all the DOS-based CU command line options that are used to create, delete, and reconfigure an IM volume.

See [Section A.4.4, “Examples of Command Line Usage,” page A-8](#), for examples of how to create various IM configurations.

A.4.1.1 Create Options

- /c** – SCSI controller number. Same as boot adapter order number. You can get the order number from the MPTBIOS banner that appears during boot. The controller number (order number) appears in the HBA column.
- /t** – SCSI target ID. For a three-disk configuration, first **/t** is primary disk, second is secondary disk, third is optional hot spare. The hot spare is always specified as the last **/t** option.
- /hs** – Hot spare. The value of the last **/t** option specified is the SCSI ID designated as the hot spare.
- /rte** – Raid type. Use this option only if you are creating a mirrored volume with three to six mirrored disks (or three to five mirrored disks and a hot spare disk). Do *not* use this option if you are creating a mirrored volume with *two* mirrored disks and an optional hot spare disk.
- /sz** – IM volume size (Mbytes), up to 2097151 Mbytes
- /so** – Volume settings override, 1 to 4 hex digits. This option applies to the current volume only. See [Section A.4.1.7, “Volume Setting Definitions.”](#)

/ad – Action data, 1 to 4 hex digits. This option changes the default create volume behavior. The Action data definitions are:
0x0001 - Do not initialize disks when volume is created.
0x0002 - Low-level initialization. Zero initialize beginning and end of disks in volume.

/a – Automatic create. Creates an IM volume with one primary disk and one secondary mirrored disk, using disks on the lowest numbered Fusion-MPT controller with at least two disks that don't have defined partitions. If more than two disks are found without partitions on a given controller, the two disks with the lowest SCSI IDs are used. The lowest SCSI ID of the selected disks is used for the IM volume ID. (This option does *not* create a hot spare disk.)

/ss – Skip synchronization during IM volume creation

A.4.1.2 Erase Disk Options

/e – Erase a specified disk, using the **/t** and **/c** options

/eall – Erase all disks on the desired SCSI bus, using the **/c** option

A.4.1.3 DOS Redirection Options

/i – Use DOS Standard In redirection

/o – Use DOS Standard Out redirection

A.4.1.4 Existing Volume Options

/rd – Disable resynchronization. Disables resynchronization by taking the secondary disk offline. This operation remains in effect until the system is rebooted. If the system is rebooted, a resynchronization will start. So this option must be used together with the No Reboot option (**/nr**).

/re – Enable resynchronization. Brings the secondary disk back online, which starts a resynchronization.

/d – Delete mirrored volume. If deleting a hot spare from the volume, use the **/t** option.

A.4.1.5 Changing Defaults for Newly Created Volumes

- /vi** – Vendor Identification (logical drive inquiry data) - 8 ASCII characters required
- /pi** – Product Identification (logical drive inquiry data) - 16 ASCII characters required
- /pr** – Product Revision (logical drive inquiry data) - 4 ASCII characters required
- /io** – Offset within inquiry data to start saving in non-volatile memory for later access. Two offsets can be specified, but each instance of this option requires the **/is** option. One possible use of this option is to save FRU data for the drive.
- /is** – Size, in bytes, to save in non-volatile memory of inquiry data from offset given in the **/io** option.
- /vs** – Set the VolumeSettings parameter (1- to 4-digit hex number). See [Section A.4.1.7, “Volume Setting Definitions.”](#)

A.4.1.6 Miscellaneous Options

- /?** – Display available Help options
- /h** – Display available Help options
- /nr** – No automatic reboot after exit. Do not access disks connected to LSI SCSI host adapters until after reboot, except for running this utility again.

A.4.1.7 Volume Setting Definitions

One hexadecimal number replaces the settings of all the options below when using either the **/vs** or **/so** options.

0x0001 – Write Caching Enabled

0x0002 – Take Physical Drive Off-Line on SMART Error

0x0004 – Autoconfigure Hot-Swap Drives

0x0008 – High Priority Resync Enabled

0x0010 – Enable firmware to replace last two bytes of Product ID in inquiry data when an inquiry is sent to the IM volume's logical drive.

A.4.2 Making Manufacturing Settings Read Only

You can make the manufacturing settings read-only by changing the PageType field for the Fusion-MPT Configuration Page, Manufacturing Page 4.

Important: Making this page read-only disables the **/vi**, **/pi**, **/pr**, **/io**, **/is**, and **/vs** options. See the documentation for the nvdata program in the *Fusion-MPT Device Management User's Guide* to find out more about changing the PageType field.

A.4.3 IM Parameter Defaults for Fusion-MPT SCSI Controllers

- Disk Write Cache DISABLED
- Volume ENABLED
- Disk Offline when SMART error DISABLED
- Auto-Configure Hot-Swap Drives ENABLED
- High Priority Resynchronization DISABLED
- Mirror Resynchronization ENABLED
- Product ID Suffix ENABLED
- No Inquiry Data saved from IM disks
- Controller 0
- Size defaults to maximum allowable by disks selected, minus a disk coercion factor. The disk coercion factor allows disks of different sizes within the same disk class to work for a mirrored volume.
- Logical Drive Vendor ID: LSILOGIC
- Logical Drive Product ID: 1030 IM
- Logical Drive Revision ID: 0x1000

A.4.4 Examples of Command Line Usage

This section shows how various DOS-based CU command line options are used for mirrored volumes.

A.4.4.1 Creating a Custom Mirrored Volume

At least two targets must be listed with the `/t` option. Other options can be used on the same command line as the create options, to override the defaults. Here are some examples:

Example 1 – Configure a mirrored pair of disks on adapter 1 with the primary disk at SCSI ID 1, the secondary disk at SCSI ID 4, and a hot spare at SCSI ID 5.

```
mptpsir /c1 /t1 /t4 /t5
```

Example 2 – Configure the IM volume the same as in Example 1, but limit the size to 1000 Mbytes and don't reboot on exit.

```
mptpsir /c1 /t1 /t4 /t5 /sz1000 /nr
```

Example 3 – Configure the IM volume with four disks on adapter 1 at SCSI IDs 1, 3, 4, and 5:

```
mptpsir /rte /c1 /t1 /t3 /t4 /t5
```

Example 4 – Configure mirrored disks with the characteristics specified in `inputfile`. (The command line options in `c:\inputfile` must be in a contiguous block of text with no inserted carriage returns.)

```
mptpsir /i < c:\inputfile
```

A.4.4.2 Deleting a Mirrored Volume or a Hot Spare

Example 1 – Delete the mirrored volume.

```
mptpsir /d
```

Example 2 – Delete the hot spare disk at SCSI ID 5 without deleting the volume.

```
mptpsir /d /t5
```

A.4.4.3 Erasing Disk(s)

Example 1 – Erase the disk with SCSI ID 5 on Controller 1.

```
mptpsir /c1 /t5 /e
```

Example 2 – Erase all disks on Controller 2.

```
mptpsir /c2 /eall
```

A.4.4.4 Replacing Manufacturing Defaults

Example 1 – Use OEM-specific vendor, product, and revision information for the logical drive ID of the mirrored volume.

```
mptpsir /viACME HBA /piMirrored Drive /pr0100
```

Example 2 – Replace the volume settings with the following characteristics:

- Set write caching to Disabled (0x0000)
- Don't take drives offline on SMART error (0x0000)
- Autoconfigure the hot-swapped drives (0x0004)
- Use low-priority synchronization (0x0000)
- Enable the Product ID suffix field (0x0010)

```
mptpsir /vs0014
```

For more information about volume settings, see [Section A.4.1.7, "Volume Setting Definitions,"](#) page A-6.

A.5 Configuring an IS Volume with the DOS-Based CU

There are two basic ways to create an IS volume with the DOS-based CU (Create options are explained in Section A.5.1.1, and specific command line examples are included in [Section A.5.4, “Examples of Command Line Usage,” page A-13](#)):

- Have the CU create the volume automatically (**/a** option).
- Create a “custom” two- to six-disk striped volume by specifying a SCSI controller (**/c** option) and the SCSI target ID of each member disk (**/t** option for each disk).

Note: The stripe size for IS volumes is fixed at 64 Kbytes.

A.5.1 Command Line Options

This section lists and explains all the DOS-based CU command line options that are used to create, delete, and reconfigure an IS volume.

See [Section A.5.4, “Examples of Command Line Usage,” page A-13](#), for examples of how to create various IS configurations.

A.5.1.1 Create Options

- /c** – SCSI controller number. Same as boot adapter order number. You can get the order number from the MPTBIOS banner that appears during boot. The controller number (order number) appears in the HBA column.
- /t** – SCSI target ID. Use a separate **/t** to specify each disk in the IS volume.
- /rts** – Raid Type = striped. You must use the **/rts** option when creating an IS volume.
- /sz** – IS logical drive size (Mbytes), up to 2097151 Mbytes
- /so** – Volume settings override, 1 to 4 hex digits. This option applies to the current volume only. See [Section A.5.1.7, “Volume Setting Definitions.”](#)

/ad – Action data, 1 to 4 hex digits. This option changes the default create volume behavior. The Action data definitions are:
0x0001 - Do not initialize disks when volume is created.
0x0002 - Low-level initialization. Zero initialize beginning and end of disks in volume.

/a – Automatic create - Creates an IS volume, using disks on the lowest numbered Fusion-MPT controller with at least two disks that don't have defined partitions. Up to 6 disks are automatically selected for the IS volume. The lowest SCSI ID of the selected disks is used for the IS volume ID.

A.5.1.2 Erase Disk Options

/e – Erase a specified disk, using the **/t** and **/c** options

/eall – Erase all disks on the desired SCSI bus, using the **/c** option

A.5.1.3 DOS Redirection Options

/i – Use DOS Standard In redirection

/o – Use DOS Standard Out redirection

A.5.1.4 Existing Volume Options

/d – Delete striped configuration

A.5.1.5 Changing Defaults for Newly Created Volumes

/vi – Vendor Identification (logical drive inquiry data) - 8 ASCII characters required

/pi – Product Identification (logical drive inquiry data) - 16 ASCII characters required

/pr – Product Revision (logical drive inquiry data) - 4 ASCII characters required

/io – Offset within inquiry data to start saving in non-volatile memory for later access. Two offsets can be specified, but each instance of

this option requires the **/is** option. One possible use of this option is to save FRU data for the drive.

/is – Size, in bytes, to save in non-volatile memory of inquiry data from offset given in the **/io** option.

/vs – Set the VolumeSettings parameter (1- to 4-digit hex number). See [Section A.5.1.7, “Volume Setting Definitions.”](#)

A.5.1.6 Miscellaneous Options

/? – Display available Help options

/h – Display available Help options

/nr – No automatic reboot after exit. Do not access disks connected to LSI SCSI host adapters until after reboot, except for running this utility again.

A.5.1.7 Volume Setting Definitions

One hexadecimal number replaces the settings of all the options below when using either the **/vs** or **/so** options.

0x0001 – Write Caching Enabled

0x0002 – Take Physical Drive Off-Line on SMART Error

0x0010 – Enable firmware to replace last two bytes of Product ID in inquiry data when an inquiry is sent to the IR volume's logical drive.

A.5.2 Making Manufacturing Settings Read Only

You can make the manufacturing settings read-only by changing the PageType field for the Fusion-MPT Configuration Page, Manufacturing Page 4.

Important: Making this page read-only disables the **/vi**, **/pi**, **/pr**, **/io**, **/is**, and **/vs** options. See the documentation for the nvdata program in the *Fusion-MPT Device Management User's Guide* to find out more about changing the PageType field.

A.5.3 IS Parameter Defaults for Fusion-MPT SCSI Controllers

- Disk Write Cache ENABLED
- Volume ENABLED
- Disk Offline when SMART error DISABLED
- Product ID Suffix ENABLED
- No Inquiry Data saved from IS disks
- Controller 0
- Size defaults to maximum allowable by disks selected, minus a disk coercion factor. The disk coercion factor allows disks of different sizes within the same disk class to work for a striped logical drive.
- Logical Drive Vendor ID: LSILOGIC
- Logical Drive Product ID: 1030 IS
- Logical Drive Revision ID: 0x1000

A.5.4 Examples of Command Line Usage

This section shows how various DOS-based CU command line options are used for striped volumes.

A.5.4.1 Creating a Custom Striped Logical Drive

At least two targets must be listed with the **/t** option. Other options can be used on the same command line as the create options, to override the defaults. Here are some examples:

Example 1 – Configure a striped volume with three disks on adapter 1, using the disks at SCSI IDs 1, 4, and 5.

```
mptpsir /rts /c1 /t1 /t4 /t5
```

Example 2 – Configure the IS logical drive the same as in Example 1, but limit the size to 1000 Mbytes and don't reboot on exit.

```
mptpsir /rts /c1 /t1 /t4 /t5 /sz1000 /nr
```

Example 3 – Configure a striped volume with the characteristics specified in `inputfile`. (The command line options in `c:\inputfile` must be in a contiguous block of text with no inserted carriage returns.)

```
mptpsir /rts /i < c:\inputfile
```

A.5.4.2 Deleting an IS Volume

Example 1 – Delete the IS volume.

```
mptpsir /rts /d
```

A.5.4.3 Erasing Disk(s)

Example 1 – Erase the disk with SCSI ID 5 on Controller 1.

```
mptpsir /rts /c1 /t5 /e
```

Example 2 – Erase all disks on Controller 2.

```
mptpsir /rts /c2 /eall
```

A.5.4.4 Replacing Manufacturing Defaults

Example 1 – Use OEM-specific vendor, product, and revision information for the logical drive ID of the IS logical drive.

```
mptpsir /viACME HBA /piStriped Drive /pr0100
```

Customer Feedback

We would appreciate your feedback on this document. Please copy the following page, add your comments, and fax it to us at the number shown.

If appropriate, please also fax copies of any marked-up pages from this document.

Important: Please include your name, phone number, fax number, and company address so that we may contact you directly for clarification or additional information.

Thank you for your help in improving the quality of our documents.

Reader's Comments

Fax your comments to: LSI Logic Corporation
Technical Publications
M/S E-198
Fax: 408.433.4333

Please tell us how you rate this document: *Integrated RAID User's Guide*.
Place a check mark in the appropriate blank for each category.

	Excellent	Good	Average	Fair	Poor
Completeness of information	_____	_____	_____	_____	_____
Clarity of information	_____	_____	_____	_____	_____
Ease of finding information	_____	_____	_____	_____	_____
Technical content	_____	_____	_____	_____	_____
Usefulness of examples and illustrations	_____	_____	_____	_____	_____
Overall manual	_____	_____	_____	_____	_____

What could we do to improve this document?

If you found errors in this document, please specify the error and page number. If appropriate, please fax a marked-up copy of the page(s).

Please complete the information below so that we may contact you directly for clarification or additional information.

Name _____ Date _____
Telephone _____ Fax _____
Title _____
Department _____ Mail Stop _____
Company Name _____
Street _____
City, State, Zip _____