USER'S GUIDE

Fusion-MPT™
Device Management

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Version 1.2

LSI LOGIC®

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This document describes version 1.2 of LSI Logic Corporation's Fusion-MPT Device Management product and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

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http://www.lsilogic.com/contacts/na_salesoffices.html

Preface

This book is the primary reference for using the Fusion-MPT™ (Message Processing Technology) firmware and device drivers. This user's guide is intended to explain how to install and configure the Fusion-MPT product, which encompasses Fusion-MPT firmware architecture, SCSI hardware architecture, Fibre Channel (FC) hardware architecture, and the operating system level device drivers that support these architectures.

Audience

This book assumes you have some familiarity with microprocessors and related support devices. The people who benefit from this book are:

- OEM customers
- End users

Organization

This document has the following chapters:

- Chapter 1, **Fusion-MPT Device Management Product**, provides general information about the Fusion-MPT device management product.
- Chapter 2, **Flash and NVDATA Utilities for SCSI Devices**, provides information on the Flash and NVDATA utilities.
- Chapter 3, **SCSI BIOS and Configuration Utility**, describes the Fusion-MPT SCSI BIOS and Configuration Utility (CU) for 32-bit systems.
- Chapter 4, **SCSI EFI and Configuration Utility**, describes the Fusion-MPT EFI and CU for 64-bit systems.

- Chapter 5, **Fibre Channel Firmware and Configuration Utility**, provides information about the Flash Configuration Utility for installing the Fibre Channel firmware.
- Chapter 6, **Fibre Channel BIOS**, provides installation instructions for the Fibre Channel BIOS.
- Chapter 7, **Windows Driver Installations**, provides instructions for installing the Fusion-MPT device driver onto Window-based system. It provides detailed instructions for Windows 98, Windows Me, Window XP, Windows NT 4.0, Windows 2000, and Windows.NET.
- Chapter 8, **UNIX Operating System Device Drivers**, provides instructions for installing the Fusion-MPT device driver into Unix-based operating system. It includes detailed instructions for Sparc 8, Solaris, OpenUnix, UnixWare, SCO Unix, and Linux.
- Chapter 9, **Linux Integrated Mirroring Configuration Utility**, describes the Linux Integrated Mirroring™ (IM) Configuration utility (limcu).
- Chapter 10, **CIM Solution**, provides information on the Common Information Model (CIM) Solution for monitoring systems.

Related Publications

LSI53C1030 Multifunction Dual Channel Ultra320 SCSI to PCI-X Controller Technical Manual, Document No. DB14-000156-03

LSI53C1020 Single Channel Ultra320 SCSI to PCI-X Controller Technical Manual, Document No. DB14-000176-02

LSI53C320 Ultra320 SCSI Bus Expander Technical Manual, Document No. DB14-000163-01

LSIFC929 Dual Channel Fibre Channel I/O Processor Technical Manual, Document Number DB14-000135-02

LSIFC919 Single Channel Fibre Channel I/O Processor Technical Manual, Document No. DB14-000151-01

LSIFC909 Fibre Channel I/O Processor Technical Manual, Document No. DB14-000150-01

Ultra320 SCSI to PCI-X Host Board Adapter User's Guide, Document No. DB15-000192-00

2 GBits/s Fibre Channel to PCI Host Adapters User's Guide, Document No. DB15-00182-01

Conventions Used in This Manual

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.

Acronyms are specified with CAPITAL letters.

Revision History

Revision	Date	Remarks
Version 1.2	6/2002	Added the SCSI Flash and NVDATA utilities chapter. Added the CIM Solution chapter. Added the Linux IM CU chapter. Combined the Unix OSes into a single chapter. Combined the Windows OSes into a single chapter. Added the Linux and Linux CU. Added the SCSI EFI and Configuration Utility chapter. Updated the Fibre Channel BIOS chapters. Updated SCSI CU and BIOS. Expanded the related publications list. Updated the Front matter to correspond with the current template. Reapplied templates with updated variables for Version 1.2.
Preliminary Version 1.0	8/2001	Initial release of document.

Chapter 1
Fusion-MPT Device Management Product

This chapter provides general information about the Fusion-MPT device management technology. This chapter contains the following sections:

1.1 Fusion-MPT Firmware, BIOS, and Device Drivers

LSI Logic provides a common device-level interface for Fusion-MPT compatible devices, which use a single, binary device driver for both SCSI and Fibre Channel (FC) devices. The supported LSI Logic devices are the LSI53C1030, LSI53C1020, LSIFC929, LSIFC919, LSIFC909 controllers and their supported host adapters. This set of controllers represents the LSI Logic Common Architecture. This guide documents how to install the Fusion-MPT firmware, BIOS, and device drivers.

1.2 Overview

The Fusion-MPT architecture bases its architecture on industry standard ARM® processor technology and supports Ultra320 SCSI and FC protocols. Fusion-MPT architecture encompasses the LSI Logic firmware architecture, the LSI Logic SCSI and FC hardware architecture, and the operating system device drivers.

Fusion-MPT technology supports the Intel 32-bit and 64-bit architecture and provides 64-bit PCI/PCI-X interfaces for high host side performance. Fusion-MPT technology is readily extensible across different physical interfaces, such as SCSI and FC, as well as emerging technologies such as InfiniBand and Serial ATA.

The Fusion-MPT technology provides the highest performance I/O architecture available by encapsulating all the information necessary for I/O controllers to autonomously complete an I/O. Additional benefits include reduced host CPU utilization and a decreased number of host interrupts per I/O to streamline I/O transactions. It also provides host software binary compatibility between the LSI Logic FC, Ultra320 SCSI products, and future interface controller products.

1.3 Description

The Fusion-MPT design supports a single binary device driver, intelligent firmware, and various hardware cores.

1.3.1 Single Binary Device Driver

Fusion-MPT technology uses a single, binary, operating system device driver to support both FC and SCSI. This technology provides common drivers for Windows NT 4.0, Windows 2000, Windows Millennium, Windows 98, Solaris, UnixWare, Open Unix, and Linux operating systems, thus reducing system integration and certification effort.

LSI Logic uses the same device driver filename (`SYMMPI.SYS`) for different Windows operating systems. The driver files are packaged either in separate subdirectories based on the Windows operating system or on different driver diskettes. You can also download current drivers from the LSI Logic web site at `http://www.lsilogic.com`.

1.3.2 Fusion-MPT Firmware

The Fusion-MPT firmware presents a multiprotocol service layer. The firmware isolates the host drivers from the hardware and provides a high-level message passing interface (MPI) to the host drivers. The firmware manages all phases of an I/O request and optimizes interrupt management for the system. For FC systems, the firmware also manages all FC-2 through FC-4 services, which minimizes the amount of FC-unique services required with the host driver.

1.3.3 Fusion-MPT Hardware

The Fusion-MPT hardware encapsulates various technologies that deliver new levels of performance. Fusion-MPT FC products utilize GigaBlaze® transceivers and AMBA bus architecture. Fusion-MPT SCSI products utilize LVDlink™ transceivers, SureLINK™ Domain Validation, and an AHB bus architecture. Furthermore, the Fusion-MPT interface isolates the hardware from the host, making hardware upgrades transparent to the host.

Chapter 2
Flash and NVDATA Utilities for SCSI Devices

This chapter explains the flash utility and the NVData utility. This chapter contains the following sections:

2.1 Flash Utility

This section provides information about the DOS-based LSI Logic flash utility, which downloads firmware and BIOS images to boards using the LSI53C1030 or LSI53C1020. The flash utility:

- Supports host adapter selection for updating the Flash ROM.
- Provides a means to identify the firmware or BIOS image version on the adapter or residing in a file.
- Provides for complete Flash ROM erasure.
- Provides the means to modify ASCII banner information in a BIOS image prior to downloading to an adapter or for writing back to a file.
- Supports command line execution.

This utility allows the user to update the Fusion-MPT firmware and/or SCSI BIOS. The board must have an on-board Flash ROM to use this utility.

2.1.1 Running the Flash Utility

The utility's executable is FLSH1030.EXE. It requires the DOS extender, DOS4GW.EXE. LSI Logic strongly recommends placing both files on a DOS bootable diskette and running the utility from this diskette. You can run the flash utility from a hard drive. However, the hard drive cannot connect with a board that you intend to update, and the DOS4GW extender must reside in the same directory as the flash utility. To run the flash utility:

Step 1. Insert the flash utility diskette into the A: drive.

Step 2. Boot the system to the A:\> prompt.

Step 3. Type FLSH1030 and press Enter.

The utility starts and displays its main menu.

2.1.2 Menu Options

The main menu allows the user to select the SCSI device that performs the selected tasks. The utility displays two entries for dual channel. Only one of the paths must be chosen; the utility reflects the data to the second SCSI channel. The main menu screen appears as:

```
 Choice   Vendor ID   Device ID     Bus          Device
-------  -------      -------      -------      -------
   1     0x1000        0x0030       0x3          0x10
         LSI Logic, Inc. LSI53C1030 Ultra320 SCSI

   2     0x1000        0x0030       0x3          0x11
         LSI Logic, Inc.    LSI53C1030 Ultra320 SCSI

   3     Refresh

                 Which PCI chip (0 to quit)?
```

After you select a chip, the utility displays another menu list:

```
FLASH

        a - Identify

        b - Download Flash

        c - Upload Current Flash to a File

        d - Erase Flash

Misc.

        z - Select PCI Chip

        q - Quit
```

a **Identify**

The Identify option displays the version number of the firmware or BIOS on the selected adapter. If multiple BIOS images are present, this option returns the version of the Fusion-MPT BIOS. This option can also provide the version number of the firmware and BIOS image files. To do so, input the filename of the image to check.

b **Download Flash**

The Download Flash option provides the user with choices for downloading images to the Flash ROM. Downloading of the firmware and BIOS images are separate choices and require the corresponding image file name as an input. This utility supports Fusion-MPT BIOS download files that contain multiple images concatenated together. To enable a streamlined process when downloading identical firmware and BIOS images, you can use a complete image as the input file for a firmware download.

This utility enables you to alter the ASCII banner string in the BIOS image. You can do this prior to downloading to the adapter, or you can write the altered image to a file. The utility prompts the user for the new banner contents and informs the user of the maximum allowable length. After the banner has been altered in an image, that image cannot be the input for this operation.

c **Upload Current Flash to a File**
The Upload option uploads the Flash ROM contents and writes them to a user-specified file. This image contains the firmware image, BIOS image, and any unused areas of the Flash ROM. This utility cannot separate the firmware and BIOS images. The image size is 512 Kbytes. Truncated upload images can result if the destination disk is not large enough to hold the entire upload image.

d **Erase Flash**
The Erase option erases the Flash ROM on the selected adapter.

2.1.3 Command Line Options

The flash utility supports the following command line options:

-/a **Update All Boards**
This option causes the flash utility to update the images on all the boards with the images that the /b or /f options specify. This option causes the utility to ignore the /d option, if it is entered.

-/b:filename **Download BIOS Image**
This option causes the flash utility to download the BIOS image given by “filename.” The flash utility ignores this option if the user omits the filename.

-/c:filename **Concatenate BIOS Images**
This option must precede the /b option. This option causes the flash utility to concatenate the image specified by “filename” with the image specified by the /b option. The concatenation occurs before the utility downloads the resulting image. The utility ignores this option if the user omits the filename.

-/d **Select Chip**
This option enables the user to select the current chip from a menu. The utility uses the selection to process the command line arguments that follow this command.

-/e **Erase Flash ROM**
This option causes the flash utility to erase the Flash ROM.

-/f:filename **Download Firmware Image**

This option causes the flash utility to download the firmware image given by “filename.” The utility ignores this option if the user omits the filename.

-/m **Multiple Flash Images**

This option indicates that the BIOS image specified by the /b option contains multiple images. This option must precede the /b option. Do not use this option in combination with the /c option.

-/o:filename **Redirect BIOS Image Output**

This option causes the flash utility to redirect the modified BIOS image to a file. The utility modifies fields in a new BIOS image to reflect the chip type. If the user specifies the /o and /b options, the utility modifies the image that the /b option specifies for the chip type and then writes the modified image to the file that the /o option specifies. The utility does not download the image to the board. The utility ignores this option if the user omits the filename or enters the /a option. This option must precede the /b option.

-/? **Help**

This options causes the flash utility to display the help screen.

2.2 NVDATA Utility

This section describes the NVDATA.EXE utility, version 1.01.00. The NVDATA utility allows the user to test and write default NVData to the serial EEPROM on Fusion-MPT SCSI devices. The NVDATA utility enables each serial EEPROM to support up to four adapters. Because dual channel adapters share a single serial EEPROM, a dual channel adapter is considered a single adapter for the purposes of the NVDATA utility.

2.2.1 Command Line Usage Syntax

You can use the NVDATA utility interactively or with command line options. The command line usage is:

```
NVDATA [/?] [/UPLD] [/CONV] [/CI] [Filename(s)]
```

A .IMG file is a serial EEPROM binary image, which is typically 2 Kbytes in length. A .DAT file is an NVDATA ASCII text file, which is typically greater than 20 Kbytes in length. Table 2.1 describes the command line options for the NVDATA utility.

Table 2.1 NVDATA Command Line Options

Option	Description
/?	This option prints help information.
/UPLD	This option uploads the serial EEPROM .IMG file from all adapters.
/CONV	This option converts an NVDATA data file to an 'IMG' file. The NVDATA file is specified as filename.DAT. The .IMG files is specified as filename.IMG.
/CI	This option concatenates the NVData image file to the firmware image and creates a new image file. You must specify three filenames after /CI. File1 is the firmware image file. File2 is the NVData image file. File3 is the final concatenated image file.
Filename	This filename specifies the .IMG or .DAT file. If you only specify the filename, the utility downloads the .DAT or .IMG file to the serial EEPROM.

2.2.2 Command Line Examples

This section provides examples of command usage.

2.2.2.1 Downloading a .DAT file to the serial EEPROM

To perform this operation, type:

```
NVDATA FileName.DAT
```

This command causes the NVDATA utility to run a pattern test on the serial EEPROM that tests its functionality. The utility reads, parses, and converts the input file to the correct image format and writes it to the serial EEPROM. The utility then saves the serial EEPROM image to a file named IMAGE?.IMG, where '?' is the adapter number and can be either 1, 2, 3, or 4. The command generates a log file, log.txt, that indicates whether the update passed or failed.

This test uses default data from FileName.DAT and calculates the necessary sizes, lengths, page versions, bytes, and checksums. You can skip the pattern test by placing `/NOTEST` in the command line.

2.2.2.2 Downloading a .IMG file to the serial EEPROM

To perform this operation, type:

```
NVDATA Filename.IMG
```

This command causes the NVDATA utility to read the serial EEPROM binary image from Filename.IMG and to write the data to the serial EEPROM. This command generates a log file, log.txt, that indicates whether the update passed or failed.

2.2.2.3 Uploading .IMG file(s) from the serial EEPROM

To perform this operation, type:

```
NVDATA /UPLD
```

This command causes the NVDATA utility to read the serial EEPROM binary image from each adapter and to save it to a file named IMAGE?.IMG, where '?' is the adapter number and can be either 1, 2, 3, or 4.

2.2.2.4 Converting a .DAT file to a .IMG file

To perform this operation, type:

```
NVDATA /CONV Filename.DAT Filename.IMG
```

This command causes the NVDATA utility to convert a .DAT file to a serial EEPROM binary .IMG file. The utility uses the default data from Filename.DAT and calculates the necessary sizes, lengths, page versions, bytes and checksums to create Filename.IMG.

2.2.2.5 Concatenating Images

To perform this operation, type:

```
NVDATA /CI File1 File2 File3
```

This command causes the NVDATA utility to concatenate the NVData image file to the firmware image and then to create a new concatenated image file. File1 is the firmware image file. File2 is the NVData image file. File3 is the final concatenated image file.

2.2.2.6 Running in Interactive Mode

This command is for advanced users. The command line usage for this command is:

```
NVDATA
```

This command causes the utility to display a list of Host Bus Adapters (HBAs) that the NVDATA utility found. After you select an adapter, the utility displays a menu of action options. The options are as follows:

1. Erase serial EEPROM memory (0x..)

   This option writes 0s to the serial EEPROM from the specified address to the end of the serial EEPROM.

2. Serial EEPROM memory pattern test (0x..)

   The option tests the serial EEPROM by writing and reading a predefined pattern to and from the serial EEPROM.

3. Serial EEPROM memory boundary test (0x..)

This option performs a boundary test on the serial EEPROM by reading and writing random data in an incrementing pattern. Be aware that this test takes a long time.

4. Display RAW NVData

   This option displays the raw data in the serial EEPROM.

5. Display formatted manufacturing settings

   This option displays the autodownload data, PCI configuration data, and option ROM offsets.

6. Display FW Variables

   This option displays firmware specific data.

7. Display formatted NVData header

   This option displays the formatted Master Data Header.

8. Display formatted NVData Page Data

   This option displays menus to select the desired configuration pages. It then displays the selected configuration pages.

9. Save NVData to a binary file

   This option saves the current serial EEPROM content to a binary file.

2.2.3 Creating Custom Input Files

The .DAT file is an ASCII text file that contains the default NVData information that is stored in the serial EEPROM. The .DAT files follow a defined format that coincides with the Fusion-MPT data structures. Any deviation from this format causes the NVDATA utility to fail.

To create a custom input file, edit the provided .DAT file. You can modify the several data fields within the .DAT file. The modifiable data fields are any data fields other than:

- Checksums
- IOC Number
- PageVersion
- PageLength
- PageNumber
- PageType (except for Manufacturing Pages 0–4)

- Total bytes of NVData
- NVDataVersion
- MPIVersion

The NVDATA utility calculates these data items. The NVDATA utility reads all other data items directly from the .DAT file. Note that you can modify the PageType field for Manufacturing Page 0 through Manufacturing Page 4.

The data entry fields are in the form:

```
Field=Data
```

where Field is the name of the data structure field and Data is the Field value. For example:

```
CHIP_NAME="C1030" DEVICE_ID=30
```

Use hexadecimal numbers for numerical data. Enclose strings by double quotes. Precede comments with a semicolon.

Note that VPD data is not supported.

Chapter 3
SCSI BIOS and Configuration Utility

This chapter presents general information about the Fusion-MPT SCSI Basic Input/Output System (BIOS) and Configuration Utility (CU), version 5.02.00, for 32-bit systems. This chapter contains the following sections:

3.1 Overview and Features

A SCSI BIOS is the bootable ROM code that manages SCSI hardware resources. The Fusion-MPT SCSI BIOS integrates with a standard system BIOS to extend the standard disk service routine that is provided through INT13h. During the boot time initialization, the SCSI BIOS determines if the system BIOS has already installed other hard disks, such as an IDE drive. If so, the SCSI BIOS maps any SCSI drives it finds behind the already-installed drive(s). Otherwise, the SCSI BIOS installs drives starting with the system boot drive and the system boots from a drive controlled by the SCSI BIOS. The Fusion-MPT BIOS supports the BIOS Boot Specification (BBS).

The Fusion-MPT SCSI BIOS:

- Supports the LSI53C1030 and LSI53C1020 Ultra320 SCSI devices
- Supports configuration of up to 256 adapters
- Provides INT13 bootrom support for up to four adapters
- Supports SureLINK Domain Validation

3.2 Initialization

This section describes the BBS initialization and CD-ROM initialization procedures.

3.2.1 Boot Initialization with BBS

The Fusion-MPT SCSI BIOS provides support for the BBS, which enables selection of the boot device. If the system supports the BBS, use the system BIOS setup menu to select the boot and drive order.

3.2.2 CD-ROM Boot Initialization

The Fusion-MPT SCSI BIOS supports boot initialization from a CD-ROM drive. The five types of emulation are:

- No emulation disk
- Floppy 1.2 Mbyte emulation disk
- Floppy 1.44 Mbyte emulation disk
- Floppy 2.88 Mbyte emulation disk
- Hard disk emulation

The type of emulation assigns the drive letter for the CD-ROM. For example, if a 1.44 Mbyte floppy emulation CD is loaded, the CD-ROM drive becomes the A: drive and the existing floppy becomes drive B:.

3.3 Starting the SCSI BIOS Configuration Utility

The Fusion-MPT SCSI BIOS and CU allow you to change the default configuration of the SCSI host adapters. You can change the default values to resolve conflicts between device settings or to optimize system performance. During boot, the system displays the version number of the SCSI BIOS. If the CU is installed, the system displays the message:

```
Press Ctrl-C to start LSI Logic Configuration Utility...
```

This message remains on the screen for about 5 seconds. After pressing `Ctrl-C`, the message changes to:

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

The system displays the Main Menu of the Fusion-MPT SCSI BIOS CU.

The system might display the following messages during the boot process:

- "`Adapter removed from boot order, parameters will be updated accordingly`" appears if an adapter is removed from the system or relocated behind a PCI bridge.
- "`Configuration data invalid, saving default configuration!`" appears if the nonvolatile (NVRAM) information is invalid.
- "`Adapter Configuration may have changed, reconfiguration is suggested!`" appears if less than four adapters are in the boot order and more adapters exist than are shown.

Pressing `Ctrl-E` or `Ctrl-A` after memory initialization during reboot allows you to re-enable and reconfigure devices.

Note: The Fusion-MPT BIOS cannot control all the devices the the CU detects. Devices such as tape drives and scanners require a device driver that is specific to the peripheral. The SCSI BIOS CU allows parameter modification to support these devices.

3.4 Using the SCSI CU

This section describes the SCSI BIOS CU. The options in the SCSI CU depend upon which BIOS and firmware you have installed. You could have installed either the standard SCSI BIOS and its associated firmware, or the IM-enabled SCSI BIOS and its associated firmware.

All of the SCSI BIOS CU screens follow fixed field areas. The header area provides static information text, which is typically the product title and version. The menu area provides the current menu and uses a cursor for menu item selection. The footer area provides general help information.

3.4.1 User Input

Table 3.1 summarizes the possible user inputs.

Table 3.1 User Input

Key	Definition	Description
F1	Help	Context sensitive help for the cursor-resident field.
F2	Menu	Sets cursor context to the menu selection area. Select a menu item and press Enter.
Arrow Keys	Select Item	Use these keys to position the cursor.
Home/End		
+/-	Change Item	The items with values in '[ ]' brackets are modifiable. Use the numeric keypad '+' and '-' to change a modifiable field to its next relative value.
Esc	Abort/Exit	Escape stops the current context operation and exits the current screen.
Enter	Execute Item	Items with values in '< >' brackets are executable. Press Enter to execute the function of the selected field.

3.4.2 Main Menu

When invoked, the CU first displays the Main Menu, which contains a scrolling list of up to 256 LSI Logic PCI to SCSI host adapters and information about each of them. Use the arrow keys to select an adapter. Press Enter to view and modify the properties of the selected adapter, and to gain access to the attached devices. The CU can only access adapters with LSI Logic Control enabled. After selecting an adapter and pressing Enter, the CU scans the adapter's SCSI bus and then displays the Adapter Properties screen.

The Main Menu contains two selections: Boot Adapter List and Global Properties. The Boot Adapter List allows selection and ordering of boot adapters. The Global Properties allows changes to global settings. Figure 3.1 shows the Main Menu for the standard SCSI BIOS. Figure 3.2 shows the Main Menu for the IM-enabled SCSI BIOS.

Figure 3.1 Main Menu for the MPTPS.ROM BIOS

```
 LSI Logic MPT SCSI Setup Utility   Version MPT -x.xx

 <Boot Adapter        <Global
    List>           Properties>

    LSI Logic Host Bus Adapters

 Adapter     PCI      Dev/      Port       IRQ       NVM       Boot      LSI
             Bus      Func      Number                         Order     Logic
                                                               Control

<LSI1030     0        20>       E400       10        ---       0         Enabled

<LSI1030     0        21>       E000       12        Yes       1         Enabled

<LSI1030     0        60>       F800       9         Yes       2         Enabled

<LSI1030     0        A0>       E800       11        Yes       3         Enabled
```

Figure 3.2 Main Menu for the MPTPSIM.ROM BIOS

```
LSI Logic MPT SCSI Setup Utility  Version MPT -x.xx

 <Boot Adapter       <Global
    List>          Properties>

  LSI Logic Host Bus Adapters

 Adapter     PCI      Dev/     Port      IRQ      NVM      Boot     LSI Logic   Mirror
             Bus      Func     Number                       Order    Control     Status

<LSI1030     0        20>      E400      10       ---      0        Enabled     Optimal

<LSI1030     0        21>      E000      12       Yes      1        Enabled     ---

<LSI1030     0        60>      F800      9        Yes      2        Enabled     ---

<LSI1030     0        A0>      E800      11       Yes      3        Enabled     ---
```

Table 3.2 describes the main menu field for both the MPTPS.ROM BIOS and the MPTPSIM.ROM BIOS.

Table 3.2 Main Menu Field Description

Field	Description
Adapter	Indicates the specific family of LSI Logic Host Adapters.
PCI Bus	Indicates the PCI Bus number assigned by the system BIOS to an adapter. The PCI Bus number can be between 0x00 and 0xFF.
Dev/Func	Indicates the PCI Device and PCI Function assigned by the system BIOS to an adapter. Bits [2:0] of this 8-bit value designate the PCI Function. Bits [7:3] designate the PCI Device.
Port Number	Indicates the I/O Port Number that communicates with an adapter. The system BIOS assigns this number.
IRQ	Indicates the Interrupt Request Line for the adapter. The system BIOS assigns this value.
NVM	Indicates whether an adapter has nonvolatile memory. The possible values are Yes or No.
Boot Order	Indicates the relative boot order of an adapter. The BIOS traverses up to four adapters in the specified order in search of bootable media. The possible values are 0, 1, 2, or 3. The Boot Adapter List Menu modifies this item.
LSI Logic Control	Indicates whether an adapter is eligible for LSI Logic software control or is reserved for control by non-LSI Logic software.
Mirror Status	This field indicates the status of the Integrated Mirroring volume if one exists. The possible values are nothing (“----”) if no mirrored volume exists, Optimal, Degraded, Disabled, Quiesced, Resynching, or Failed.

3.4.3 Boot Adapter List Menu

The Boot Adapter List Menu specifies the adapter boot order when more than one OS adapter is present. The CU can designate up to four adapters as bootable. To access the Boot Adapter Menu, select <Boot Adapter List> on the Main Menu and press enter. The CU then displays the Boot Adapter List Menu.

To add an adapter to the boot list, press Insert while on the Boot Adapter List. This locates the cursor on the adapter select list. Use the arrow keys to select an adapter and press Enter to add it to the end of Boot Adapter List. To remove an adapter from the boot list, select the adapter and press Delete. Select the adapter and press the ‘-’ key to decrease the adapter’s relative order in the boot list, or press the ‘+’ key to increase

the adapter's relative order in the boot list. Figure 3.3 shows the Boot Adapter List Menu for both the standard SCSI BIOS and the IM-enabled SCSI BIOS.

Figure 3.3 Boot Adapter List Menu

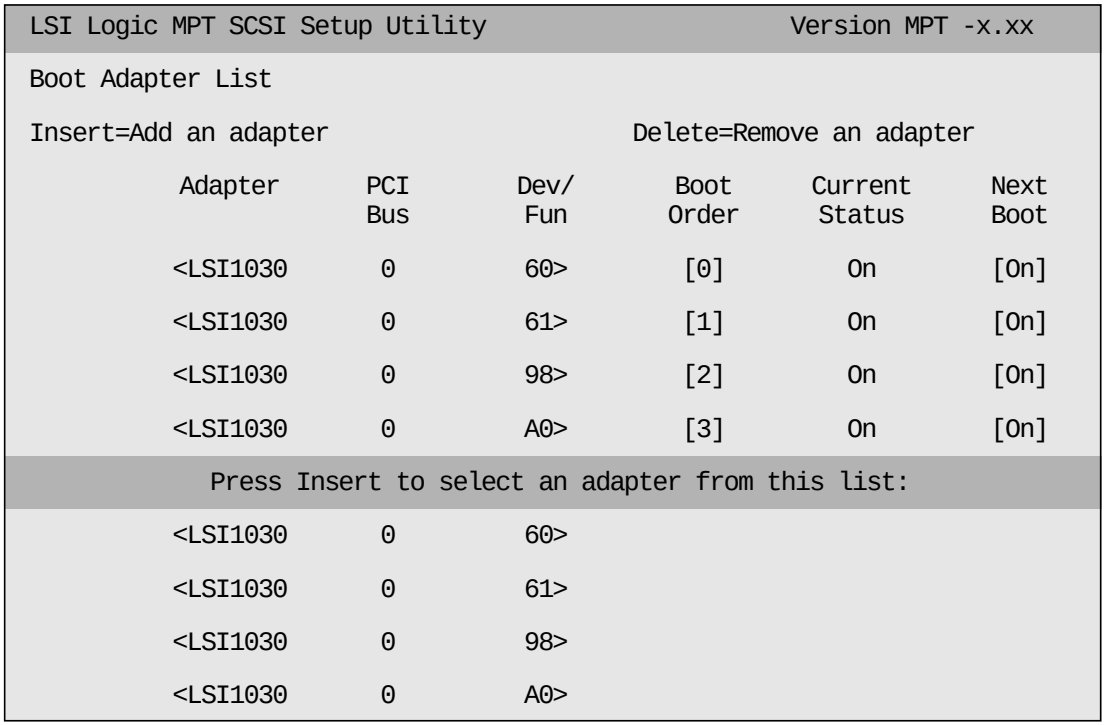


Table 3.3 describes the fields in the Boot Adapter Menu.

Table 3.3 Boot Adapter Menu Field Descriptions

Field	Description
Adapter	Indicates the specific family of LSI Logic Host Adapters.
PCI Bus	Indicates the PCI Bus number assigned by the system BIOS to an adapter. The PCI Bus number can be between 0x00 and 0xFF.
Dev/Func	Indicates the PCI Device and PCI Function assigned by the system BIOS to an adapter. Bits [2:0] of this 8-bit value designate the PCI Function. Bits [7:3] designate the PCI Device.

Table 3.3 Boot Adapter Menu Field Descriptions

Field	Description
Boot Order	Specifies the relative boot order of an adapter. This value of this field can be 0, 1, 2, or 3. Press '-' to decrease an adapter's relative boot order. Press '+' to increase an adapter's relative boot order.
Current Status	Indicates if an adapter in the boot list was enabled during the most recent boot. The Fusion-MPT SCSI BIOS ignores disabled adapters and their attached devices, but these adapters and devices are visible to the CU.
Next Boot	Specifies whether to enable an adapter upon the next boot.

3.4.4 Global Properties

The Global Properties Menu allows configuration of the Display and Video modes, as well as a pause if the CU displays an alert message. To access the Global Properties Menu, select "<Global Properties>" on the Main Menu and press Enter. The system then displays the Global Properties Menu. Figure 3.4 shows the Global Properties Menu for both the standard SCSI BIOS and the IM-enabled SCSI BIOS.

Figure 3.4 Global Properties Menu

```
LSI Logic MPT SCSI Setup Utility      Version MPT -x.xx

                          Global Properties

   Pause When Boot Alert Displayed    [Yes]

   Boot Information Display Mode      [Verbose]

   Negotiate with devices             [Supported]

   Video Mode                         [Color]

   Support Interrupt                  [Hook interrupt, the Default]


        <Restore Defaults>
```

Table 3.4 describes the Global Properties Menu fields.

Table 3.4 Global Properties Menu Field Description

Field	Description
Pause When Boot Alert Displayed	This option specifies whether or not the CU pauses for user acknowledgement after displaying an alert message during boot. To continue after displaying a message, specify 'No.' To wait for the user to press any key after displaying a message, specify 'Yes.'
Boot Information Display Mode	This option specifies the information display mode of the BIOS. It controls how much adapter and device information the system displays during boot. You can set the Display Mode to either 'Terse' or 'Verbose.' Specify the Terse mode to display the minimum amount of information. Specify the Verbose mode to display detailed information.
Negotiate with Devices	This option sets the default value for synchronous and wide negotiations with specified devices. Options are: All, None, or Supported.
Video Mode	This option specifies the default video mode for the CU. You can set the Video Mode to either 'Color' or 'Monochrome.' The monochrome setting enhances readability on a monochrome monitor.
Support Interrupt	This option allows the ability to stop the system from hanging on INT40.
<Restore Defaults>	Pressing Enter obtains default settings.

3.4.5 Adapter Properties Menu

The Adapter Properties Menu allows you to view and modify adapter settings. It also provides access to an adapter's device settings. To access the Adapter Properties Menu, select the adapter on the Main Menu and press enter. The CU then displays the Adapter Properties Menu for the selected adapter. Figure 3.5 shows the Adapter Properties Menu for the standard SCSI BIOS. Figure 3.6 shows the Adapter Properties Menu for the IM-enabled SCSI BIOS.

Figure 3.5 Host Adapter Properties Menu Example for the Standard SCSI BIOS

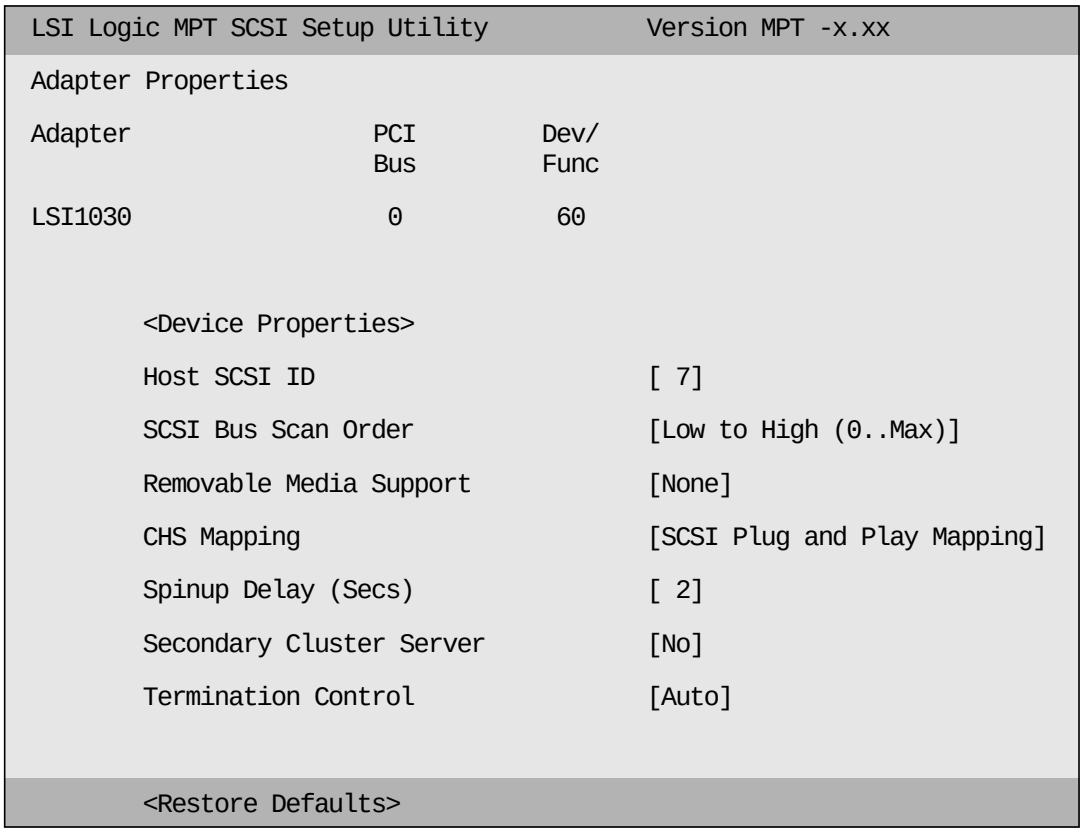


Figure 3.6 Host Adapter Properties Menu Example for the IM-Enabled SCSI BIOS

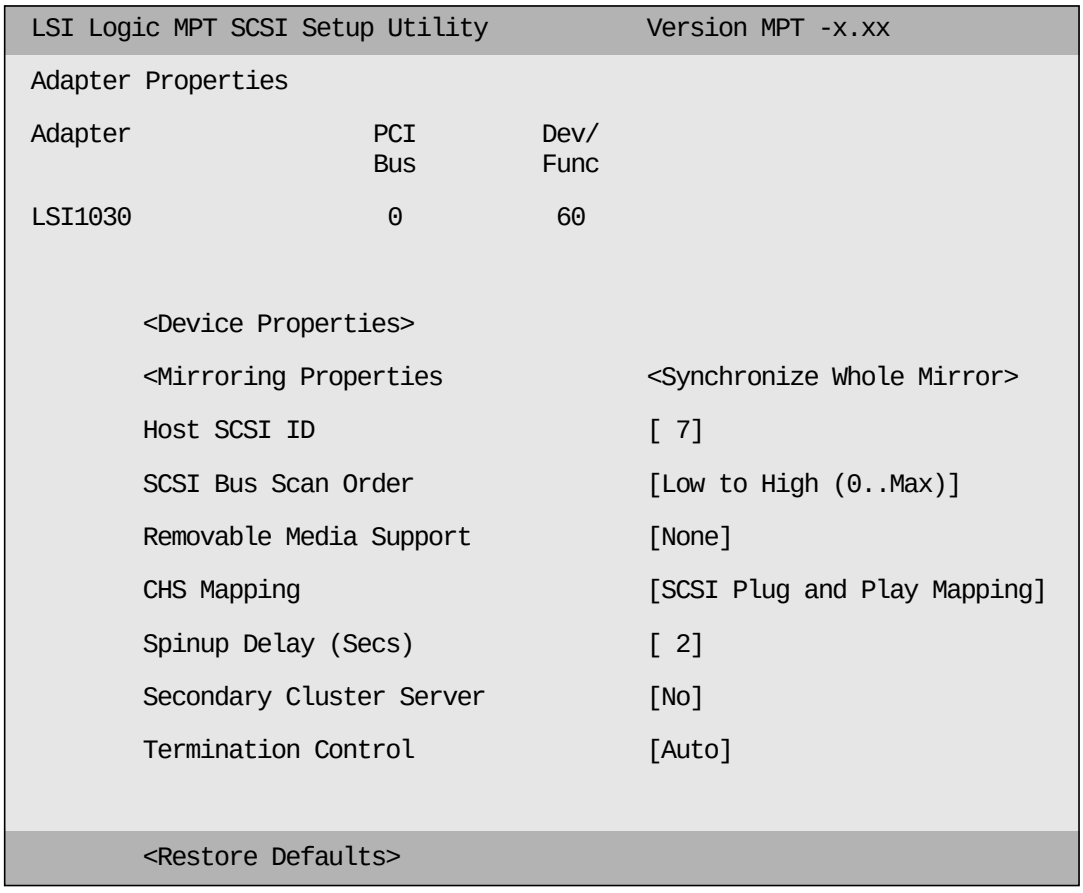


Table 3.5 describes the Adapter Properties Menu fields for both the standard SCSI BIOS and the IM-enabled SCSI BIOS.

Table 3.5 Adapter Properties Menu Field Description

Field	Description
<Device Properties>	Press Enter to view and modify device properties.
<Mirroring Properties>	Press Enter to view and modify the mirroring properties. The CU grays-out this field if the Integrated Mirroring feature is currently unavailable. This could result from using firmware that does not support the IM feature or having an incompatible setup.
<Synchronize Whole Mirror>	If a mirrored volume currently exists, press enter to resynchronize the volume. The CU greys-out this field if the current firmware in use does not support the IM feature or if the existing mirrored volume does not need resynchronization.
Host SCSI ID	This field indicates the SCSI identifier of an adapter. LSI Logic recommends setting this field to the highest priority SCSI identifier, which is SCSI ID 7.
SCSI Bus Scan Order	This field indicates the order in which to scan SCSI identifiers on an adapter. Changing this item affects drive letter assignments if more than one device is attached to an adapter and might create a conflict with an operating system that automatically assigns drive order.
Removable Media Support	This field specifies the removable media support option for an adapter. There are three possible settings: None, Boot Drive Only, and With Media Installed. 'None' indicates there is no removable media support, whether the drive is selected as first (BBS), or is the first in the scan order (non-BBS). 'Boot Drive Only' provides removable media support for a removable hard drive if it is first in the scan order. 'With Media Installed' provides removable media regardless of the drive ordering.
CHS Mapping	This field defines the Cylinder Head Sector (CHS) values mapping method. CHS Mapping allows two settings: 'SCSI Plug and Play Mapping' (default value) and 'Alternate CHS Mapping.' SCSI Plug and Play Mapping automatically determines the most efficient and compatible mapping. Alternate CHS Mapping utilizes an alternate method that might be required if a device is moved between adapters from different vendors. These options have no effect after the FDISK command partitions the disk. To change the CHS Mapping on a partitioned disk, use the FDISK command to delete all partitions and reboot the system to clear the memory. Be certain that the correct disk is the target of an FDISK command.
Spinup Delay	This field indicates the number of seconds to wait between spin-ups of devices attached to an adapter. Staggered spin-ups balance the electrical current load on the system during boot. The default value is 2 seconds, with choices between 1 and 10 seconds.

Table 3.5 Adapter Properties Menu Field Description (Cont.)

Field	Description
Secondary Cluster Server	The options for this field are ‘Yes’ or ‘No’ (default). Setting this field to Yes indicates that the Fusion-MPT adapter shares devices with another adapter, and prevents the Fusion-MPT SCSI BIOS from issuing SCSI Bus resets. This is a requirement for the Microsoft Cluster Server.
Termination Control	This field indicates if an adapter has automatic termination control. The options for this field are ‘Auto’ or ‘Off.’ ‘Auto’ indicates that the adapter automatically determines to enable or disable its termination. ‘Off’ indicates that termination at the adapter is off and that other devices at the ends of the SCSI bus must terminate the bus. If Auto is grayed out, it means that termination is not programmable.
Restore Defaults	To obtain default settings, press Enter.

3.4.6 Device Properties

The Device Properties screen provides viewing and updating of device settings for an adapter. To access the Device Properties Menu, select ‘<Device Properties>’ on the Host Adapter Properties List Menu and press Enter. Changing a setting for the host device changes the setting for all devices. Figure 3.7 provides an example of the Device Properties screen for both the standard SCSI BIOS and the IM-enabled SCSI BIOS.

Figure 3.7 Device Properties Menu

LSI Logic MPT SCSI Setup Utility						Version MPT -x.xx	
SCSI ID	Device Identifier	MB/sec	MT/sec	Data Width	Scan ID	Scan LUNs > 0	Dis-connect
0	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
1	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
2	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
3	SEAGATE ST31055N	[160]	[80]	[16]	[Yes]	[Yes]	[On]
4	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
5	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
6	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
7	LSI1030	[160]	[80]	[16]	[Yes]	[Yes]	[On]
8	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
9	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
10	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
11	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
12	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
13	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
14	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
15	–	[160]	[80]	[16]	[Yes]	[Yes]	[On]
<< Scroll Indicator >>							

Figure 3.7 Device Properties Menu (Cont.)

SCSI ID	Device Identifier	SCSI Timeout	Queue Tags	Boot Choice	Format
0	–	< 10>	[On]	[No]	<Format>
1	–	< 10>	[On]	[No]	<Format>
2	–	< 10>	[On]	[No]	<Format>
3	SEAGATE ST31055N	< 10>	[On]	[No]	<Format>
4	–	< 10>	[On]	[No]	<Format>
5	–	< 10>	[On]	[No]	<Format>
6	–	< 10>	[On]	[No]	<Format>
7	LSI1030	< 10>	[On]	[No]	<Format>
8	–	< 10>	[On]	[No]	<Format>
9	–	< 10>	[On]	[No]	<Format>
10	–	< 10>	[On]	[No]	<Format>
11	–	< 10>	[On]	[No]	<Format>
12	–	< 10>	[On]	[No]	<Format>
13	–	< 10>	[On]	[No]	<Format>
14	–	< 10>	[On]	[No]	<Format>
15	–	< 10>	[On]	[No]	<Format>
<< Scroll Indicator >>					

Figure 3.7 Device Properties Menu (Cont.)

SCSI ID	Device Identifier		Verify	Restore Defaults
0	–		<Verify>	<Defaults>
1	–		<Verify>	<Defaults>
2	–		<Verify>	<Defaults>
3	SEAGATE ST31055N	0594	<Verify>	<Defaults>
4	–		<Verify>	<Defaults>
5	–		<Verify>	<Defaults>
6	–		<Verify>	<Defaults>
7	LSI1030		<Verify>	<Defaults>
8	–		<Verify>	<Defaults>
|9	–		<Verify>	<Defaults>
10	–		<Verify>	<Defaults>
11	–		<Verify>	<Defaults>
12	_		<Verify>	<Defaults>
13	_		<Verify>	<Defaults>
14	_		<Verify>	<Defaults>
15	_		<Verify>	<Defaults>
			<< Scroll Indicator >>	

Table 3.6 describes the fields in the Device Properties menu.

Table 3.6 Device Properties Menu Fie ld Description

Field	Description
SCSI ID	This field indicates the device's SCSI Identifier.
Device Identifier	This field indicates the ASCII device identifier string extracted from the device's Inquiry Data.

Table 3.6 Device Properties Menu Fie (Cont.) ld Description

Field	Description
MB/sec	This field specifies the maximum synchronous data transfer rate in Mbytes/s. Users cannot directly edit this field because the Data Width or MT/s fields determine its setting. The default for this field is 320.
MT/sec	This field indicates the maximum synchronous data transfer rate, in Mega Transfers/s. The default value is 160 MT/Sec. Table 3.7 provides more information.
Data Width	This field indicates the maximum data width in bits.
Scan ID	This field indicates whether to scan for this SCSI identifier at boot time. Set this option to 'No' if there is a device that you do not want to be available to the system. To decrease the boot time, choose No for unused SCSI IDs.
Scan LUNs > 0	This field indicates whether to scan for non-zero LUNs. LUN 0 is always queried. Use this option if a multi-LUN device responds to unoccupied LUNs, or to reduce the visibility of a multi-LUN device to LUN 0. Set this option to 'No' if there is a problem with a device that responds to all LUNs.
Disconnect	This field allows a device to disconnect during SCSI operations. Some newer devices run faster with disconnect enabled, while some older devices run faster with disconnect disabled.
SCSI Timeout	This field indicates the maximum amount of time [0 to 9999] in seconds to wait for a SCSI operation to complete. Because time-outs provide a safeguard that allows the system to recover if an operation fails, LSI Logic recommends using a value greater than zero. A value of zero allows unlimited time for an operation to complete and could result in the system hanging. To specify a new timeout value, press Enter, type in a value, and press Enter again.
Queue Tags	This field allows the use of queue tags for a device. The Fusion-MPT SCSI BIOS does not use queue tags. This item specifies queue tag control to higher level device drivers.
Boot Choice	This field indicates if this device can be selected as the boot device. This option is only applicable to devices attached to adapter 0 in the boot list on non-BBS systems. It provides primitive BBS flexibility to non-BBS systems.
Format	Press Enter to low-level format the device. If enabled, this option allows low-level formatting on a disk drive. Low-level formatting completely erases all data on the drive. Formatting the drive creates a 512-byte sector size, even if the drive was formatted to another sector size.
Verify	Press Enter to verify all sectors on the device and to reassign defective Logical Block Addresses.
Restore Defaults	Press Enter to obtain default settings.

Table 3.7 provides information on data transfer rates.

Table 3.7 Data Transfer Rate Information

Mega Transfers/s	Data Width = 8 (Mbytes/s)	Data Width = 16 (Mbytes/s)	Synchronous Period (nsec)
0 = Asynchronous	0 = Asynchronous	0 = Asynchronous	0 = Asynchronous
5	5	10	200
10	10	20	100
20	20	40	50
40	40	80	25
80	–	160	12.5
160	–	320	6.25

3.4.7 Mirroring Properties Menu

The Mirroring Properties Screen allows the user to view and modify the IM settings. This screen lists each device attached and allows the user to set the primary, secondary, and hot spare disks. This screen is only accessible if there is Fusion-MPT firmware running that supports the IM feature and the current configuration supports IM. To determine if the firmware is IM-compatible, view the Product field on the main Adapter List screen. Figure 3.8 provides an example of the Mirroring Properties Menu.

Figure 3.8 Mirroring Properties Menu

LSI Logic Corp. EFI MPT SCSI Setup Utility				Version - x.xx	
Mirroring Properties		Volume SCSI ID: 2		Size (MB):	4567
SCSI ID	Device Identifier	Mirrored Pair	Status	Predict Failure	Size (MB)
0	-	[No]	----	---	----
1	-	[No]	----	---	----
2	SEAGATE ST31055N	[Primary]	Optimal	[No]	4567
3	SEAGATE ST31055N	[Secondary]	Optimal	[No]	4567
4	-	[No]	----	---	----
5	-	[No]	----	---	----
6	-	[No]	----	---	----
7	53C1030	[No]	----	---	----
8	-	[No]	----	---	----
9	SEAGATE ST31055N	[Hot Spare]	----	---	----
|10	-	[No]	----	---	----
11	-	[No]	----	---	----
12	-	[No]	----	---	----
13	-	[No]	----	---	----
14	-	[No]	----	---	----
|15	-	[No]	----	---	----

Table 3.8 describes the fields in the Mirroring Properties Menu.

Table 3.8 Mirroring Properties Menu Field Description

Field	Description
Volume SCSI ID	This field indicates the SCSI identifier of the IM volume.
Size (Mbytes)	This field indicates the size of the IM volume.
SCSI ID	This field indicates the device's SCSI identifier.
Device Identifier	This field indicates the ASCII device identifier string extracted from the device's Inquiry Data.
Mirrored Pair	This field displays which disks are part of the IM volume, and which disks are the primary, secondary, and hot spare disks. There can be one disk set as the primary disk and one disk set as the secondary disk. A hot spare disk is optional.
Status	This field displays the current status of the IM volume. Options for this field are Ok, Missing, Incompatible, Failed, Initing, CfgOffline, UserFailed, Offline, Out of Sync, and Incomplete Mirrored Pair.
Predict Failure	This field displays Predict Failure information. Options for this field are Yes and No.
Size (Mbytes)	This field indicates the size of each disk. When an IM volume is created, this field reflects the size of the disk volume and not the size of each individual disk.

3.4.8 Exiting the SCSI BIOS Configuration Utility

Because some changes only take effect after the system reboots, it is important to exit this configuration utility properly. To exit, press Esc and respond to the verification prompts. Some changes might be lost if you reboot before properly exiting the CU.

Chapter 4
SCSI EFI and Configuration Utility

This chapter contains information about the LSI Logic EFI 1.1 Fusion-MPT SCSI Boot Services Driver and the associated Configuration Utility (CU). This chapter contains the following sections:

4.1 Introduction

The Extensible Firmware Interface (EFI) Fusion-MPT SCSI BIOS is a native IA64 EFI 1.1 Boot Services Driver (BSD) that provides pre-OS support for the Fusion-MPT architecture LSI53C1030 and the LSI53C1020 SCSI processors. A BSD is a BIOS for systems based on Intel architecture and the EFI specification. The BIOS is delivered as one executable, and contains a BSD and a CU.

4.2 Features

The EFI Fusion-MPT BIOS:

- Supports up to 256 Host Adapter channels per PCI Function, with up to 15 targets/channel and 8 LUNs/target.
- Supports media removal and media change for SCSI removable media device types.

- Installs the following EFI protocols for each supported Host Adapter channel:
  - Device Path
  - SCSI Pass Thru
- Installs the following EFI protocols for each supported SCSI Target/LUN:
  - Device Path
  - Block I/O
- Supports EFI 1.1 Driver Binding and Configuration Protocol.
- Provides full control of the configuration settings through the CU.

4.3 Boot Services Driver

The Fusion-MPT EFI BSD conforms to the EFI 1.1 Driver Model specification. The BSD integrates with EFI system firmware and extends disk services by installing Block IO (LBA) interfaces for supported SCSI devices. At load time the driver automatically detects all supported SCSI I/O processors and attached SCSI devices. The driver then installs Block I/O interfaces for the SCSI hard drives, removable media devices, CD-ROMs, Write-once, and magneto-opticals (MO) devices. Platform firmware can use the driver services to boot from any supported SCSI device. Systems normally use the driver services to copy an OS Loader to boot a system, but can also use the driver services for file system I/O at the EFI Shell.

4.3.1 BSD Installation

Use the EFI shell `load` command to load the BSD. From the EFI shell change to the file system that contains the `lsimpt.efi` boot services driver file. This is the same as switching to the desired drive in a DOS prompt environment. Type "`load lsimpt.efi`" to load the boot services driver. The BSD detects all the Fusion-MPT SCSI devices. The BSD then installs the necessary EFI protocols.

You can also load the LSI Logic BSD from an option ROM with the "`lsimpt.rom`" file. Load the `lsimpt.rom` file onto the Flash ROM using the LSI Logic EFI flash utility. If a system supports option ROM loading, the system installs the LSI Logic driver at boot time. After installation, this form of the BSD functions identically to the `.efi` form of the BSD.

4.4 EFI Configuration Utility

This section describes the SCSI BIOS EFI CU. The EFI CU provides viewing and editing of controller parameters. The CU uses the EFI 1.1 Configuration Protocol, and can be invoked with the "`drvcfg`" command. The CU can change the default configuration of the SCSI host adapters. Alter the default values if there is a conflict between device settings or to optimize system performance. One or more of the Fusion-MPT SCSI host adapters must have an NVRAM to store the changes.

All the SCSI BIOS CU screens follow fixed field areas. The header area provides static information text, which is typically the product title and version. The menu area provides the current menu and uses a cursor for menu item selection. The footer area provides general help information.

The CU uses several input keys that are not directly supported by all terminal emulation programs. Refer to your terminal emulation program documentation to determine which alternate key to use. Table 4.1 summarizes the possible user inputs. The CU grays-out the selections that are not permissible.

Table 4.1 User Input

Key	Definition	Description
F1/Shift+1	Help	Context sensitive help for the cursor-resident field.
Arrow Keys/ H,J,K,L; Home,End/I,O	Select Item	Use these keys to position the cursor.
+/-	Change Item	The items with values in '[ ]' brackets are modifiable. Use the numeric keypad '+' and '-' to change a modifiable field.
Esc	Stop/Exit	Escape stops the current context operation and exits the current screen.
Enter	Execute Item	Items with values in '< >' brackets are executable. Press Enter to execute the function of the selected field.

4.4.1 Main Menu

When invoked, the CU first displays the Main Menu, which contains a scrolling list of up to 256 LSI Logic PCI to SCSI host adapters and information about each of them. Use the arrow keys to select an adapter. Press Enter to view and modify the properties of the selected adapter, and to gain access to the attached devices. The CU can only access adapters with LSI Logic Control enabled. After selecting an adapter and pressing Enter, the CU scans the adapter's SCSI bus and then displays the Adapter Properties screen. The CU can only access adapters with LSI Logic Control enabled. Adapters that do not have a nonvolatile memory display the defaults setting, which the CU cannot change. After selecting an adapter and pressing Enter, the CU scans the adapter's SCSI bus and then displays the Adapter Properties screen. Figure 4.1 provides an example of the Main Menu.

Figure 4.1 EFI Main Menu

LSI Logic Corp. EFI MPT SCSI Setup Utility Version v-x.xx

LSI Logic Host Bus Adapters

Adapter	PCI Bus	PCI Dev	PCI Fnc	Rev ID	FW Rev	MPI Rev	Product	LSI Control	Mirror Status
53C1030	0	1	0	03	00010300	0102	IM	Enabled	Optimal
53C1030	0	2	1	03	00010300	0102	IM	Enabled	-------
53C1030	0	3	0	03	00010300	0102	Basic	Enabled	-------
53C1030	0	3	1	03	00010300	0102	Basic	Enabled	-------

LSI Logic Corp. EFI MPT SCSI Setup Utility Version PCI -x.xx

LSI Logic Host Bus Adapters

Adapter	PCI Bus	PCI Dev	PCI Fnc	MPI Rev	Product	LSI Control	Mirror Status	NVM	IRQ
53C1030	0	1	0	0102	IM	Enabled	Optimal	Yes	10
53C1030	0	2	1	0102	IM	Enabled	-------	Yes	12
53C1030	0	3	0	0102	Basic	Enabled	-------	Yes	7
53C1030	0	3	1	0102	Basic	Enabled	-------	Yes	3

Table 4.2 describes the Main Menu fields.

Table 4.2 Main Menu Field Descriptions

Field	Description
Adapter	Indicates the specific family of LSI Logic Host Adapters.
PCI Bus	Indicates the PCI Bus number that the system BIOS assigns to an adapter.
PCI Dev	Indicates the PCI Device number that the system BIOS assigns to an adapter.
PCI Fnc	Indicates the PCI Function number that the system BIOS assigns to an adapter.
Rev ID	Indicates the chip revision of the device.
FW Rev	Indicates the Fusion-MPT firmware version number.
MPI Rev	Indicates the Fusion-MPT revision level.
Product	Indicates the capabilities of the Fusion-MPT firmware. The values for this field are either ‘Basic’ or ‘Integrated Mirroring’ (IM).
LSI Control	Indicates whether an adapter is eligible for LSI Logic software control or is reserved for control by non-LSI Logic software. The possible values for this field are ‘Enabled,’ ‘Disabled,’ or ‘Forbidden.’ If set to ‘Forbidden,’ access to the controller is not available. If set to ‘Disabled,’ the user can view and modify settings for the adapter but the LSI Logic EFI driver does not attempt to control the adapter. If set to ‘Enabled,’ the Fusion-MPT EFI driver attempts to control the adapter. If set to either ‘Enabled’ or ‘Disabled,’ the Boot Support Setting in the Adapter Properties menu can change this setting. For the new setting to take effect, you must either reload the EFI driver or reboot the system.
Mirror Status	Indicates the status of the Integrated Mirroring Volume if one exists. The possible values are nothing (“----”) if no mirrored volume exists, Optimal, Degraded, Disabled, Quiesced, Resyncing, or Failed.
NVM	Indicates if an adapter has nonvolatile memory. The possible values are Yes or No.
IRQ	Indicates the Interrupt Request Line for an adapter. The system BIOS assigns this value.

4.4.2 Adapter Properties Menu

The Adapter Properties Menu allows you to view and modify adapter settings. It also provides access to an adapter's device settings. To access the Adapter Properties Menu, select the adapter on the Main Menu and press enter. The CU then displays the Adapter Properties Menu for the selected adapter. Figure 4.2 provides an example of the Adapter Properties Menu.

Figure 4.2 Adapter Properties Menu

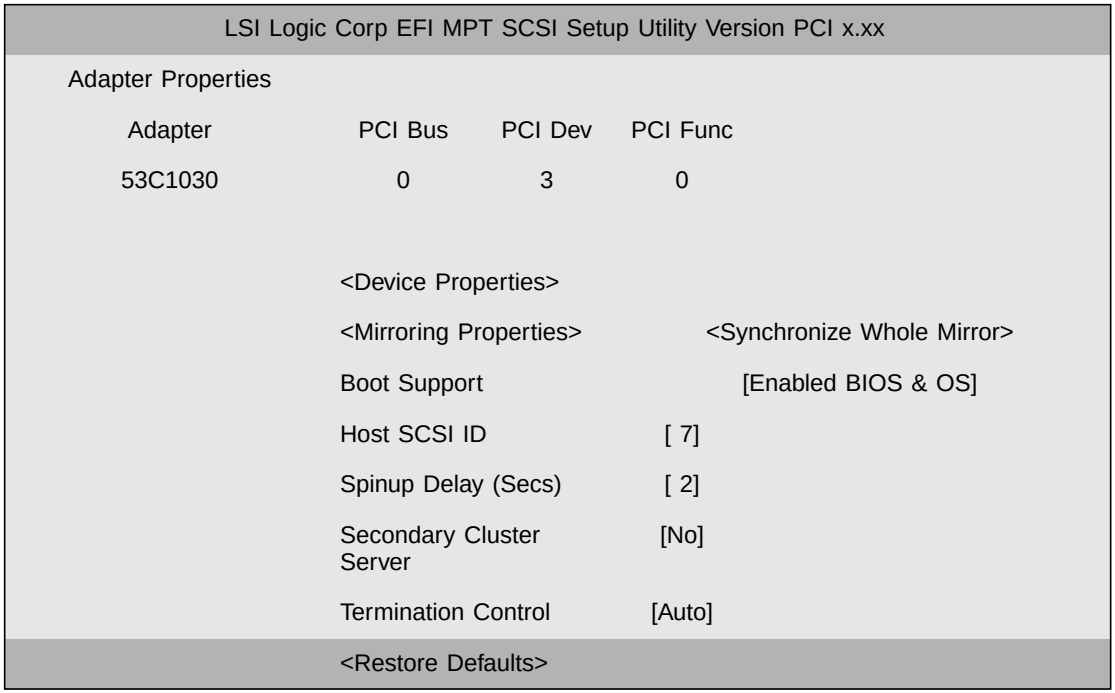


Table 4.3 describes the fields of the Adapter Properties Menu.

Table 4.3 Adapter Properties Menu Field Description

Field	Description
<Device Properties>	Press Enter to view and modify device properties.
<Mirroring Properties>	Press Enter to view and modify the mirroring properties. The CU grays-out this field if the Integrated Mirroring feature is currently unavailable. This could result from using firmware that does not support the IM feature or having an incompatible setup.
<Synchronize Whole Mirror>	If a mirrored volume currently exists, press enter to resynchronize the volume. The CU grays-out this field if the current firmware in use does not support the IM feature or the existing mirrored volume does not need resynchronization.
Boot Support	This field indicates if an adapter is enabled for LSI Logic software control. The possible selections are Disabled, Enabled BIOS Only, Enabled OS Only, and Enabled BIOS and OS. If Disabled is set, then the EFI Driver does not control the adapter, but the adapter is still visible in the Setup Utility and users can change settings. If Enabled BIOS only is set, then the EFI driver controls the adapter. This setting might not be supported by your OS or OS drivers. If Enabled OS Only is set, then the OS driver controls the adapter. If Enabled BIOS & OS is set, then both the EFI driver and OS driver control the adapter. Set this field to Disabled or to Enabled OS Only if you do not want the LSI Logic EFI driver to control. LSI Logic recommends setting this field to Enabled BIOS and OS. If you want the EFI driver to control the adapter. Changes in this setting are reflected in the LSI Control field on the Main Adapter List Menu. The new setting does not take effect until the EFI driver reloads or the system reboots.
Host SCSI ID	This field indicates the SCSI identifier of an adapter. LSI Logic recommends setting this field to the highest priority SCSI identifier, which is SCSI ID 7.
Spin-up Delay (Secs)	This field indicates the number of seconds to wait between spin-ups of devices attached to an adapter. Staggered spin-ups balance the electrical current load on the system during boot. The default value is 2 seconds, with choices between 1 and 10 seconds.
Secondary Cluster Server	The options for this field are ‘Yes’ or ‘No’ (default). Setting this field to Yes indicates that the Fusion-MPT adapter shares devices with another adapter, and prevents the Fusion-MPT SCSI BIOS from issuing SCSI Bus resets. This is a requirement for the Microsoft Cluster Server. LSI Logic recommends setting this field to ‘Yes’ in multi-initiator configurations.

Table 4.3 Adapter Properties Menu Field Description (Cont.)

Field	Description
Termination Control	This field indicates if an adapter has automatic termination control. The options for this field are ‘Auto’ or ‘Off.’ ‘Auto’ indicates that the adapter automatically determines to enable or disable its termination. ‘Off’ indicates that termination at the adapter is off and that other devices at the ends of the SCSI bus must terminate the bus. The default for this field is Auto. The CU greys-out Auto if the termination is not programmable. NVDATA settings determine the ability to modify the termination control setting. The serial EEPROM store the NVDATA settings. To enable the termination control setting, you must update the NVDATA image in the serial EEPROM with an `nvdata.dat` file that specifies the GPIO pin to use for termination control. The `nvdata.efi` utility writes the new `nvdata.dat` file to the serial EEPROM.
Restore Defaults	To obtain default settings, press Enter.

Table 4.4 Driver Support Field Settings

Driver Support Setting	Description
Disable	The EFI Driver does not control the adapter when loaded, but the adapter is visible in the CU and users can change settings.
Enabled BIOS Only	The EFI driver controls the adapter and the OS drivers do not control adapter. Some OS drivers do not support this setting.
Enabled OS Only	The EFI driver does not control the adapter and the OS driver controls the adapter.
Enabled BIOS and OS	Both the EFI driver and OS driver control the adapter. LSI Logic recommends using this setting if you want the Fusion-MPT EFI to control the adapter.

4.4.3 Device Properties Menu

The Device Properties screen provides viewing and allows updating of the device settings for an adapter. To access the Device Properties Menu, select ‘<Device Properties>’ on the Host Adapter Properties List Menu and press Enter. Changing a setting for the host device changes the setting for all devices. Figure 4.3 provides an example of the Device Properties screen.

Figure 4.3 Device Properties Menu

LSI Logic Corp. EFI MPT SCSI Setup Utility Version - x.xx

SCSI ID	Device Identifier	MB/sec	MT/sec	Data Width	Scan Id	Scan LUNs > 0	Dis-connect
0	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
1	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
2	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
3	SEAGATE ST31055N	[160]	[80]	[16]	[Yes]	[Yes]	[On]
4	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
5	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
6	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
7	53C1030	[320]	[160]	[16]	[Yes]	[Yes]	[On]
8	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
9	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
10	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
11	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
12	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
13	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
14	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]
15	-	[320]	[160]	[16]	[Yes]	[Yes]	[On]

<< Scroll Indicator >>

Figure 4.3 Device Properties Menu (Cont.)

SCSI ID	Device Identifier	SCSI Timeout	Queue Tags	Format
0	-	< 10>	[On]	<Format>
1	-	< 10>	[On]	<Format>
2	-	< 10>	[On]	<Format>
3	SEAGATE ST31055N	< 10>	[On]	<Format>
4	-	< 10>	[On]	<Format>
5	-	< 10>	[On]	<Format>
6	-	< 10>	[On]	<Format>
7	53C1030	< 10>	[On]	<Format>
8	-	< 10>	[On]	<Format>
9	-	< 10>	[On]	<Format>
10	-	< 10>	[On]	<Format>
11	-	< 10>	[On]	<Format>
12	-	< 10>	[On]	<Format>
13	-	< 10>	[On]	<Format>
14	-	< 10>	[On]	<Format>
15	-	< 10>	[On]	<Format>
<< Scroll Indicator >>				

Figure 4.3 Device Properties Menu (Cont.)

SCSI ID	Device Identifier	Verify	Restore Defaults
0	-	<Verify>	<Defaults>
1	-	<Verify>	<Defaults>
2	-	<Verify>	<Defaults>
3	SEAGATE ST31055N	<Verify>	<Defaults>
4	-	<Verify>	<Defaults>
5	-	<Verify>	<Defaults>
6	-	<Verify>	<Defaults>
7	53C1030	<Verify>	<Defaults>
8	-	<Verify>	<Defaults>
9	-	<Verify>	<Defaults>
10	-	<Verify>	<Defaults>
11	-	<Verify>	<Defaults>
12	-	<Verify>	<Defaults>
13	-	<Verify>	<Defaults>
14	-	<Verify>	<Defaults>
15	-	<Verify>	<Defaults>
		<< Scroll Indicator >>	

Table 4.5 describes the fields in the Device Properties Menu.

Table 4.5 Device Properties Menu Field Description

Field	Description
SCSI ID	This field indicates the device's SCSI Identifier.
Device Identifier	This field indicates the ASCII device identifier string extracted from the device's Inquiry Data.

Table 4.5 Device Properties Menu Field Description (Cont.)

Field	Description
MB/sec	This field specifies the maximum synchronous data transfer rate in Mbytes/s. Users cannot directly edit this field because the Data Width or MT/s fields determine its setting. The default for this field is 320.
MT/sec	This field indicates the maximum synchronous data transfer rate, in Mega Transfers/s. The default value is 160 MT/Sec. Table 4.6 provides more information.
Data Width	This field indicates the maximum data width in bits. Possible values are 8 or 16. The default value for this field is 16.
Scan Id	This field indicates whether to scan for this SCSI identifier at boot time. Set this option to 'No' if there is a device that you do not want to be available to the system. To decrease the boot time, choose 'No' for unused SCSI IDs.
Scan LUNs > 0	This field indicates whether to scan for non-zero LUNs. LUN 0 is always queried. Use this option if a multi-LUN device responds to unoccupied LUNs, or to reduce the visibility of a multi-LUN device to LUN 0. Set this option to 'No' if there is a problem with a device that responds to all LUNs.
Disconnect	This field allows a device to disconnect during SCSI operations. The default for this field is On. Some newer devices run faster with disconnect enabled, while some older devices run faster with disconnect disabled. This field is not modifiable on integrated RAID volumes.
SCSI Timeout	This field indicates the maximum amount of time [0 to 9999] in seconds to wait for a SCSI operation to complete. Because time-outs provide a safeguard that allows the system to recover if an operation fails, LSI Logic recommends using a value greater than zero. A value of zero allows unlimited time for an operation to complete and could result in the system hanging. The default value for this field is 10 seconds.
Queue Tags	This field allows queue tags for a device. The BSD does not use queue tags. This item specifies queue tag control to higher level device drivers. The possible values of the field are On or Off. This field is not modifiable on integrated RAID volumes. The default for this field is On.
Format	Press Enter to low-level format the device. If enabled, this option allows low-level formatting on a disk drive. Low-level formatting completely erases all data on the drive. Formatting the drive creates a 512-byte sector size, even if the drive was formatted to another sector size.
Verify	Press Enter to verify all sectors on the device and to reassign defective Logical Block Addresses (LBAs).
Restore Defaults	Press Enter to obtain default settings.

Table 4.6 provides information on data transfer rates.

Table 4.6 Data Transfer Rate Information

Mega Transfers/s	Data Width = 8 Bits (Mbytes/s)	Data Width = 16 Bits (Mbytes/s)	Synchronous Period (nsec)
0 = Asynchronous	0 = Asynchronous	0 = Asynchronous	0 = Asynchronous
5	5	10	200
10	10	20	100
20	20	40	50
40	40	80	25
80	–	160	12.5
160	–	320	6.25

4.4.4 Mirroring Properties Menu

The Mirroring Properties Screen allows the user to view and modify the IM settings. This screen lists each device attached and allows the user to set the primary, secondary, and hot spare disks. This screen is only accessible if there is Fusion-MPT firmware running that supports the IM feature and the current configuration supports IM. To determine if the firmware is IM-compatible, view the Product field on the main Adapter List screen. Figure 4.4 provides an example of the Mirroring Properties Menu.

Figure 4.4 Mirroring Properties Menu

LSI Logic Corp. EFI MPT SCSI Setup Utility				Version - x.xx	
Mirroring Properties		Volume SCSI ID: 2		Size (MB):	4567
SCSI ID	Device Identifier	Mirrored Pair	Status	Predict Failure	Size (MB)
0	-	[No]	----	---	----
1	-	[No]	----	---	----
2	SEAGATE ST31055N	[Primary]	Optimal	[No]	4567
3	SEAGATE ST31055N	[Secondary]	Optimal	[No]	4567
4	-	[No]	----	---	----
5	-	[No]	----	---	----
6	-	[No]	----	---	----
7	53C1030	[No]	----	---	----
8	-	[No]	----	---	----
9	SEAGATE ST31055N	[Hot Spare]	----	---	----
|10	-	[No]	----	---	----
11	-	[No]	----	---	----
12	-	[No]	----	---	----
13	-	[No]	----	---	----
14	-	[No]	----	---	----
|15	-	[No]	----	---	----

Table 4.7 describes the fields in the Mirroring Properties Menu.

Table 4.7 Mirroring Properties Menu Field Description

Field	Description
Volume SCSI ID	This field indicates the SCSI identifier of the IM volume.
Size (Mbytes)	This field indicates the size of the IM volume.
SCSI ID	This field indicates the device's SCSI identifier.
Device Identifier	This field indicates the ASCII device identifier string extracted from the device's Inquiry Data.
Mirrored Pair	This field displays which disks are part of the IM volume, and which disks are the primary, secondary, and hot spare disks. There can be one disk set as the primary disk and one disk set as the secondary disk. A hot spare disk is optional.
Status	This field displays the current status of the IM volume. Options for this field are Ok, Missing, Incompatible, Failed, Initing, CfgOffline, UserFailed, Offline, Out of Sync, and Incomplete Mirrored Pair.
Predict Failure	This field displays Predict Failure information. Options for this field are Yes and No.
Size (Mbytes)	This field indicates the size of each disk. After an IM volume is created, this field reflects the size of the disk volume and not the size of each individual disk.

4.5 Exiting the SCSI Setup Utility

Because some changes only take effect after the system reboots, it is important to exit the configuration utility properly. To exit, press Esc and respond to the verification prompts. Some changes might be lost if you reboot before properly exiting the CU.

Chapter 5
Fibre Channel Firmware and Configuration Utility

This chapter provides information about installing and configuring Fibre Channel (FC) firmware and Configuration Utility (CU) for standard operating systems. This chapter contains the following sections:

5.1 General Description

The LSI Logic FC chips and host adapters contain firmware that presents a multiprotocol service layer based on the Fusion-MPT architecture. The FC firmware provides FCP (SCSI-3 over FC) Initiator, FCP Target, and LAN interface services to the host system. The `FC929.ROM` file contains the firmware that supports the LSIFC919 or LSIFC929 chips and their related host adapters.

5.2 FC Firmware

This section includes the features, description, installation, and configuration of the FC firmware.

5.2.1 Features

The LSI Logic FC chips and host adapters:

- Support Fusion-MPT, version 1.2
- Support Concurrent Initiator, Target, and LAN roles
- Act as a Multiple Initiator
- Provide Auto negotiation between 1 Gbit/s and 2 Gbits/s operation
- Support Auto topology configuration (ability to configure N-port, NL-port, or default Auto mode)
- Support Storage Networking Industry Association (SNIA) System Management Firmware Interface
- Support FC device hot-plug
- Support FC tape

5.2.2 Description

The FC controllers operate in an environment where one or more host drivers serve as the interface layer between the operating system and the Fusion-MPT services provided by the LSI Logic FC firmware. The host driver is responsible for initializing the controller, building request message frames, issuing request message frames to the controller, and processing reply message frames received from the controller.

The LSI Logic firmware translates Fusion-MPT message frames into FC specific sequences, frames, and primitives that are delivered to the FC transmit and receive physical interfaces. The firmware-based Link Services library transparently provides all link service support used by the host for all FC topologies. The firmware manages all link exceptions, which isolates the host driver from FC-unique exceptions. The Fusion-MPT architecture enables the use of parallel SCSI host drivers with the FC controllers, with little or no modification to the SCSI host driver.

5.3 Installing the Firmware

You can use the FC Flash CU to update the FC firmware.

5.3.1 Installing the Flash Configuration Utility

The FCUTIL.EXE program runs on DOS on Intel-based hardware. Follow these steps to install the Flash CU.

Step 1. Make a directory on your local hard drive by typing:

```
c:\ md fcutil
```

Step 2. Copy the FCUTIL.EXE into the directory by typing:

```
copy a:\fcutil exe c:\fcutil\*.*/v
```

Step 3. For the Flash CU to work, you must also type:

```
copy a:\dos4gw.exe c:\fcutil
```

5.3.2 Running the Flash Configuration Utility

Use the FCUTIL.EXE program to update the Fusion-MPT firmware on the FC controllers and/or host adapters.

To execute the FCUTIL.EXE program, follow these steps:

Step 1. Type:

```
fcutil
```

The system displays:

```
"Which chip (0 to quit)?"
```

Step 2. Type the number on the left side of the menu and press Enter.

The system displays menu options with the World Wide Port Name and World Wide Node Name for each port of the FC device. This menu also displays each port's current topology, each port's current board speed, the current device path setting, and the current firmware loaded in the Flash.

Step 3. Select the Download Firmware option.

Step 4. Enter the name of the firmware:

`fc929.rom`

`fc929.rom` is the default firmware file name. During the download operation, the controller validates the firmware image and displays a message while loading the firmware image. Flashing the firmware takes approximately 45 seconds.

Step 5. Cycle the power.

5.4 Configuring the Firmware

The LSI Logic firmware supports several configuration options for the FC host adapters. The Fusion-MPT Flash CU provides the ability to configure the FC host adapter(s).

Important. To ensure the configuration change takes effect, reboot your system before selecting another option.

Follow these steps to configure your host adapter:

Step 1. Type:

`fcutil`

The system displays a menu of the detected FC host adapters.

Step 2. Select the host adapter to update.

The system displays:

`"Which chip (0 to quit)?"`

Step 3. Type the number on the left side of the menu and press Enter.

Step 4. The following items detail how to configure various options. Refer to Table 5.1 for information about configuration options.

1. To change the port speeds, use the AutoNegotiation option. By default, AutoNegotiation is enabled.

   If Port 0 is set to a 1 Gbit/s operation, the menu displays:

   ```
   Toggle Port 0 Board Speed to 2 Gbit/s
   Toggle Port 0 Board Speed to Auto
   ```

   If Port 1 is set to 2 Gbit operation, the menu displays:

   ```
   Toggle Port 1 Board Speed to 1 Gbit
   Toggle Port 1 Board Speed to Auto
   ```

2. To change the interrupt coalescing values on Port 0 or Port 1, use the Interrupt Coalescing option. The default values are Queue Depth = 9 and Delay Time = 500 ms.
3. To change the device path, use the Multipathing option. By default, this option is enabled.
4. To change topology, use the AutoToplogy option. By default, this option is enabled.
5. To change adapters, use the Change Adapters option.
6. To exit from this utility, use the Quit option.

Table 5.1 Configuration Options for FC adapters

Option	Description
AutoNegotiation	This option allows the FC chip to automatically adjust to 2 Gbits/s or 1 Gbit/s operation, depending on the link speed of the other nodes on the link. Some older switches or peripherals might prevent this option from working. In those cases, manually set the link speed to either 2 Gbits/s or 1 Gbit/s.
Interrupt Coalescing	This option optimizes system performance by configuring the number of I/O replies that the controller posts to the host driver per host interrupt. The Queue Depth specifies the number of I/O replies that the controller queues before generating a host interrupt. The delay time specifies the amount of time, in milliseconds, to wait for an interrupt to be generated if the number of posted replies is less than queue depth.
MultiPathing	This option recognizes the need to provide a unique Logical ID for each port of a dual ported target. If a dual ported target is attached to a single channel of the FC chip, enabling the MultiPathing option creates two Logical IDs for the single drive, one for each port on the drive. With MultiPathing disabled, the FC chip recognizes that both ports on the target address the same drive and a single Logical ID is created for the drive. Carefully analyze your system and topology requirements before enabling or disabling this option.
AutoTopology	This option allows the FC chip to automatically configure itself for private loop, public loop, and direct N-Port connections. With AutoTopology, the chip starts link initialization with a LIP. If the LIP does not returned to the FC chip, the chip assumes that it is not on a loop and tries to login to an attached switch. If the switch does not respond, the chip assumes it is directly connected to another N-Port.
Change Adapters	This option allows you to switch between FC host adapters.

5.5 Running a Linux Operating System

This section describes the procedure for updating the Fusion-MPT firmware while your Linux operating system is running.

5.5.1 Using the Fusion-MPT Flash Utility

The Fusion-MPT Flash Utility (`mptflash`) updates the Fusion-MPT firmware on Fusion-MPT FC chips and their associated host adapters. This utility uses the MPI FWDownload command to update the firmware image in flash while the current firmware is running. The firmware update becomes effective after a subsequent reboot.

Because the LSIFC929 controller is a dual channel device, each channel appears as two separate I/O Controllers (IOCs) to the system. You only need to perform this update procedure to one of the two visible IOCs for each LSIFC929. Also note that the LSIFC919 and LSIFC929 controllers must use the same firmware image file.

5.5.2 Updating the Firmware

The following examples show procedures for updating the Fusion-MPT firmware on a FC controller chip or host adapter in a Linux OS.

Step 1. Boot your system.

Step 2. Log in as root.

Step 3. Verify that the Fusion-MPT base driver is properly installed by typing:

```
# insmod mptbase
```

The system displays:

```
Fusion MPT base driver 1.02.00
mptbase: Initiating ioc0 bringup
ioc0: FC919: Capabilities=(Initiator, Target, LAN)
mptbase: Initiating ioc1 bringup
ioc1: FC929: Capabilities=(Initiator, Target, LAN)
mptbase: Initiating ioc2 bringup
ioc2: FC929: Capabilities=(Initiator, Target, LAN)
mptbase: 3 MPT adapters found, 3 installed.
```

Step 4. Verify the current layout and version of existing Fusion-MPT controllers by typing:

```
# cat /proc/mpt/summary
```

The system displays:

```
ioc0: LSIFC919, FwRev=1000h, Ports=1, MaxQ=256
LanAddr=00:A0:B8:04:78:55, IRQ=9
ioc1: LSIFC929, FwRev=0900h, Ports=1, MaxQ=256
LanAddr=00:A0:B8:04:0B:32, IRQ=10
ioc2: LSIFC929, FwRev=0900h, Ports=1, MaxQ=256
LanAddr=00:A0:B8:04:0B:33, IRQ=5
```

Step 5. Verify that the Fusion-MPT miscellaneous device (ioctl) driver is loaded by typing:

```
# insmod mptctl
```

The system displays:

```
Fusion-MPT misc device (ioctl) driver 1.02.00
mptctl: Registered with Fusion-MPT base driver
mptctl: /dev/mptctl @ (major,minor=10,220)
```

Step 6. Verify that a proper `/dev/mptctl` character special device node exists by typing:

```
# ls -l /dev/mptctl
```

The system displays a message similar to:

```
crw-r--r--r 1 root root 10, 220 Dec 27 16:32
/dev/mptctl
```

If you do not have one a `/dev/mptctl` character special device node, you can create one by typing:

```
# mknod /dev/mptctl C 10 220
```

Step 7. Create the mptflash utility program by changing your directory to the `drivers/message/fusion/utils` subdirectory. Type:

```
#cd /usr/src/linux/drivers/message/fusion/utils
```

Step 8. Type:

```
# make mptflash
```

The system displays:

```
gcc -g -O -Wall -I. -I.. -I../../../../ include -c
mptflash.c\ -o mptflash.o
gcc mptflash.o -o mptflash
```

Step 9. Move the resulting mptflash program by typing:

```
# mv mptflash /sbin
```

Step 10. Find the IOC firmware image by changing your directory and listing the file by typing:

```
#cd /tmp
#ls -l fc929-100.rom
```

The system displays:

```
-rw-rw-r-- 1 fibre fibre 195876 Jul 19 01:00 fc929-
100.rom
```

Run the mptflash utility program by specifying the IOC to update as ioc1 or ioc2.

Step 11. Type at the command prompt:

```
# mptflash fc929-100.rom 1
```

The system displays:

```
step1: Cmd line check: Ok
step2: get_oldver() results: “LSIFC9x9-0.09.00”
step3: open (“fc929-100.rom”): Ok, fwfd=3
step4: stat (“fc929-100.rom”): Ok, size=195876 bytes
step5: malloc(195876): Ok
step6: read(3,,195876): Ok
Current F/W Version = “LSIFC9x9-0.09.00”
New F/W Version = “LSIFC929-1.00.00
                (2001.07.19)”
step7: open(“/dev/mptctl”): Ok, ctlfd=4
pre-step8: ioctl(4,MPTFWDOWNLOAD,)
Okay, this is like, a “really” DANGEROUS procedure.
Are you absolutely sure you want to do this?
(y [n])
```

Step 12. Type y and press Enter.

The system takes approximately 10–25 seconds and then displays:

```
!!! MPT firmware transfer to IOC1 SUCCEEDED!!!
(8 of 8 f/w update steps were successful)
CHANGE EFFECTIVE ONLY AFTER NEXT RESET/ POWER CYCLE
```

Step 13. Reboot your system.

5.5.3 Firmware Troubleshooting

If the firmware download using Fusion-MPT Flash Utility (`mptflash`) fails, reinstall the firmware using the DOS-based Flash CU program.

Chapter 6
Fibre Channel BIOS

This chapter describes the Fibre Channel (FC) BIOS installation process for Intel and Solaris SPARC systems. This chapter contains the following sections:

6.1 Introduction

The system loads the FC BIOS to facilitate booting from FC drivers. The BIOS also contains an embedded configuration manager that configures firmware-provided options. For this release, the BIOS CU is not documented. To make configuration changes, use the Flash CU, which is documented in Chapter 5, “Fibre Channel Firmware and Configuration Utility.” The LSI Logic BIOS integrates with a standard system BIOS, extending the standard disk service routine provided through INT13h.

Two types of BIOS are available for LSI Logic Host Adapters: an Intel BIOS for Intel-based platforms, and Open Boot BIOS for Solaris SPARC platforms.

6.2 FC BIOS

This section provides the features, description, and installation of the FC BIOS.

6.2.1 Intel BIOS Features

The Fusion-MPT FC Intel BIOS:

- Supports Fusion-MPT, version 1.2
- Supports selection and configuration for up to 256 adapters
- Allows boot device selection from any four host adapters
- Offers configuration options for AutoNegotiation, AutoTopology, and MultiPathing
- Provides automatic INT13 drive mapping for FC drives
- Uses a shared interface with the Fusion-MPT SCSI BIOS and CU

6.2.2 Solaris SPARC BIOS Features

The FC Solaris SPARC BIOS is an Fcode image that:

- Supports Fusion-MPT, version 1.2
- Offers configuration options for AutoNegotiation, AutoTopology, and MultiPathing
- Uses a shared interface with the Fusion-MPT SCSI BIOS and CU

The Solaris SPARC system must have the available resources listed in Table 6.1 to install the Fusion-MPT host adapters.

Table 6.1 Solaris SPARC Resources

Resource	Requirement
Host Bus Slot	Sun Solaris system with available PCI slot
Operating System	Solaris 2.6 release or later
Firmware	OpenBoot PROM Version 3.0 or greater

6.2.3 Description

During the boot time initialization, the FC BIOS determines if there are other hard disks, such as an IDE drive, already installed by the system BIOS. If there are, the FC BIOS maps any FC drives it finds behind the drive(s) that are already installed. Otherwise, the FC BIOS installs drives starting with the system boot drive and the system boots from a drive controlled by the FC BIOS.

6.3 Updating the BIOS and Firmware

The BIOS and Fcode images (for Solaris SPARC) are updated using the FC Flash Configuration Utility. To install this configuration utility (`FCUTIL.EXE`), follow the directions in Section 5.3.1, “Installing the Flash Configuration Utility,” page 5-3.

To update the BIOS and Fcode images from a file, follow these steps:

Step 1. Execute the `FCUTIL.EXE` by typing at the command prompt:

```
C:\fcutil
```

Step 2. Press Enter.

Step 3. Select the host adapter.

Step 4. Press Enter.

Step 5. Select the Update BIOS menu option to download the BIOS and Fcode image. The system prompts you to enter a filename for the BIOS image.

Step 6. Enter the source file for BIOS image:

`mptbios.rom`

or

Press Enter to select the default value. The system prompts you to select one of two options. The Solaris SPARC Fcode image for the LSI44929 is `lsi929f.rom`. The Solaris SPARC Fcode image for the LSI40919 is `lsi919f.rom`.

Step 7. Enter the source file for Fcode image:

`lsi929f.rom`

or

`lsi919f.rom`.

The Intel BIOS and Solaris Fcode images are downloaded together. The system displays a download message while writing the images to the host adapter.

Chapter 7
Windows Driver Installations

This chapter describes the SYMMPI.SYS driver Windows-based operating system and provides installation instructions for various Windows operating systems. This chapter contains the following sections:

7.1 Windows Device Driver Description

Microsoft and LSI Logic provide the miniport device driver, called SYMMPI.SYS. The SYMMPI.SYS driver is named “LSI Logic PCI SCSI/FC MPI MiniPort Driver,” and completes the path to the LSI Logic controller with an optional SCSI or FC BIOS. The SYMMPI.SYS driver supports the LSI53C1030, LSI53C1020, LSIFC929, LSIFC919, and LSIFC909 controllers, as well as their associated host bus adapters.

The SYMMPI.SYS driver contains these features:

- Supports 320 Mbytes/s parallel SCSI transfers
- Supports Integrated Mirroring™ technology
- Supports PCI and PCI-X bus protocols
- Supports 1 and 2 Gbaud FC transfers
- Supports Fusion-MPT common software interface

- Supports multiple host adapters
- Supports multiple Logical Unit Numbers (LUNs)
- Supports Scatter-Gather operations
- Supports SCSI pass-through functionality
- Supports disk array configurations with no LUN 0
- Supports disk array configurations with noncontiguous LUNs
- Auto request sense
- Supports a maximum block size of 1 Mbyte

Depending on the media used to distribute the LSI Logic drivers (web or CD-ROM), you might need to create a driver diskette. To do so, copy the files listed for your operating system in Table 7.1 to the root directory of a clean diskette and label this diskette “Windows Driver Diskette” and use it during the installation process. You can also download the current drivers from the LSI Logic web site at `http://www.lsilogic.com`.

Table 7.1 Fusion-MPT Device Driver Files for Windows OS

Windows OS	Files
Windows NT 4.0	`TXTSETUP.OEM`, `SYMMPI.SYS`, `SYMMPI.TAG`, `OEMSETUP.INF`
Windows 2000	`TXTSETUP.OEM`, `SYMMPI.SYS`, `SYMMPI.TAG`, `OEMSETUP.INF`, `SYMMPI2K.CAT`
Windows XP	`\txtsetup.oem`, `\symmpi.tag`, `\32_bit\oemsetup.inf`, `\32_bit\symmpi.sys`, `\64_bit\oemsetup.inf`, `\64_bit\symmpi.sys`, `\32_bit\mpixp32.cat`, `\64_bit\mpixp64.cat`
Windows 98	`SYMMPI.MPD`, `SYMMPI.INF`, `SYMMPI.CAT`
Windows Millennium	`SYMMPI.MPD`, `SYMMPI.INF`, `SYMMPI.CAT`

The Windows-based operating systems runs on Intel architecture processors using current technology and provides a graphical user interface environment. An I/O manager handles I/O requests for the operating system. It also provides class drivers for hard disk, optical, CD-ROM, printer, and scanner peripherals. You can add other class drivers to support new devices. The Windows operating systems described in the guide provide tape device support and does not require a class driver for tape devices.

The SYMMPI.SYS driver meets the Microsoft specification for miniport drivers. This driver allows connection of parallel SCSI and FC devices for PCI and PCI-X based machines. The SYMMPI.SYS driver files does not require any changes.

A Windows application passes commands directly to the SCSI or FC devices by using the SCSI pass-through facility. This facility allows applications to control and access devices directly by filling in a data structure and calling into the port or class driver. Refer to the Microsoft Windows documentation for more details.

7.1.1 Miniport Driver Configuration Options

By default, the SYMMPI.SYS driver provides optimum performance in most standard systems. Some nonstandard systems require fine tuning to obtain peak system memory utilization and performance. If you observe less than the advertised functionality and performance on any platform after installation, please contact LSI Logic Technical Support. Go to the LSI Logic technical support home page at:

http://www.lsilogic.com/support/index.html#hotline

and call the listed number for assistance. LSI Logic can provide additional registry settings to customize the driver for specific systems and applications.

7.2 Windows 98 Driver Installation

This section describes the SYMMPI.SYS driver for the Windows 98 operating system and includes these topics:

- Section 7.2.1, “New System Installation”
- Section 7.2.2, “Existing System Installation”

The following procedures install the SYMMPI.SYS driver onto a new or existing Windows 98 system.

7.2.1 New System Installation

This procedure installs the SYMMPI.SYS driver onto a new Windows 98 system. Follow these instructions for new system installations:

Step 1. Start the Windows 98 according to the Microsoft instructions.

Step 2. Go to the Start Menu and choose Settings-->Control Panel.

Step 3. Select System and click on the Device Manager tab.

Step 4. Under the Other Devices section, double-click on the PCI SCSI Bus Controller.

Step 5. Select the Re-install Driver button under the General Tab, and click Next.

Step 6. Select the "Search for a better driver than..." and click on Next.

Step 7. Insert the Windows 98 driver diskette.

Step 8. Check the Specify a Location box and type A:\Win98 and click the Next button.

Step 9. Click Next again and click the Finish button.

Step 10. Remove the diskette from the drive and click Yes to restart the computer.

The Windows 98 Setup is complete and the new driver is operational.

7.2.2 Existing System Installation

Review this procedure before you install the SYMMPI.SYS driver onto an existing Windows 98 system. Follow these steps to install the SYMMPI.SYS driver:

Step 1. Boot Windows 98.

The Found New Hardware Wizard window pops up. Click Next.

Step 2. Select the "Search for a suitable driver..." and click on the Next button.

Step 3. Click on the Next button again.

Step 4. Select the Specify Location box, and click Next.

Step 5. Type A:\Win98 and click the OK button.

The next screen displays:

"Windows has found a driver for this device."

Step 6. Click Next, and then Finish.

Repeat Steps 2 through 6 for the second SCSI channel, if one is present.

7.3 Windows Millennium Driver Installation

This section describes the SYMMPI.SYS driver for the Windows Millennium operating system and includes these topics:

- Section 7.3.1, "New System Installation"
- Section 7.3.2, "Existing System Installation"

The following procedures install the SYMMPI.SYS driver onto a new or existing Windows Millennium system.

7.3.1 New System Installation

Follow these instructions for new system installations:

Step 1. Start the Windows Millennium according to the Microsoft instructions.

Step 2. Go to the Start Menu and choose Settings-->Control Panel.

Step 3. Select System and click on the Device Manager tab.

Note: You may have to select the View Control Panel Settings on the left side of the Control Panel window to see the System option.

Step 4. Under the Other Devices section, double-click on the PCI SCSI Bus Controller.

Step 5. Select the Re-install Driver button under the General Tab and select Next.

Step 6. Select the "Specify location of the driver (Advanced)" and click Next.

Step 7. Select the "Search for a better driver..." and check the Specify Location box and uncheck all other boxes.

Step 8. Type `A:\WinMe` in the text area under the Specify Location check box.

Step 9. Insert the driver diskette, and click Next.

Step 10. Click Next again and click the Finish button.

Step 11. Remove the diskette from the drive and click Yes to restart the computer.

The Windows Millennium Setup is complete and the new driver is operational.

7.3.2 Existing System Installation

Follow these instructions for already existing system.

Step 1. Boot Windows Millennium.

The Found New Hardware wizard window pops up.

Step 2. Insert the driver diskette.

Step 3. Select the Install software automatically option, and click on the Next button.

Step 4. Click on the Finish button.

Repeat steps 1–4 for the second SCSI channel, if one is present.

7.4 Windows XP Driver Installation

This section describes the SYMMPI.SYS driver for the Windows XP operating system. It provides instructions for existing system installations and includes these topics:

- Section 7.5.1, “Installing the SYMMPI.SYS Driver”
- Section 7.5.2, “Performance Tuning”

This driver supports only Windows XP.

7.4.1 Installing the SYMMPI.SYS Driver

The following procedures install the SYMMPI.SYS driver onto a new or existing Windows XP system.

7.4.1.1 New System Installation

This procedure installs the SYMMPI.SYS driver onto a new Windows XP system. Windows XP automatically adds the driver to the registry and copies the driver to the appropriate directory.

These instructions assume the use of a CD-ROM. The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system documentation.

Step 1. Start the Windows XP installation by booting from the Windows XP CD-ROM.

The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system’s documentation.

Step 2. Press F6 to install the SYMMPI.SYS driver when the screen displays:

“Press F6 if you need to install...”

Note: You must press F6 for the system to recognize the new driver. Otherwise, the system does not recognize the devices controlled by the driver during the Windows setup.

Step 3. Choose S to specify an additional device when the screen displays:

"Setup could not determine the type..."

Note: If this screen is not displayed as the first user input, then the F6 key press was not seen by the setup program. Reboot the system and return to Step 2.

The system prompts for the manufacturer-supplied hardware support disk.

Step 4. Insert the Window XP driver diskette and press Enter.

Step 5. Select the appropriate Windows XP driver from the menu by highlighting it and press Enter to proceed.

Step 6. Follow the Windows XP installation procedure from this point.

7.4.1.2 Existing System Installation

This procedure installs or upgrades the SYMMPI.SYS driver onto an existing Window XP system.

Step 1. Boot Windows XP.

The Found New Hardware Wizard appears. The information on the first page of this window identifies the SCSI controller and requests the driver diskette.

Step 2. Insert the Windows XP driver diskette into the floppy drive.

Step 3. Choose the Install Software Automatically option.

Step 4. Click on the Next button.

Step 5. In some cases, a message displays saying that this driver is not digitally signed. This message informs you that a nonsigned driver is being installed. Click on Continue Anyway.

Step 6. The system loads the driver from the Windows XP driver diskette and copies the driver to the system disk.

The Found New Hardware Wizard screen appears and displays the message:

"The wizard has finished..."

Step 7. Click on the Finish button to complete the driver upgrade.

Step 8. Repeat this process for the second channel, if one is present.

7.4.2 Performance Tuning for Windows XP

Windows XP offers registry entries that can tune the performance of SCSI I/O for certain configurations. The tunable parameters are the large transfer block size support and the guaranteed number of concurrent I/Os for a particular SCSI bus.

7.4.2.1 Large Block Size Support

The `SYMMPI.SYS` drivers can support up to a 1 Mbyte transfer size in Windows XP; however, the default Windows XP transfer size is 64 Kbytes. To enable better performance, the driver installation process adds a registry entry to enable 256 Kbytes transfer sizes. Programmers can also use the `mpi_256K.reg` file to set or re-enable the maximum transfer size. There are two methods to add this registry setting. The first method is to locate the `mpi_256K.reg` data file using Windows Explorer, double-click on the file, and edit it. The second method is to type at the command prompt:

```
regedit mpi_256K.reg
```

This command inserts an entry in the registry to enable 256 Kbytes block size support.

Editing the `mpi_256K.reg` can set any maximum block size between 64 Kbytes and 1 Mbyte. The formula to calculate the proper value for MaximumSGList in a 32-bit OS is:

MaximumSGList = [(Maximum Block Size)/4 Kbytes] + 1

For 64-bit systems, the OS page size is 8 Kbytes instead of 4 Kbytes. Therefore, the maximum transfer size is 2 Mbytes, the default driver installation enables support for 512 Kbytes transfer size, and the formula to calculate the MaximumSGList is:

MaximumSGList = ((Maximum Block Size)/8 Kbytes) + 1

As an example, to determine the MaximumSGList value for 256 Kbytes in a 32-bit OS, take [(256 Kbytes/4 Kbytes) +1] = 65 (or 0x41 in hexadecimal).

The maximum value allowed for MaximumSGList is 255 or 0xFF. For the particular value of 0xFF, the internal value passed to Windows XP is increased to 0x101, allowing support for a full 1 Mbyte transfer.

Read the information in the `mpi_256K.reg` data file before editing it. The system must reboot for the new registry setting to be effective. To reset the maximum block size to the default of 64 Kbytes, follow the instructions above, except use `mpidfblk.reg` as the data file.

7.4.2.2 Maximum Number of Concurrent I/Os (Guaranteed)

Windows XP guarantees a maximum of 32 concurrently active I/Os on a particular SCSI bus. Due to the method of memory allocation, the actual limit of concurrent I/Os can vary between various drivers or versions of drivers. This can have a significant impact on performance benchmarking between different driver versions or adapter vendors. In effect, one adapter could support 80 outstanding I/Os, while another adapter could only support 32 outstanding I/Os.

To enable better performance, the driver installation process adds a registry entry to support 128 concurrent I/Os. If a different maximum value is desired, programmers can use the `mpi100io.reg` data file to add a registry entry that set the maximum numbers of concurrent I/Os. There are two methods to add this registry setting. One method is to locate the `mpi100io.reg` data file using Windows Explorer, double-click on the file, and edit it. The other method is to type at the command prompt:

```
regedit mpi100io.reg
```

This command inserts an entry in the registry to guarantee a maximum of 100 concurrent I/Os per adapter.

Note: Setting this value to a high number uses increasing amounts of nonpaged pool memory, which is a critical Windows XP resource. High values for this setting can degrade system performance.

Be sure to read the information in the `mpi100io.reg` data file before editing it. You must reboot system for the new registry setting to take effect. To reset the guaranteed number of concurrent I/Os to the Windows XP default of 32, follow the instructions above but use `mpidefio.reg` as the data file.

7.5 Windows NT 4.0 Installation

This section provides instructions for driver installation on the Windows NT 4.0 operating system and includes the following subsections:

- Section 7.5.1, “Installing the SYMMPI.SYS Driver”
- Section 7.5.2, “Performance Tuning”

This driver supports only Windows NT 4.0 and its service packs.

7.5.1 Installing the SYMMPI.SYS Driver

The following procedures installs the `SYMMPI.SYS` driver onto a new or existing Windows NT 4.0 system.

7.5.1.1 New System Installation

This procedure installs the `SYMMPI.SYS` driver onto a new Windows NT 4.0 system. Windows NT 4.0 automatically adds the driver to the registry and copies the driver to the appropriate directory.

To install these drivers onto a Windows NT 4.0 system, you can either boot directly from the Windows NT 4.0 CD-ROM or use Windows NT 4.0 boot floppy driver diskettes. Each installation method requires different steps, which the following sections explain.

CD-ROM Installation – The following steps describe a Windows NT 4.0 installation using a CD-ROM:

Step 1. Start the Windows NT 4.0 installation by booting from the Windows NT 4.0 CD-ROM.

The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Please refer to your system documentation.

Step 2. Press F6 when the screen displays “`Windows NT Setup.`”

Note: You must press F6 for system to recognize the new driver. Otherwise, the system does not recognize the devices controlled by the driver during the Windows setup.

Step 3. Choose S to specify an additional device when the screen displays:

"Setup could not determine the type of one or more mass storage devices...".

Note: If this screen is not displayed as the first user input, then pressing F6 was not seen by the setup program. Reboot the system and return to Step 2.

The system prompts for the driver diskette.

Step 4. Insert the Windows NT 4.0 driver diskette and press Enter.

Step 5. Select the Windows NT 4.0 driver from the menu by highlighting it. Press Enter to proceed.

Step 6. Windows NT 4.0 now recognizes the miniport driver and the SCSI hardware. Press Enter to continue.

Step 7. Follow the Microsoft Windows NT 4.0 installation procedure from this point.

Step 8. Install the Windows NT 4.0 Service Packs 5 or higher after Windows NT 4.0 installation completes.

Boot Floppy Disk Installation – The following steps describe a Windows NT 4.0 installation using a boot floppy disk:

Step 1. Start the Windows NT 4.0 installation by booting from the Microsoft Setup floppy diskette.

Step 2. Press Enter when the "Welcome to Setup" screen appears. The "Windows NT 4.0 Workstation Setup" window appears next.

Step 3. Press S to skip automatic detection and perform manual selection. A screen displays the message:

"Setup has recognized the following mass storage devices in your computer..."

Step 4. Choose S to configure additional adapters when a screen displays the adapters found.

Step 5. Move the highlight bar to Other and press Enter. The system prompts for the driver diskette.

Step 6. Insert the Windows NT 4.0 driver diskette and press Enter. The system displays and highlights:

"LSI Logic PCI SCSI/FC MPI MiniPort Driver"

Step 7. Press Enter to proceed. The Windows NT Workstation Setup window reappears.

Step 8. If using an IDE CD-ROM for installation, press S to load additional drives. Another window appears. Scroll up and select:

"IDE CD-ROM (ATAPI 1.2)/PCI IDE Controller"

Press Enter.

Otherwise, press Enter if you have completed configuring additional adapters.

Upon exiting, a screen displays the message:

"Setup will load support ..."

Step 9. Press Enter to continue.

This message implies that Windows NT 4.0 recognizes the miniport device driver.

Step 10. Follow the Microsoft Windows NT 4.0 installation procedure at this point.

7.5.1.2 Existing System Installation

To install the SYMMPI.SYS driver, follow these steps:

Step 1. Boot Windows NT 4.0 and log on as Administrator.

Step 2. Click on the Start button. Move to Settings-->Control Panel and click.

Step 3. Double-click on SCSI Adapters.

Step 4. Click on the Drivers tab.

Step 5. Click Add.

A list of installed adapters appears.

Step 6. Click the Have Disk button.

Step 7. When prompted, insert the Windows NT 4.0 driver diskette.

Step 8. Enter the path to copy the driver files from:

A:\NT

Select OK.

Step 9. The driver name “LSI Logic PCI SCSI/FC MPI Driver Install Disk” is highlighted on the Install Driver menu. If it is not highlighted, select it. Choose OK.

Step 10. Choose New.

Step 11. Verify the path to the SCSI Adapter files reads:

A:\NT

If not, enter it as shown above. Select Continue.

Step 12. Remove the diskette from your A: drive.

Step 13. The System Settings Change message displays:

“You must restart your computer before..”

Step 14. Click on the Yes button to restart and reboot Windows NT 4.0. You must restart the computer to load the new driver.

Step 15. Repeat this process for the second channel, if one is present.

7.5.2 Performance Tuning

Windows NT 4.0 offers registry entries that can tune the performance of SCSI I/O for certain configurations. The tunable parameters are the large transfer block size support and the guaranteed number of concurrent I/Os for a particular SCSI bus.

7.5.2.1 Large Block Size Support

The SYMMPI.SYS drivers can support up to a 1 Mbyte transfer size in Windows NT 4.0; however, the default Windows NT 4.0 transfer size is 64 Kbytes. To enable better performance, the driver installation process adds a registry entry to enable 256 Kbytes transfer sizes. You can also use the mpi_256K.reg file to set or re-enable the maximum transfer size. There are two methods to add this registry setting. The first method is to locate the mpi_256K.reg data file using Windows Explorer, double-click on the file, and edit it. The second method is to type at the command prompt:

```
regedit mpi_256K.reg
```

This command inserts an entry in the registry to enable 256 Kbytes block size support.

Editing the `mpi_256K.reg` can set any maximum block size between 64 Kbytes and 1 Mbyte. The formula to calculate the proper value for MaximumSGList is:

MaximumSGList = [(Maximum Block Size)/4 Kbytes] + 1

As an example, to determine the MaximumSGList value for 256 Kbytes take [(256 Kbytes/4 Kbytes) +1] = 65 (or 0x41 in hexadecimal).

The maximum value allowed for MaximumSGList is 255 or 0xFF. For the particular value of 0xFF, the internal value passed to Windows NT 4.0 is increased to 0x101, allowing support for a full 1 Mbyte transfer.

Read the information in the `mpi_256K.reg` data file before editing it. The system must reboot for the new registry setting to be effective. To reset the maximum block size to the default of 64 Kbytes, follow the instructions above, except use `mpidfblk.reg` as the data file.

7.5.2.2 Maximum Number of Concurrent I/Os (Guaranteed)

Windows NT 4.0 guarantees a maximum of 32 concurrently active I/Os on a particular SCSI bus. Due to the method of memory allocation, the actual limit of concurrent I/Os can vary between various drivers or versions of drivers. This can have a significant impact on performance benchmarking between different driver versions or adapter vendors. In effect, one adapter could support 80 outstanding I/Os, while another adapter could only support 32 outstanding I/Os.

To enable better performance, the driver installation process adds a registry entry to support 128 concurrent I/Os. If a different maximum value is desired, programmers can use the `mpi100io.reg` data file to add a registry entry that sets the maximum numbers of concurrent I/Os. There are two methods to add this registry setting. One method is to locate the `mpi100io.reg` data file using Windows Explorer, double-click on the file, and edit it. The other method is to type at the command prompt:

```
regedit mpi100io.reg
```

This command inserts an entry in the registry to guarantee a maximum of 100 concurrent I/Os per adapter.

Note: Setting this value to a high number uses increasing amounts of nonpaged pool memory, which is a critical Windows NT 4.0 resource. High values for this setting can degrade system performance.

Be sure to read the information in the `mpi100io.reg` data file before editing it. You must reboot system for the new registry setting to take effect. To reset the guaranteed number of concurrent I/Os to the Windows NT 4.0 default of 32, follow the instructions above but use `mpidefio.reg` as the data file.

7.6 Windows 2000 Driver Installation

This section describes the `SYMMPI.SYS` driver for the Windows 2000 operating system and includes these topics:

- Section 7.6.1, “Installing the SYMMPI.SYS Driver”
- Section 7.6.2, “Performance Tuning”

This driver supports only Windows 2000.

7.6.1 Installing the SYMMPI.SYS Driver

The following procedures install the`SYMMPI.SYS` driver onto a new or existing Windows 2000 system.

7.6.1.1 New System Installation

This procedure installs the `SYMMPI.SYS` driver onto a new Windows 2000 system. Windows 2000 automatically adds the driver to the registry and copies the driver to the appropriate directory.

The method for installing Windows 2000 on a new system involves using a CD-ROM. Refer to the Microsoft document for installing Windows 2000 using boot floppy diskettes.

Step 1. Start the Windows 2000 installation by booting from the Windows 2000 CD-ROM.

The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system documentation.

Step 2. Press F6 to install the SYMMPI.SYS driver when the screen displays:

"Press F6 if you need..."

Note: You must press F6 for the system to recognize the new driver. Otherwise, the system does not recognize the devices controlled by the driver during the Windows 2000 setup.

Step 3. Choose S to specify an additional device when the screen displays:

"Setup could not determine the type of one or more mass storage devices..."

Note: If this screen is not displayed as the first user input, then pressing F6 was not seen by the setup program. Reboot the system and return to Step 2.

Step 4. The system prompts for the manufacturer-supplied hardware support disk. Insert the driver diskette containing the Windows 2000 device driver and press Enter.

Step 5. Select the Windows 2000 device driver from the menu by highlighting it and press Enter.

Step 6. Press Enter to proceed.

Step 7. Return to the Windows 2000 Setup screen.

Step 8. Press Enter to proceed.

Step 9. Follow the Microsoft Windows 2000 installation procedure at this point.

Step 10. Repeat this process for the second channel, if one is present.

7.6.1.2 Existing System Installation

This procedure installs or upgrades the SYMMPI.SYS driver onto an existing Windows 2000 system.

Step 1. Boot Windows 2000.

The Found New Hardware Wizard begins.

Step 2. Click on the Next button.

Step 3. Click on the "Search for a suitable driver..." button to select it, and then click on the Next button.

Step 4. Click on the Next button.

Step 5. Check the specify location box, uncheck all other boxes, and click on the Next button.

Step 6. Type A:\W2K and click on the OK button.

Step 7. Click on the Next button on the Driver Files Search Results window.

Step 8. Click on the Finish button to complete the driver installation.

Step 9. Repeat this process for the second channel, if one is present.

7.6.2 Performance Tuning

The Windows 2000 operating system has registry entries that you can use to tune the performance of SCSI I/O for certain configurations. The tunable parameters are the large transfer block size support and the guaranteed number of concurrent I/Os for a particular SCSI bus.

7.6.2.1 Large Block Size Support

The SYMMPI.SYS drivers can support up to a 1 Mbyte transfer size in a Windows 2000 system; however, the default Windows 2000 transfer size is 64 Kbytes. To enable better performance, the driver installation process adds a registry entry to enable 256 Kbytes transfer sizes. Programmers can also use the mpi_256K.reg file to set or re-enable the maximum transfer size. There are two methods to add this registry setting. The first method is to locate the mpi_256K.reg data file using Windows Explorer, double-click on the file, and edit it. The second method is to type at the command prompt:

```
regedit mpi_256K.reg
```

This command inserts an entry in the registry to enable 256 Kbytes block size support.

Editing the MPI_256K.REG data file can set any maximum block size between 64 Kbytes and 1 Mbyte. The formula to calculate the proper value for MaximumSGList is:

MaximumSGList = [(Maximum Block Size)/4 Kbytes] + 1

As an example, to determine the MaximumSGList value for 256 Kbytes, take [(256 Kbytes/4 Kbytes) +1] = 65 (or 0x41 in hexadecimal).

The maximum value allowed for MaximumSGList is 255 or 0xFF. For the particular value of 0xFF, the internal value passed to Windows 2000 is increased to 0x101, allowing support for a full 1 Mbyte transfer.

Read the information in the `mpi_256K.reg` data file before editing it. The system must reboot for the new registry setting to be effective. To reset the maximum block size to the default of 64 Kbytes, follow the instructions above, except use `mpidfblk.reg` as the data file.

7.6.2.2 Maximum Number of Concurrent I/Os (Guaranteed)

Windows 2000 guarantees a maximum of 32 concurrently active I/Os on a particular SCSI bus. Due to the method of memory allocation, the actual limit of concurrent I/Os can vary between various drivers or versions of drivers. This can have a significant impact on performance benchmarking between different driver versions or adapter vendors. In effect, one adapter could support 80 outstanding I/Os, while another adapter could only support 32 outstanding I/Os.

To enable better performance, the driver installation process adds a registry entry to support 128 concurrent I/Os. If a different maximum value is desired, programmers can use the `mpi100io.reg` data file to add a registry entry that set the maximum numbers of concurrent I/Os. There are two methods to add this registry setting. One method is to locate the `mpi100io.reg` data file using Windows Explorer, double-click on the file, and edit it. The other method is to type at the command prompt:

```
regedit mpi100io.reg
```

This command inserts an entry in the registry to guarantee a maximum of 100 concurrent I/Os per adapter.

Note: Setting this value to a high number uses increasing amounts of nonpaged pool memory, which is a critical Windows 2000 resource. High values for this setting can degrade system performance.

Be sure to read the information in the `mpi100io.reg` data file before editing it. You must reboot system for the new registry setting to take effect. To reset the guaranteed number of concurrent I/Os to the Windows 2000 default of 32, follow the instructions above but use `mpidefio.reg` as the data file.

7.7 Windows.NET Driver Installation

This section describes the `SYMMPI.SYS` driver for the Windows.NET operating system. It provides instructions for existing system installations and includes these topics:

- Section 7.5.1, “Installing the SYMMPI.SYS Driver”
- Section 7.5.2, “Performance Tuning”

This driver supports only Windows Window.NET.

7.7.1 Installing the SYMMPI.SYS Driver

The following procedures installs the `SYMMPI.SYS` driver onto a new or existing Windows.NET system.

7.7.1.1 New System Installation

This procedure installs the `SYMMPI.SYS` driver onto a new Windows.NET system. Windows.NET automatically adds the driver to the registry and copies the driver to the appropriate directory.

The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system documentation.

Step 1. Start the Windows.NET installation by booting from the Windows.NET CD-ROM.

The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system’s documentation.

Step 2. Press F6 to install the SYMMPI.SYS driver when the screen displays:

"Press F6 if you need to install..."

Note: You must press F6 for the system to recognize the new driver. Otherwise, the system does not recognize the devices controlled by the driver during the Windows setup.

Step 3. Choose S to specify an additional device when the screen displays:

"Setup could not determine the type..."

Note: If this screen is not displayed as the first user input, then the F6 key press was not seen by the setup program. Reboot the system and return to Step 2.

The system prompts for the manufacturer-supplied hardware support disk.

Step 4. Insert the Windows.NET driver diskette and press Enter.

Step 5. Select the appropriate Windows.NET driver from the menu by highlighting it. Press Enter to proceed.

Step 6. Follow the Windows.NET installation procedure from this point.

7.7.1.2 Existing System Installation

This procedure installs or upgrades the SYMMPI.SYS driver onto an existing Window.NET system.

Step 1. Boot Windows.NET.

The Found New Hardware Wizard appears. The information on the first page of this window identifies the SCSI controller and requests the driver diskette.

Step 2. Insert the Windows.NET driver diskette into the floppy drive.

Step 3. Choose the Install Software Automatically option.

Step 4. Click on Next button.

Step 5. In some cases, a message displays saying that this driver is not digitally signed. This message informs you that a nonsigned driver is being installed. Click on Continue Anyway.

Step 6. The system loads the driver from the Windows.NET driver diskette and copies the driver to the system disk.

The Found New Hardware Wizard screen appears and displays the message:

"The wizard has finished..."

Step 7. Click on the Finish button to complete the driver upgrade.

Step 8. Repeat this process for the second channel, if one is present.

7.7.2 Performance Tuning

Windows.NET offers registry entries that can tune the performance of SCSI I/O for certain configurations. The tunable parameters are the large transfer block size support and the guaranteed number of concurrent I/Os for a particular SCSI bus.

7.7.2.1 Large Block Size Support

The SYMMPI.SYS drivers can support up to a 1 Mbyte transfer size in Windows.NET; however, the default Windows.NET transfer size is 64 Kbytes. To enable better performance, the driver installation process adds a registry entry to enable 256 Kbytes transfer sizes. Programmers can also use the mpi_256K.reg file to set or re-enable the maximum transfer size. There are two methods to add this registry setting. The first method is to locate the mpi_256K.reg data file using Windows Explorer, double-click on the file, and edit it. The second method is to type at the command prompt:

```
regedit mpi_256K.reg
```

This command inserts an entry in the registry to enable 256 Kbytes block size support.

Editing the mpi_256K.reg can set any maximum block size between 64 Kbytes and 1 Mbyte. The formula to calculate the proper value for MaximumSGList in a 32-bit OS is:

MaximumSGList = [(Maximum Block Size)/4 Kbytes] + 1

For 64-bit systems, the OS page size is 8 Kbytes instead of 4 Kbytes. Therefore, the maximum transfer size is 2 Mbytes, the default driver installation enables support for 512 Kbytes transfer size, and the formula to calculate the MaximumSGList is:

MaximumSGList = ((Maximum Block Size)/8 Kbytes) +1

As an example, to determine the MaximumSGList value for 256 Kbytes in a 32-bit OS, take [(256 Kbytes/4 Kbytes) +1] = 65 (or 0x41 in hexadecimal).

The maximum value allowed for MaximumSGList is 255 or 0xFF. For the particular value of 0xFF, the internal value passed to Windows.NET is increased to 0x101, allowing support for a full 1 Mbyte transfer.

Read the information in the `mpi_256K.reg` data file before editing it. The system must reboot for the new registry setting to be effective. To reset the maximum block size to the default of 64 Kbytes, follow the instructions above, except use `mpidfblk.reg` as the data file.

7.7.2.2 Maximum Number of Concurrent I/Os (Guaranteed)

Windows.NET guarantees a maximum of 32 concurrently active I/Os on a particular SCSI bus. Due to the method of memory allocation, the actual limit of concurrent I/Os can vary between various drivers or versions of drivers. This can have a significant impact on performance benchmarking between different driver versions or adapter vendors. In effect, one adapter can support 80 outstanding I/Os, while another adapter can only support 32 outstanding I/Os.

To enable better performance, the driver installation process adds a registry entry to support 128 concurrent I/Os. If a different maximum value is desired, programmers can use the `mpi100io.reg` data file to add a registry entry that sets the maximum numbers of concurrent I/Os. There are two methods to add this registry setting. One method is to locate the `mpi100io.reg` data file using Windows Explorer, double-click on the file, and edit it. The other method is to type at the command prompt:

```
regedit mpi100io.reg
```

This command inserts an entry in the registry to guarantee a maximum of 100 concurrent I/Os per adapter.

Note: Setting this value to a high number uses increasing amounts of nonpaged pool memory, which is a critical Windows.NET resource. High values for this setting can degrade system performance.

Be sure to read the information in the `mpi100io.reg` data file before editing it. You must reboot system for the new registry setting to take effect. To reset the guaranteed number of concurrent I/Os to the Windows.NET default of 32, follow the instructions above but use `mpidefio.reg` as the data file.

7.8 Troubleshooting

The `SYMMPI.SYS` driver logs error messages to the system error log. For these errors, the system error log EventID is 11, and the specific error code values are displayed at offset 0x10. Data is displayed in words.

Chapter 8
UNIX Operating System Device Drivers

This chapter describe the Fusion-MPT device driver for various UNIX operating systems. This chapter contains the following sections:

8.1 Solaris 8 Device Driver Installation

This section describes version 5.04.00 of the Fusion-MPT device driver for the Solaris 8 operating systems. This section includes the following subsections:

8.1.1 Introduction

The Solaris 8 operating system for x86 runs on single or multiple processors. It provides a command line interface environment and a graphical environment that incorporates many high level features. Refer to the Sun Microsystems web site (`http://www.sun.com/docs`) for Solaris 8 x86 documentation.

The Fusion-MPT driver package, `LSImptsl`, allows the Solaris 8 operating system to interface with Fusion-MPT devices.

Caution: All other users must be logged off the system when performing this upgrade. Also, any server applications must be shut down before performing this procedure.

LSI Logic recommends placing the system in single user mode because this prevents many services from running and prevents other users from logging in.

Note: LSI Logic has tested this driver software on the Solaris 8 01/01 and 04/01 releases. LSI Logic assumes no responsibility or liability when a user attempts to use this software with other versions of Solaris.

8.1.1.1 Features

The `LSImptsl` driver package supports these features:

- Meets the Sun Microsystems Sun SCSI Common Architecture (SCSA) specifications for device drivers
- 1 Gbaud FC data transfers (100 Mbytes/s)
- 2 Gbaud FC data transfers (200 Mbytes/s)
- Ultra320 SCSI (320 Mbytes/s)
- Multiple host adapters
- Multiple and noncontiguous Logical Unit Number (LUN) support
- Scatter/gather
- Tagged command queuing
- Multiprocessor safe

8.1.1.2 LSI Logic Devices Supported

The `LSImptsl` driver package supports the following devices and their associated host adapters:

- LSI53C1030 dual channel Ultra320 SCSI controller
- LSI53C1020 single channel Ultra320 SCSI controller
- LSIFC929 dual port 2 Gbaud FC controller
- LSIFC919 single port 2 Gbaud FC controller
- LSIFC909 single port 1 Gbaud FC controller

8.1.2 Building the LSImptsl Driver Update Diskette

Before proceeding to the installation instructions, create an LSImptsl driver update diskette for Solaris installations. Do this by copying the raw dd image file onto a 1.44 Mbyte diskette. The image file is named `lsimptsl.dd`. Building the driver update diskette is dependent upon the operating system that you are using.

Note: The current Solarix x86 Fusion-MPT driver is also available from the LSI Logic web site at `http://www.lsilogic.com`.

8.1.2.1 Solaris Systems

Follow these steps to create the LSImptsl driver diskette on a Solaris system:

Step 1. Insert a clean 3.5-inch diskette into the floppy diskette drive.

Step 2. At the shell prompt, type:

```
#volcheck -v
#dd if=/<path>/lsimptsl.dd
of=/vol/dev/aliases/floppy0 bs=32768
#eject floppy
```

<path> is the path to the directory holding the lsimptsl.dd. The "dd" command copies the image to the floppy diskette.

Step 3. Label this diskette "LSImptsl Driver Diskette."

8.1.2.2 For DOS of Windows System Users

To create the LSImptsl Driver Update diskette, use a utility that copies the raw dd image onto a 1.44 Mbyte diskette. LSI Logic recommends the `FDIMAGE.EXE` program, which is a public utility. This program and operating instructions are available through the World Wide Web or CD-ROM. The FDIMAGE utility is available from the LSI Logic web site.

To create the LSImptsl driver diskette, follow these steps:

Step 1. Insert a formatted 3.5-inch (1.44 Mbyte) diskette into the floppy drive.

Step 2. At the command prompt, type:

```
fdimage -qv lsimptsl.dd A:
```

Note: This command works when running MS-DOS, Windows 9x, Windows Me, Windows NT, or Windows 2000 operating systems. If you are running anti-virus software, LSI Logic recommends that you temporarily disable it when running the fdimage program. Otherwise, the fdimage program might not be able to get exclusive access to your floppy drive, which it requires to write the image to a diskette.

Step 3. Label the diskette "LSImptsl Driver."

Step 4. Use this diskette for Solaris 8 installations when the system prompts you to insert the driver diskette.

8.1.3 Installing the Fusion-MPT Solaris Driver

This section provides the LSImptsl driver installation instructions for new and existing systems.

8.1.3.1 New System Installation

Follow the steps below to install the LSImptsl driver diskette on a new Solaris (Intel Platform Edition) system. If booting from a Solaris Device Configuration Assistant Diskette, make sure to use the diskette appropriate for the release of Solaris 8.

Step 1. Insert the boot media and boot the system. For network installations, verify with the system administrator that the Solaris Network Installation image is available on the network.

Step 2. Choose F4_Add Driver when the Solaris Device Configuration Assistant screen appears.

The message "`Enumerating buses...`" appears. Then, the Install Driver Update screen appears.

Step 3. Remove the diskette and insert the Solaris Driver ITU diskette.

Step 4. Press F2_Continue.

The Select Solaris System Version screen appears.

Step 5. Select the appropriate Solaris operating system, and press F2_Continue.

The Loading Driver Update Software screen appears, along with a progress bar that shows the percentage of drivers that have been extracted from the diskette. When the new drivers on the diskette have loaded, the Continue Driver Update Installation screen appears.

Step 6. Repeat Step 3 to Step 5 until all the needed Solaris Driver ITU diskettes are installed.

Step 7. Remove the Solaris Driver ITU diskette. If you booted from the Solaris Device Configuration Assistant Diskette, reinsert it into the diskette drive.

Important: Do not remove the Solaris Device Configuration Assistant Diskette from the drive until the systems displays the following message:

"`If you want to bypass the device configuration and boot screens when the system reboots, eject the Device Configuration Assistant/Boot diskette now.`"

Step 8. Press F2_Continue.

The Solaris Device Configuration Assistant screen appears.

Step 9. Press F2_Continue.

The message "`Enumerating buses...`" appears.

The system scan the devices and displays the Scanning Devices screen. When finished, the system displays the Identified Devices screen.

Step 10. Press F2_Continue.

The system displays a "`Loading driver...`" message and messages about required drivers. After a few seconds, the system displays the Boot Solaris screen.

Step 11. Select the device controller attached to the device that contains the installation medium.

Step 12. Press F2_Continue.

The system displays the drivers for the selected device controller. The system starts the installation program and boots the complete Solaris 8 operating environment.

Step 13. The following messages appear and prompt for each of the Solaris Driver ITU diskette(s) :

```
"Installing unbundled device driver support
Extracting driver list from tree..
<ITU diskette name> driver-name...
Please insert the Driver Update diskette labeled
<ITU diskette name>
Press <ENTER> when ready."
```

Step 14. Remove the Solaris Device Configuration Assistant Diskette.

Step 15. Re-insert the LSImptslDrive ITU diskette and press Enter.

The system installs packages and/or patches that contain the new drivers from the diskette.

Step 16. The system prompts:

```
Please insert the Driver Update diskette labeled
<LSImptsl>
Press Enter when ready.
```

Step 17. Insert the LSImptsl Driver ITU diskette into the floppy drive.

Step 18. The system prompts to create a new instance of the LSImptsl package. Respond "n" and press Enter.

Step 19. The system prompts overwrite the existing instance of LSImptsl driver. Respond "y" and press Enter.

Step 20. If drivers on other Solaris Driver ITU diskettes are required, remove the Driver ITU diskette from the diskette drive, insert the next driver ITU diskette when the system prompts for it, and press Enter.

Step 21. Repeat Step 20 until all the required drivers are installed.

When the installation completes, the system displays: "Installation complete."

Step 22. Remove the diskette from the diskette drive.

Step 23. Reboot the system.

When the Solaris operating environment has finished booting and is running, the new devices are available for use.

8.1.3.2 Existing System Installation

Before adding new or updated drivers, install and configure new hardware devices according to the instructions in the corresponding Device Reference Page.

When the Solaris Intel Platform Edition software is already installed, the simplest way to add new or updated drivers is to install the LSImptsl driver diskettes as patches. For more information about managing diskettes and drives, see the System Administration Guide.

To add new or updated drivers, follow these steps:

Step 1. Go to the root directory.

Step 2. To see if the Volume Management software is running on the machine that you are updating, type:

```
# ps -ef | grep vold
```

Step 3. To stop Volume Management temporarily if it is running, type:

```
# /etc/init.d/volmgt stop
```

Step 4. Insert the Solaris Driver ITU diskette into the diskette drive.

Step 5. Mount the Solaris Driver ITU diskette at the `/mnt` mount point:

```
# mount -F pcfs /dev/diskette /mnt
```

You must mount the Solaris Driver ITU diskette at this point in the file structure to update the system successfully.

Step 6. Execute the install script on the diskette:

```
# /mnt/DU/sol_28/i86pc/Tools/install.sh -i
```

The `install.sh` script searches for all new or updated drivers on the diskette. When a new or updated driver is found, this prompt appears:

```
Unconditionally installing ITUs <ITU driver names>
Do you want to create a new instance of this package
[y, n, ?, q]
```

Step 7. If the driver is the one that you want to install, type “y” or press Enter. If the driver is not the one you want to install, type “n.”

If you specify yes, the `install.sh` script installs the indicated driver as well as the `bootmod` and `bootbin` patches.

Step 8. When the installation completes and the `install.sh` script extis, unmount the diskette by typing:

```
# cd /
# umount /mnt
```

Step 9. Remove the Solaris Driver ITU diskette from the diskette drive.

Step 10. Reboot your machine by typing:

```
# reboot
```

Step 11. If you have not already done so, turn off your system, add the new hardware, and reboot your system.

Step 12. At the `<< Current Boot Parameters >>` prompt, type:

```
b -r
```

to force reconfiguration of the machine.

The new devices are available for use when the Solaris operating environment finishes booting and is running.

8.1.4 Upgrading the SYMcasl Driver to LSImptsl

This section provides instructions describing how to upgrade a system currently using the LSI Logic `SYMcasl` driver with the `LSImptsl` driver. Use the normal installation procedure documented in Section 8.1.3.2, “Existing System Installation,” to upgrade the `lsimptsl` driver to a newer version.

Caution: The following procedure can cause permanent data loss. LSI Logic strongly recommends backing up all data before proceeding with this upgrade. LSI Logic recommends that only experienced Solaris system administrators perform this procedure.

The following steps outline the procedure to upgrade the SYMcasl driver the LSImptsl driver.

Step 1. Log on as root or use the `su` command to get super-user privileges.

Step 2. Mount the LSImptsl driver package using the `volcheck` command.

```
Change working directories to:
/floppy/floppy0/DU/sol_28/i86pc/Tools
```


Step 3. Remove the SYMcasl driver package using the `pkgrm` command.

Step 4. Run the `install.sh` shell script in the current working directory.

Step 5. Reboot your system into single-user state. This is a reconfiguration boot. Log in as root.

Step 6. Edit the `/etc/path_to_inst` file and remove any lines containing `SYMcasl.`

The `path_to_inst` file does not have write permissions. It is necessary either to change the permission of the file using the `chmod` command, or to use the forced write command (for the vi-editor, this is "`:w!`").

Step 7. Reboot the system using the `reboot` command. Do not perform a reconfiguration boot because the changes to the `path_to_inst` file will be lost.

8.1.5 Troubleshooting

This section lists some potential error messages. In the message descriptions below, the system replaces the <n> with a number of the SCSI bus that is reporting the error. <s> and <x> are placeholders for strings and numbers that the operating system displays.

Message: `LSImptsl<n>: This hardware not supported by this driver`

Cause/Solution: The `LSImptsl` driver was asked to control an LSI53C1030, LSI53C1020, LSIFC929, LSIFC919, or LSIFC909 located on a host adapter board (HAB) that is manufactured by a company other than LSI Logic. This HAB requires a special driver provided by that manufacturer. Contact the manufacturer for assistance.

Message: `LSImptsl<n>: Failed to map device registers`

Cause/Solution: The `LSImptsl` driver could not access the hardware registers necessary for operation. The operating system did not properly configure the PCI device.

Message: `LSIMPTSL<n>: Hardware not properly enabled by system, cmd=0x<xxxx>`

Cause/Solution: The system has not properly enabled the configuration resources that the `LSImptsl` driver requires to use this hardware. Report the `cmd=0x<xxxx>` value to LSI Logic technical support at 719-533-7230.

Message: `LSIMPTSL<n>: Unsupported 64-bit register address. Please load 64-bit version of kernel and driver`

Cause/Solution: This version of the `LSImptsl` driver does not support physical addresses using 64-bit values. Contact LSI Logic Technical Support at 719-533-7230 to determine if a new driver is available to support 64-bit version. An updated driver may also be located on the LSI Logic web page at: `http://www.lsilogic.com`.

Message: `LSIMPTSL<n>: The host adapter ID in the .conf file is being ignored because the SCSI BIOS Configuration Utility will override it.`

Cause/Solution: The `lsimptsl.conf` file has a line (scsi-initiator-id=x) to change the host adapter SCSI ID. This line is being ignored because the SCSI BIOS Configuration Utility has set the SCSI ID. Please use the SCSI BIOS Configuration Utility to change the SCSI ID.

Message: `LSIMPTSL<n>: Ignored invalid scsi-initiator-id value = <x>`

Cause/Solution: The `lsimptsl.conf` file has an invalid scsi-initiator-id value. The allowable values are between 0 and 128.

Message: `LSIMPTSL<n>: <s> property value is too large. Using maximum value of <x>`

Cause/Solution: A property value in the `lsimptsl.conf` value is greater than the maximum allowed value. The driver uses the value <x> instead.

Message: `LSIMPTSL<n>: <s> property value is too small. Using default value of <x>`

Cause/Solution: A property value in the `lsimptsl.conf` value is less than the minimum allowed value. The driver uses the value <x> instead.

Message: `LSIMPTSL<n>: Could not allocate memory to read configuration data`

Cause/Solution: The driver could not allocate the memory required to process the configuration data. This is because the configuration was not properly determined. To fix this problem, manually configure the driver using the `lsimptsl.conf` file.

Message: `LSIMPTSL<n>: Configuration data is corrupt and will be ignored`

Cause/Solution: The configuration data provided by the SCSI BIOS Configuration Utility has been determined to be corrupted. Run the SCSI BIOS Configuration Utility to correct this error.

Message: `LSIMPTSL<n>: Unable to make reset notification callbacks`

Cause/Solution: The driver could not notify the target device driver of a SCSI bus reset. This error might cause the target driver to malfunction.

Message: `LSIMPTSL<n>: Disabling queue tags for target ID <x>`

Cause/Solution: The `LSImptsl` driver determined that the target is not responding properly to queue tagged I/Os and has disabled queue tags for the device. This is usually because the device does not support queue tags. To disable this message, disable queue tags for the given device using the FC BIOS Configuration Utility.

Message: `Device (ID=<x>, LUN=<x>) not supported`

Cause/Solution: A Solaris target driver attempted to initialize a device whose target ID is out of the supported range or whose LUN is not zero. This warning is most likely triggered by illegal entries in the target driver conf file.

Messages: `LSIMPTSL<n>: ddi_dma_sync() failed for data buffer. Data corruption may occur.`
`LSIMPTSL<n>: ddi_dma_sync() failed for I/O data at <xxxxxxxx>. Data corruption may occur.`
`LSIMPTSL<n>: ddi_dma_sync() failed for Adapter data. Data corruption may occur.`

Cause/Solution: A call to the operating system `ddi_dma_sync` function failed. The system data caches might not be properly synchronized with system main memory, which results in data corruption or a driver failure.

Messages: `LSIMPTSL<n>: ddi_dma_numwin() failed`
`LSIMPTSL<n>>: ddi_dma_getwin() failed`
`LSIMPTSL<n>: ddi_dma_alloc_handle: 0x<xx> unknown/impossible`
`LSIMPTSL<n>: ddi_dma_buf_bind_handle: DDI_DMA_INUSE impossible`
`LSIMPTSL<n>: ddi_dma_buf_bind_handle: 0x<xx> unknown/impossible`
`LSIMPTSL<n>: ddi_dma_unbind_handle: failed`

Cause/Solution: The operating system did not respond to the named routine in a known manner. This is a fatal error that is not recoverable. Report this error to LSI Logic technical support at 719-533-7230.

Messages: `LSIMPTSL<n>: Device in a slave-only slot and is unusable`
`LSIMPTSL<n>: Hi-level interrupts not supported.`

Cause/Solution: The adapter is in a slot that cannot be used with this driver. Move the adapter to a different PCI slot.

Message: `LSIMPTSL<n>: Failed to attach. This adapter will not be installed.`

Cause/Solution: Because of the previous error, this adapter could not attach to the I/O subsystem and is not accessible. See the previous error message and solve that problem.

Messages `LSIMPTSL<n>: Failed to allocate memory`

Cause/Solution: The `LSImptsl` driver could not allocate the memory needed during initialization.

Message: `LSIMPTSL<n>: Unbind failed!`

Cause/Solution: The driver could not unload itself. This is a fatal error.

Message: `LSIMPTSL<n>: Unable to obtain soft state structure.`

Cause/Solution: The driver could not initialize a required data structure and did not load. Please call technical support at 719-533-7230.

Message: `LSIMPTSL<n>: Failed to attach interrupt handler`

Cause/Solution: The driver could not initialize the interrupt handler. Please call technical support at 719-533-7230.

Messages: `LSIMPTSL<n>: The adapter is malfunctioning.`
`LSIMPTSL<n>: The adapter is either malfunctioning, of an unknown type, or a revision that isn't supported.`

Cause/Solution: The driver is not able to communicate with hardware. Update the device driver or the hardware. Device driver updates are available on the LSI Logic web site at `http://www.lsilogic.com`.

Message: `LSIMPTSL<n>: Could not attach to the SCSI subsystem`

Cause/Solution: The `LSImptsl` driver could not communicate with the Solaris SCSA subsystem. Update the device driver. Device driver updates are available on the LSI Logic web site at `http://www.lsilogic.com`.

8.1.6 Solaris SPARC

This section provides instructions for installing the Solaris SPARC Fusion-MPT driver and includes these topics:

- Section 8.1.7, “Introduction”
- Section 8.1.8, “Installing the FC Host Adapters”
- Section 8.1.9, “Installing the Solaris SPARC Driver”
- Section 8.1.10, “Troubleshooting”

8.1.7 Introduction

The Fusion-MPT driver, `itmpt`, allows the Solaris SPARC operating system to interface with the FC LSIFC919 and LSIFC929 controllers. This Fusion-MPT driver is optimized for low CPU overhead and high I/O throughput, making use of the Fusion-MPT architecture. LSI Logic FC host adapters have built-in Fcode, designed to operate in the Sun OpenBoot environment, allowing FC devices to be available to the OpenBoot (ok) prompt. This driver minimizes CPU utilization through including interrupt coalescing, which can result in less than one interrupt per I/O.

To preserve a consistent mapping between Solaris target IDs and FC target devices, the driver maintains a configuration file with entries that map each Solaris target ID to an FC target World Wide Name (WWN). This is done for all FC target devices, and is in addition to the Root Boot persistent target ID selection, which is configurable through the Fcode BIOS. By default, the `itmpt` driver does not maintain persistent bindings between targets and WWNs. However, LSI Logic recommends persistent bindings for most RAID controllers, such as the MetaStor® RAID product.

To configure persistent bindings, LSI Logic provides the `lsiadm` utility and the `lsiprobe` utility to configure the driver. To facilitate updates to the adapter in a native Solaris environment, LSI Logic provides the `lsiupdate` utility. Table 8.1 describes these three utilities.

Table 8.1 Solaris SPARC Utilities

Solaris Utilities	Description
`lsiadm`	Maintains persistent bindings between targets and WWNs by automatically adding bindings to or deleting bindings from the `/kernel/drv/itmpt.conf` file, that the `itmpt` driver uses.
`lsiprobe`	Automatically adds the extended LUN support to or deletes extended LUN support from the `/kernel/drv/ssd.conf` file that the `itmpt` driver uses.
`lsiupdate`	Updates the INT13h BIOS, FCode, and Fusion-MPT firmware that reside on the LSIFC919 and LSIFC929 controllers from a running Solaris machine. This utility communicates through icctls to the `itmpt` driver to perform the updates.

8.1.7.1 Features

The Solaris SPARC Fusion-MPT driver supports these features:

- Fusion-MPT interface for FC, SCSI, and RAID devices using a single binary image.
- A highly efficient, low CPU usage architecture.
- 66 MHz/64-bit PCI interface support provides maximum I/O bandwidth.
- Multiple host adapters.
- Multiple LUNs.
- Scatter/Gather.
- Disk array configurations with no LUN 0.
- Disk array configurations with noncontiguous LUNs.
- Multiprocessor environments.

The lsiadm, lsiprobe, and lsiupdate Solaris SPARC utilities support these features:

- Configures persistent bindings between targets and WWNs (lsiadm)
- Configures extended LUN support (lsiprobe)
- Updates the INT13h BIOS, FCode, and Fusion-MPT firmware that reside on LSIFC919 and LSIFC929 controllers (lsiupdate)

8.1.7.2 LSI Logic Devices Supported

The LSI Logic Solaris SPARC `itmpt` driver supports the LSIFC929, LSIFC919, LSI53C1030, and LSI53C1020 controllers and their associated host adapters.

8.1.8 Installing the FC Host Adapters

This section provides system requirements for installing your FC host adapter(s).

8.1.8.1 System Requirements

Table 8.2 lists the Solaris SPARC system resources that are required to install the FC host adapters.

Table 8.2 Solaris SPARC Resource Requirements

Resource	Requirement
Host Bus Slot	Sun Solaris system with available PCI slot
Operating System	Solaris 2.6 release or later
NetWork Boot Server	SPARC or Intel Solaris boot server[1]
Firmware	OpenBoot PROM Version 3.0 or greater[1]

1. Only required if using the LSI Logic module to support your system disk.

After installing the module in an appropriate PCI slot and making all the necessary internal and external connections to the module, follow the steps in Section 8.1.8.2, “Verifying Correct Installation”.

8.1.8.2 Verifying Correct Installation

Use this procedure to verify installation of your FC host adapters before booting your system:

Step 1. Power on the system. The system displays a banner.

Step 2. Press the Stop-A keys to interrupt the boot process and stop at the `ok` prompt.

Step 3. Use the `show-devs` command to list the system devices. For example, type:

```
ok show-devs
```

The system displays output similar to:

```
/SUNW,UltraSPARC-IIi@0,0
/pci@1f,0
/virtual-memory
/memory@0,10000000
/aliases
/options
/openprom
/chosen
/packages
/pci@1f,0/pci@1
/pci@1f,0/pci@1,1
/pci@1f,0/pci@1/pci@2
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1
/pci@1f,0/pci@1/pci@2/IntraServer,fc@4
/pci@1f,0/pci@1/pci@2/IntraServer,fc@4/disk
/pci@1f,0/pci@1/pci@2/IntraServer,fc@4/tape
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/tape
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/disk
/openprom/client-services
```

Note: The above output is an example. The output of `show-devs` depends on the system configuration. Use the entries corresponding to your system, not those given here.

Step 4. If adapter is not listed, check that it is correctly installed. Reseat the adapter if necessary.

8.1.8.3 Identifying the FC Disks

The `probe-scsi-all` command identifies the FC disk devices on the LSI Logic FC host adapter. To display this information, type:

```
ok probe-scsi-all
```

The system displays output similar to:

```
/pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1
    Target 0
        Unit 0 Disk IBM DNES-309170W SA30
/pci@1f,0/pci@1/pci@2/IntraServer,fc@7
MPT Firmware Version 1.00
Target 0
        Unit 0 Disk SEAGATE ST39173FC 6615
        WWN 220000203710d063 ID 111d2
Target 1
        Unit 0 Disk SEAGATE ST39173FC 6258
        WWN 220000203710c09b ID 111d6
Target 2
        Unit 0 Disk SEAGATE ST39173FC 6258
        WWN 220000203710b066 ID 111d5
Target 3
        Unit 0 Disk SEAGATE ST39173FC 6258
        WWN 220000203710b063 ID 111d3
Target 4
        Unit 0 Disk SEAGATE ST39173FC 6258
        WWN 220000203710b04f ID 111d4
Target 5
        Unit 0 Disk SEAGATE ST39173FC 6615
        WWN 2200002037104f73 ID 111d9
Target 6
        Unit 0 Disk SEAGATE ST39173FC 6615
        WWN 2200002037102d0f ID 111d1
```

If the FC disks on the LSI Logic FC host adapter are not identified by the system, check the following:

- Are all the FC cables correctly connected to the disk enclosure?
- Is the disk enclosure powered up?
- If the external disk enclosure requires a loopback connector, is the loopback connector correctly installed?

8.1.9 Installing the Solaris SPARC Driver

The LSI Logic LSIFC919 and LSIFC929 controllers use the `itmpt` FC Fusion-MPT driver for Solaris. This Fusion-MPT driver is included with the host adapter kit.

Note: If using an LSI Logic FC host adapter for your system disk, use the Network Installation Procedure to load the device driver during installation.

8.1.9.1 Existing System Installation

These instructions provide instructions for installing the Fusion-MPT `itmpt` driver to an existing Solaris operating system.

Note: Log on as root to perform the installation.

To create a directory named install, follow these steps;

Step 1. Uncompress and untar the `itmpt_install.tar.Z` file by typing the following commands:

```
# uncompress itmpt_install.tar.Z
# tar -xvf itmpt_install.tar
# cd install
```

Step 2. Load the `itmpt` driver using the `pkgadd` command by typing:

`pkgadd -d.`

The system displays:

```
The following packages are available:
1 ITImpt LSI Logic/IntraServer FusionMPT(tm)
Fibrechannel/SCSI drivers (sparc) itmpt kit version 1.3
Select package(s) you wish to process (or 'all' to process
all packages).
(default: all) [?,??,q]: 1
Processing package instance <ITImpt> from
</floppy/intraserver>
LSI Logic/IntraServer FusionMPT(tm) Fibrechannel/SCSI
drivers (sparc) itmpt kit version 1.3
IntraServer Technology, Inc / LSI Logic
Using </> as the package base directory.
## Processing package information.
## Processing system information.
2 package pathnames are already properly installed.
## Verifying disk space requirements.
```

```
## Checking for conflicts with packages already installed.
## Checking for setuid/setgid programs.
This package contains scripts which will be executed
withsuperuser permission during the process of installing
this package.
Do you want to continue with the installation of <ITImpt>
[y,n,?] y
Installing LSI Logic/IntraServer FusionMPT(tm)
Fibrechannel/SCSI drivers as <ITImpt>
## Installing part 1 of 1.
/kernel/drv/itmpt
/kernel/drv/itmpt.conf
[ verifying class <none> ]
## Executing postinstall script.
installing /kernel/drv/sparcv9/itmpt
Updating /kernel/drv/ssd.conf with itmpt entries...
Entries added. For support of more than 15 targets or
nonzero
LUNs it may be necessary to edit /kernel/drv/ssd.conf to
addadditional entries.
Following installation, please reboot the system to properly
configure and load the drivers.
Installation of <ITImpt> was successful.
```

8.1.9.2 Network System Installation

If the LSI Logic FC host adapter supports a Solaris SPARC system disk, install the Solaris operating system using a network installation. This section describes a complete installation of Solaris to a client system using LSI Logic FC adapters for the system disk. The method described in this section installs the LSI Logic `itmpt` driver onto a network boot kit, making it available during the SPARC installation process.

If the LSI Logic FC host adapter is an additional storage adapter in an existing system, use the driver installation procedure as follows:

Setting up a Boot/Install Server – Refer to the “Preparing to Install Solaris Software Over the Network” section of the *Solaris Advanced Installation Guide*, available at `http://docs.sun.com`.

To set up a boot and install server, follow these steps:

Step 1. Insert the Solaris distribution CD-ROM in your boot/install server's CD-ROM drive.

Step 2. Change the directory to the Tools area on your Solaris distribution CD-ROM:

```
cd /cdrom/cdrom0/Solaris_2.7/Tools
```

Step 3. Use the `setup_install_server` script to copy the boot and installation files to the boot/install server:

```
./setup_install_server /export/home/install
```

Installing the itmpt Driver on the Boot/Install Server – To install the `itmpt` driver on the Boot/Install server, and run the `install.sh` script with the `–n` parameter to copy the driver kit to the boot server's boot files:

Step 1. Place the diskette in the floppy drive and execute the `volcheck` command.

Step 2. Change the directory to the root of the floppy:

```
cd /floppy/floppy0
```

Step 3. Execute the `install.sh` shell script to add the `itmpt` driver to the boot installation area. Type at the command prompt the following command along with the appropriate directory (all on one line):

```
./install.sh -n
```

For Solaris 2.7 boot files, the directory is

```
/export/home/install/Solaris_2.7
```

For Solaris 2.8 boot files, the directory is

```
/export/home/install/Solaris_2.8
```

The system displays a message that can safely be ignored:

```
major number maximum based on server, not client
```

Running the `install.sh` script copies and installs the Fusion-MPT drivers into the `Tools/Boot/` area of the boot files and allows the boot server to boot FC host adapters for installation.

Adding Clients to Your Boot/Install Server – For each machine that boots into the boot/install server, follow these steps to add a client entry on the boot/install server:

Step 1. Change the directory to the boot/install kit (either Solaris 2.7 or Solaris 2.8):

```
cd /export/home/install/Solaris_2.7/Tools
```

Step 2. Use the `add_install_client` script to add the client machine by typing at the command prompt:

```
./add_install_client -i ipaddr -e ethernetid
client_name platform_group
```

where:

`ipaddr` is the TCP/IP address of the client

`ethernetid` is the Ethernet hardware (mac) address of the client

`client_name` is the client's system name

`platform_group` is the client's vendor defined hardware group

An example is:

```
./add_install_client -i 192.168.103.124 -e 00:08:26:02:25:34
sunsys sun4u
```

Note: Obtain the platform_group from a machine of the same type as the target client using the `uname -m` command.

Booting the Client Using the Boot/Install Server – Begin the installation of the Solaris operating system to the client target machine using the boot and install server.

To boot the network install kit on the client machine, follow these steps.

Step 1. Type this command at the OpenBoot prompt:

```
ok boot net -v
```

Step 2. Choose “Manual Reboot” rather than “Auto Reboot” during the installation of Solaris on the target machine. “Auto Reboot” does not provide the opportunity to complete the installation of the FC Fusion-MPT drivers, and the system fails to boot.

After the system installs the Solaris operating system, the system waits for a manual reboot.

Step 3. Proceed to a console window and run the `/sbin/itmptinst` script, which copies and installs the drivers from the boot server to the newly created Solaris installation. After this script completes, the Fusion-MPT device driver installation is complete.

Step 4. Manually reboot the system.

The system displays a message that can safely be ignored:

```
major number maximum based on server, not client
```

Step 5. The Solaris SPARC system prompts to allow power saving automatic shutdown.

Step 6. Respond “`No`” if you are using the FC host adapter to support your boot disk.

If the disk drive configuration of the machine changes, it might be necessary to issue the command: `touch /reconfigure.` Then, reboot the system so that the system can detect and correctly install the new disks.

8.1.10 Troubleshooting

Refer to the LSI Logic *2 Gbit/s PCI to Fibre Channel Host Adapter User’s Guide* for troubleshooting techniques.

8.2 UnixWare 7 and Open Unix 8 Device Driver Installation

This chapter describes the Fusion-MPT driver version 1.03.04 for the UnixWare 7 and Open Unix 8 operating systems. This document refers to both operating systems as “UnixWare.” This chapter includes the following sections:

Use Fusion-MPT driver version 1.03.00 for UnixWare.

8.2.1 Introduction

UnixWare software extends the UNIX SVR4.2 operating system. UnixWare features include a graphical user interface (GUI), networking, application compatibility, multitasking capability, and multiuser capability. The Fusion-MPT device driver allows UnixWare operating systems to interface with Fusion-MPT devices. The UnixWare Fusion-MPT driver supports the LSI53C1030, LSI53C1020, LSIFC929, LSIFC919, and LSIFC909 devices and their associated LSI Logic host adapters.

8.2.1.1 Features

The UnixWare Fusion-MPT driver supports these features:

- Easy installation using UnixWare tools
- Multiple host adapters
- Multiple and noncontiguous Logical Unit Numbers (LUNs)
- Dynamic interrupt mapping
- Scatter/Gather
- Pass-through functionality
- 1 Ultra320 SCSI bus with 15 SCSI devices per bus
- 8 FC buses with 16 FC devices per bus

8.2.1.2 Driver Diskette Description

The Fusion-MPT driver for UnixWare operating systems is available on a 3.5-inch diskette labeled “Fusion-MPT UnixWare driver.” Use this diskette to load the driver during the installation of the operating system, or to access attached devices after a UnixWare installation. The following sections describe these procedures.

The current UnixWare Fusion-MPT driver is also available from the LSI Logic Web site at `http://www.lsilogic.com`.

8.2.2 Building the Fusion-MPT Driver Diskette

To create a Fusion-MPT driver diskette to use with UnixWare 7 from the raw dd image file, copy the raw dd image file onto a 1.44 Mbyte diskette. The dd image file is in the zipped file that was downloaded from the LSI Logic web site. The following sections describe this process for UNIX and DOS operating systems.

8.2.2.1 UNIX System Users

Follow these steps to create the Unix Fusion-MPT driver diskette on a UNIX system:

Step 1. Insert a blank 3.5-inch (1.44 Mbyte) diskette.

Step 2. Type:

```
dd if=/<path>/unixware.dd of=/dev/fd0
```

In this command, `<path>` is the path the directory where the dd image file resides. This command copies the raw dd image file to the blank diskette.

Step 3. Label this diskette “Fusion-MPT driver diskette.”

8.2.2.2 DOS System Users

Follow these steps to create the UnixWare Fusion-MPT driver diskette on a DOS system:

Step 1. Copy the raw dd image onto a 1.44 Mbyte diskette.

The RAWRITE3.COM utility, which is a public domain utility, can perform this copy. The RAWRITE3.DOC file provides instructions for using this utility. RAWRITE3.COM and RAWRITE3.DOC are in the zipped file downloaded from the LSI Logic web site at `http://www.lsilogic.com`.

Step 2. Label the diskette “Fusion-MPT driver diskette.”

8.2.3 Installing the UnixWare Fusion-MPT Driver

This section provides installation instructions for new and existing UnixWare systems.

8.2.3.1 New System Installation

Step 1. Boot the system using the installation diskettes or CD-ROMs in the UnixWare Operating System media kit.

Step 2. Follow the instructions on the screen.

Step 3. Insert the Fusion-MPT driver diskette when the installation prompts for the host adapter diskette.

The system loads the required drivers and indicates when finished. At the end of the installation, the system prompts you to reinsert the host adapter driver diskette.

Step 4. Insert the Fusion-MPT driver diskette and press Enter. The kernel builds and the installation terminates.

Step 5. Remove the driver diskette when prompted.

Step 6. Reboot your system.

8.2.3.2 Existing System Installation

Before installing the Fusion-MPT driver, make a backup copy of the existing kernel. Follow these steps to back up the kernel and to add or update the UnixWare Fusion-MPT driver:

Step 1. Log on as root.

Step 2. At the shell prompt type:

```
cp /stand/unix    /stand/unix.safe
```

Use this copy of the old kernel to reboot the system if the driver installation fails. Refer to the Section 8.2.4, “Troubleshooting,” page 8-28, for more information.

Step 3. Insert the Fusion-MPT driver diskette after the kernel back-up completes.

Step 4. Load the driver using the pkgadd command:

```
pkgadd -d diskette1
```

Step 5. Select the Fusion-MPT driver package.

The system installation then loads the Fusion-MPT driver.

The system prompts you again to load a driver, even if loading was successful.

Step 6. Type “q” (quit) and press Enter.

Step 7. Verify that the driver loaded successfully by typing:

```
pkginfo mpt
```

If the driver loaded successfully, the package information looks like:

```
system mpt LSI Logic IHV HBA
```

Step 8. Reboot your system by typing this command:

```
init 6
```

During the boot process, the operating system scans the system and lists the devices found. If the kernel panics during boot, then reboot the system with the saved copy of the old kernel. If the reboot is successful, the system is ready to use.

8.2.4 Troubleshooting

If the driver installation fails, reboot the system with the `unix.safe` kernel file that was created before installing the Fusion-MPT host adapter driver. Follow these steps:

Step 1. Reboot your system.

Step 2. Wait for the UnixWare Logo screen to appear, then press the space bar to begin an interactive boot session.

Step 3. Type at the command prompt when the interactive boot prompt appears:

```
boot unix.safe
```

The UnixWare Logo screen reappears and the system boots from the `unix.safe` kernel file.

8.3 SCO OpenServer 5 Device Driver Installation

This section describes how to install the version 1.03.05 of the lsil device driver and configure various peripherals with the SCO OpenServer 5 operating system from Caldera. This section consists of the following subsections:

- Section 8.3.1, “SCO OpenServer Introduction”
- Section 8.3.2, “Installing the OpenServer UNIX Driver”
- Section 8.3.3, “Troubleshooting”

8.3.1 SCO OpenServer Introduction

SCO UNIX is the first UNIX operating system licensed for IBM-compatible microcomputers. The integrated communications, file system, international application support, and documentation create an ideal platform for those requiring a full-featured, UNIX-based operating system. SCO UNIX takes full advantage of the 80386-and-above microprocessor capabilities.

SCO OpenServer 5 provides only one installation diskette, labeled Boot Disk. This diskette, the lsil BTLD driver diskette, and other software media are used during an SCO OpenServer 5 installation. To connect

SCSI devices to one or more host adapters, you must place the proper host adapter driver in the SCO UNIX kernel. The lsil Boot Time Loadable Driver (BTLD) diskette contains one package: lsil. You must link-edit the proper driver into the SCO UNIX kernel. The kernel must reside on the boot drive: either an internal, non-SCSI hard drive or a SCSI hard drive attached to host adapter 0 with SCSI ID 0 and LUN 0. The BTLD permits an easy installation of SCO UNIX with the software provided by Caldera.

The lsil driver allows SCO OpenServer 5 operating systems to interface with SCSI devices connected to the LSI53C1030 family of chipsets and/or LSI53C1030 host adapter cards. Driver 1.03.05 also features support for the LSIFC929, LSIFC919, and LSIFC909 FC chipsets and their associated Host Adapter boards. The current OpenServer drivers are also available for downloading from the LSI Logic web site at `http://www.lsilogic.com`.

The following sections provide instructions for configuring the SCO UNIX kernel with the lsil driver, installing OpenServer UNIX onto a hard drive, and adding peripheral devices. These instructions assume that you are familiar with UNIX system administration.

Several features of the lsil OpenServer device driver are:

- Provides easy UNIX installation through the lsil BTLD diskette
- Supports SureLINK Domain Validation
- Supports multiple host adapters

8.3.2 Installing the OpenServer UNIX Driver

OpenServer UNIX installation requires creation of a kernel that contains driver support for the LSI Logic device. The two possible installation procedures are:

1. Installing OpenServer UNIX and the lsil driver for the first time on a boot drive. For this option, follow the procedure in Section 8.3.2.1, “New System Installation.” A BTLD to provides a user-friendly method for installing OpenServer UNIX onto a hard disk drive.
2. Loading or updating the proper lsil driver to an already created OpenServer UNIX boot drive. For this option, follow the procedure in Section 8.3.2.2, “Existing System Installation.”

LSI Logic recommends that you complete the entire installation in one session.

8.3.2.1 New System Installation

This procedure installs SCO UNIX onto a hard disk drive and builds a new UNIX kernel that includes the lsil driver. Refer to the SCO OpenServer Handbook for more details on SCO UNIX installation.

Step 1. Link the lsil BTLD into the UNIX kernel during installation.

a. Insert the OpenServer UNIX installation diskette and reboot the system. For OpenServer 5, this diskette is labeled Boot Disk.

b. At the prompt, type "`link`" and press Enter.

c. At the next prompt, type "`link`" and press Enter. Do not remove the diskette.

d. When the installation prompts for the diskette, insert either the installation diskette or the lsil BTLD diskette, and press Enter.

The system might prompt for a routine:

```
"Please enter which routine (0-40) to replace'?' to
list):
   'a' to add "lsilinit" at the end [default],
   'n' to do nothing, or
   'q' to quit"
```

Enter the routine number that precedes this message. The system might prompt with another inquiry:

```
"Please enter which routine (0-2) to replace '?' to list),
   'a' to add "lsilpoll" at the end [default],
   'n' to do nothing, or
   'q' to quit"
```

Enter the routine number that proceeded this message.

e. Continue the installation according to the SCO UNIX documentation. The SCO OpenServer 5 system automatically creates a file, unix.safe, during installation. To access this UNIX kernel, type "`unix.safe`".

Step 2. Install SCSI device support by continuing from Step 3 in Section 8.3.2.2, "Existing System Installation."

8.3.2.2 Existing System Installation

This procedure assumes that a OpenServer UNIX installation already exists on a system hard disk drive and builds a new UNIX kernel that includes the lsil driver. Refer to the OpenServer UNIX System Administrator's Reference Manual for more details on SCO UNIX installation.

Step 1. The SCO OpenServer 5 system automatically creates a unix.safe file during installation. To access this UNIX kernel, type "`unix.safe`".

Step 2. Installing the lsil driver

a. Insert the lsil BTLD diskette in the drive. Type "`installpkg`" and press Enter.

b. A prompt appears to insert the requested diskette. Because the BTLD diskette is already inserted, press Enter.

c. A prompt asks for the name of the package. Type "`lsil`" and press Enter.

d. If a driver exists from a previous installation, the installation prompts about replacing it. Press "y" for yes.

e. After the package installation routine completes, relink the kernel by typing "`/etc/conf/cf.d/link_unix`"

f. The installation prompts:

"`Do you want this kernel to boot by default (y/n)?`"

Type "y" and press Enter. The system backs up the old kernel.

g. The installation prompts:

"`Do you want the kernel environment rebuilt (y/n)?`"

Type "y" and press Enter.

h. Reboot the system by typing "`reboot`" and pressing Enter.

Step 3. Adding a SCSI or FC disk drive

If you are not adding a SCSI or FC disk drive, go to Step 4. To add a SCSI or FC disk drive:

a. Type "`mkdev hd`" and press Enter.

b. The installation prompts for the name of the driver. Type "`lsil`" and press Enter.

c. The installation prompts for the host adapter that supports the disk drive. Type the host adapter number and press Enter.

   If you are adding another LSI Logic host adapter to the SCO UNIX kernel, the system might prompt to update the link-kit. Type “y” and press Enter. If you entered the host adapter number incorrectly, type “n” and press Enter. The system then prompts for the host adapter number.

d. In SCO OpenServer 5 installations, the system prompts for the bus number of the disk drive. LSI Logic host adapters support one bus per adapter. Type “`0`” and press Enter.

e. The installation prompts for the target ID of the disk drive. Type the disk drive ID number and press Enter.

f. The installation prompts for the LUN of the disk drive. Type the LUN and press Enter, or press Enter to select the default value of zero.

g. The installation prompts to update the configuration file. Type “y” and press Enter if the displayed values are correct. Type “n” if the values are incorrect and retry from Step d.

h. The installation prompts to create a new kernel. Type “y” and go to Step 6 if this is the last device to add. Type “n” and return to Step 3 if there are more devices to add.

Step 4. Adding a Tape Drive

If you are not adding a tape drive, go to Step 5. To add a tape drive to the system:

a. Type “`mkdev tape`” and press Enter.

b. The Tape Drive Configuration Program menu appears. Select option 1 to install a tape drive, and press Enter.

c. The Tape Drive Installation menu appears. Select option 4 to install a tape drive, and press Enter.

d. From the next list, select the type of tape drive and press Enter.

e. The installation prompts to configure the tape drive. Type “y” and press Enter.

f. The installation prompts for the name of the device driver. Type “`lsil`” and press Enter.

g. The installation prompts for the host adapter that supports the tape drive. Type the host adapter number, and press Enter.

   If you are adding another LSI Logic host adapter to the SCO UNIX kernel, the system might prompt to update the link-kit. Type “y” and press Enter. If you entered the host adapter number incorrectly, type “n”, and press Enter. The system then prompts for the host adapter number.

h. In SCO OpenServer 5 installations, the system prompts for the bus number of the disk drive. LSI Logic host adapters support one bus per adapter. Type “`0`” and press Enter.

i. The installation prompts for the ID of the tape drive. Type the ID number of the tape drive and press Enter.

j. The installation prompts for the LUN of the tape drive. Type “`0`” and press Enter.

k. The installation prompts to update the configuration file. Type “y” and press Enter.

l. A list shows the special devices created. Press Enter.

m. A list shows the links to the installed tape drive. When the system prompts for a boot string, type “q” and press Enter to return to the Tape Drive Configuration Program menu.

n. Type “q” and press Enter to terminate the Tape Drive Configuration Program menu.

o. The installation prompts to create a new kernel. Type “y” and proceed to Step 6 if this is the last device to add. Type “n” and return to Step 3 if there are more devices to add.

Step 5. 5. Adding a CD-ROM Drive

If you are not adding a CD-ROM drive to this system, proceed to Step 6.

a. Type “`mkdev cdrom`” and press Enter.

b. The CD-ROM Configuration Program menu appears. Select option 1 to install a CD-ROM drive and press Enter.

c. The installation prompts to configure the CD-ROM Drive. Type “y” and press Enter.

d. The installation prompts for the name of the device driver that supports this device. Type “`lsil`” and press Enter.

e. The installation prompts for the host adapter that supports the CD-ROM drive. Type the host adapter number and press Enter.

   If you are adding another LSI Logic host adapter to the SCO UNIX kernel, the system might prompt to update the link-kit. Type “y” and press Enter. If you entered the host adapter number incorrectly, type “n”, and press Enter. The system then prompts for the host adapter number.

f. In SCO OpenServer 5 installations, the system prompts for the bus number of the disk drive. LSI Logic host adapters support one bus per adapter. Type “`0`” and press Enter.

g. The installation prompts for the ID of the CD-ROM Drive. Type the ID number and press Enter.

h. The installation prompts for the LUN of the CD-ROM drive. Type the LUN and press Enter, or press Enter for the default value of zero.

i. The installation prompts to update the Configuration file. Type “y” and press Enter.

j. The installation prompts to configure a CD-ROM/TAPE installation device. Type “n” and press Enter.

k. The installation prompts to add a file system. Type “y” and press Enter. The system displays the file system Configuration Program menu. Select option 1 to add and press Enter. The system updates the configuration file and returns to the CD-ROM Configuration Program menu.

l. Type “q” and press Enter to terminate the CD-ROM Configuration Program menu.

m. The installation prompts to create a new kernel. Type “y” and proceed to step 6 if this is the last device to add. Type “n” and return to step 3 if there are more devices to add.

Step 6. Rebuilding the Kernel

a. To rebuild the kernel, type “`/etc/conf/cf.d/link_unix`”

b. The installation prompts:

   “`Do you want this kernel to boot by default (y/n)?`”

   Type “y” and press Enter. The system backs up the old kernel.

c. The installation prompts:

   "`Do you want the kernel environment rebuilt (y/n)?`"

   Type "y" and press Enter.

d. Reboot the system by typing "`reboot`" and pressing Enter.

e. Press Enter to load the new kernel.

8.3.3 Troubleshooting

This section provides a troubleshooting guide.

8.3.3.1 Successful Installation Conditions

This subsection outlines the conditions that exist after a successful installation.

- The `etc/conf/sdevice.d` directory contains a file named "lsil." This file contains the sdevice entries.
- The `etc/conf/cf.d` directory contains the sdevice, mdevice, and mscsi files. The sdev.hdr and mdev.hdr files describe the field entries in the sdevice and mdevice files, respectively.
- The sdevice file contains an lsil entry for each LSI Logic host adapter in the system.
- The second field in the sdevice file reads "Y."
- An lsil entry appears in the mdevice file.
- An lsil entry for each configured device appears in the mscsi file.
- The /`etc/conf/pack.d/lsil` directory exists and contains the driver.o and space.c files.

8.3.3.2 Potential Problems and Solutions

Some potential problems and their suggested solutions are:

1. Difficulty loading the SCO UNIX kernel to an IDE hard drive.

* * * Solution * * *

Only link the kernel if there is a device attached to an LSI Logic host adapter. Follow the instructions in the SCO UNIX Installation documentation. After the installation completes, proceed to Step 2 in Section 8.3.2.2, "Existing System Installation," and use "`installpkg`" to install the lsil device driver.

2. A device is not found.

* * * Solution * * *

Reboot and press `Cntl-C` when the installation prompts to view the LSI Logic Configuration Utility. Verify that the device has the correct host adapter and ID. If the device is not shown, then it could be turned off or a cabling problem could exist.

3. The UNIX system is unreliable after the configuration change.

* * * Solution * * *

After altering the hardware or software configuration is altered, you must rebuild the kernel. Use the /etc/conf/cf.d directory and type:

```
./link_unix
```

4. An error message occurs during the rebuild of the kernel.

* * * Solution * * *

Reinstall the proper lsil driver using the installpkg utility. Relink the kernel and reboot the system.

5. The root disk is not found or the partitioning of the disk fails.

* * * Solution * * *

If the boot drive is a disk, use the BIOS Configuration Utility to check that the disk is assigned ID 0 and is configured to host adapter 0, LUN 0.

8.4 Linux Device Driver Installation

This section provides general information about the Fusion- MPT device drivers for the Linux operating system. This section includes the following subsections:

- Section 8.4.1, “General Description”
- Section 8.4.2, “Installing the Linux Driver Modules”
- Section 8.4.3, “Debugging and Troubleshooting”

8.4.1 General Description

The Fusion-MPT Linux drivers are free software. LSI Logic distributes these drivers in the hope that they are useful, but without any warranty or implied warranty of merchantability or fitness for a particular purpose. Users can redistribute them and/or modify them under the terms of version 2 or later of the GNU Public License as published by the Free Software Foundation. For detailed information on the GNU Public License, contact the Free Software Foundation, Inc., at `http://www.gnu.org/copyleft/gpl.html`, or at 59 Temple Place – Suite 330, Boston, MA 02111-1307.

The Linux Fusion-MPT device driver:

- Supports the Fusion-MPT architecture and common software interface
- Supports SCSI and IETF-compliant LAN protocols over FC
- Supports 1 Gbit/s and 2 Gbit/s FC
- Supports Ultra320 SCSI

The Linux Fusion-MPT device driver supports the following controllers and their associated LSI Logic host adapters:

- LSI53C1030 and LSI53C1020 Ultra320 SCSI controllers
- LSIFC929, LSIFC919, and LSIFC909 FC Controllers

8.4.2 Installing the Linux Driver Modules

LSI Logic provides the driver in binary form for selected releases and provides driver source to enable compilation and installation with any Linux kernel. The Linux kernel source tree must be available to perform these procedures.

8.4.2.1 Installing a Fusion-MPT Controller

LSI Logic provides driver update disks that are suitably formatted to allow installation of Red Hat 7.0, 7.1, 7.1SBE, 7.2, 7.2ASE, or SuSE 7.2, 7.3. The Fusion-MPT driver is bundled in Red Hat 7.3 and SuSE 8.0. You can use the driver disks to upgrade the bundled driver on these installations.

The driver disks are packaged according to the OS vendor and release version. Download the tar files for the version of interest, extract and then use the “dd” command or “rawrite” command to transfer the appropriate image to a diskette.

To install Red Hat 7.3 to an i686 machine, download the `redhat73-2.01.tar.gz` and `RedHat_readme.txt` files.

Extract the Red Hat tar file by typing:

```
# tar xzvf redhat73-2.01.tar.gz
# cd redhat73-2.01
# dd if=rh73_i686.img of=/dev/fd0
```

You must select the appropriate architecture. i386 binaries are not compatible with an i686 installation.

8.4.2.2 Adding or Updating Fusion-MPT Binaries to an Existing Installation

LSI Logic driver disks contain binaries that are compatible with many standard installations. If your installation is supported, you can add these binaries to your installation without being required to patch and rebuild the kernel.

To install the binaries, follow the procedure described above to transfer the appropriate image to a floppy diskette. Then perform the following commands as a root user:


```
# mount /dev/fd0 /mnt/floppy
# cd /mnt/floppy
# ./post_install.scr   (dot-slash)
```

The script “post_install.scr” transfers the binaries on the diskette into the appropriate location in your installation.

If you are not using the Fusion-MPT driver to boot the system, proceed to Section 8.4.2.7, “Loading the Drivers As Modules,” page 8-43. If you are using the Fusion-MPT driver to boot the system, you must recreate the ramdisk image. If you use LILO, you must also rerun LILO and then reboot for the new binaries to be accessible.

8.4.2.3 Adding Fusion-MPT Support to the Kernel

Users must add Fusion-MPT support to the kernel source tree for Red Hat 7.0, 2.2, and 2.4.0 through 2.4.6 kernels. You can unpack the mptlinux driver source tar archive from the root of the Linux kernel source tree, which is normally located at `/usr/src/linux`, by typing:

```
# cd /usr/src/linux
# zcat /tmp/mptlinux-2.01-src.tar.gz | tar xvf -
```

The user must patch the kernel as Section 8.4.2.5, “Kernel Patch Instructions,” describes.

8.4.2.4 Updating the Bundled Fusion-MPT Driver

The mptlinux driver bundled in Red Hat 7.1, Red Hat 7.2, and in the official Linux kernels starting with version 2.4.7, requires an update. Before updating the bundled driver, save the original driver in a compressed tar file by typing:

```
# cd /usr/src/linux/drivers/message
# tar czvf fusion.orig.tar.gz fusion
```

Delete the original driver tree to remove obsolete files and unpack the new driver files by typing:

```
# rm -rf fusion
# cd /usr/src/linux
# zcat /tmp/mptlinux-2.01-src.tar.gz | tar xvf -
```

The user must patch the kernel as Section 8.4.2.5, “Kernel Patch Instructions,” describes.

8.4.2.5 Kernel Patch Instructions

No kernel patches are required if the kernel version is greater than version 2.4.18. All kernel versions less than or equal to kernel version 2.4.18 require a kernel patch. kernel.org provides kernel patches for kernel versions 2.2.12 through 2.2.20, and kernel versions 2.4.0 through 2.4.18. The Red Hat, Caldera, TurboLinux, and SuSE releases provide additional patches, as Table 8.3 and Table 8.4 shows.

Table 8.3 mptlinux Patch Files for Linux Kernel Versions 2.2.x

Patch Files	Linux 2.2.x Kernel Versions
2.2.5-15, 2.2.5-16	Red Hat 6.0
2.2.12-20	Red Hat 6.1
2.2.14-5.0, 2.2.14-6.0	Red Hat 6.2
2.2.16-22	Red Hat 7.0
2.2.14-caldera	Caldera 2.3.1
2.2.18-2	Turbo Linux 6.5

Fusion-MPT LAN support and IA64 support requires a Linux 2.4.x kernel. IA64 support also requires modutils v2.3.15 or newer. Table 8.3 provides a list of Fusion-MPT patch files available for Linux 2.4.x kernel versions.

Table 8.4 mptlinux Patch Files for Linux Kernel Versions 2.4.x

Patch Files	Linux 2.4.x Kernel Versions
2.4.2-2, 2.4.3-12, 2.4.9-6	Red Hat 7.1
None Needed	Caldera 3.1
2.4.3-6	Red hat 7.1SBE

Table 8.4 mptlinux Patch Files for Linux Kernel Versions 2.4.x

Patch Files	Linux 2.4.x Kernel Versions
2.4.4-4GB	SuSE 7.2
2.4.5-3	TurboLinux 7.0
2.4.7-10, 2.4.9-13	Red Hat 7.2
2.4.9-18	Red Hat 7.2 IA64
2.4.9-e.3	Red Hat 7.2ASE
2.4.10-4GB	SuSE 7.3

The following steps illustrate patch installation.

Step 1. To identify the kernel version, display the makefile by typing:

```
# more /usr/src/linux/Makefile
```

On a Red Hat 6.2 system, the system displays:

```
VERSION = 2
PATCHLEVEL = 2
SUBLEVEL = 14
EXTRAVERSION = -5.0
```

Step 2. Apply the closest patch set available. For a Red Hat 6.2 system, type:

```
# patch -p0 <drivers/message/fusion/patch/linux-
2.2.14-5.0.txt
```

The patch set makes changes to the following files:

- `Makefile`
- `arch/alpha/config.in`
- `arch/i386/config.in`
- `arch/sparc64/config.in`
- `drivers/Makefile`
- `drivers/block/genhd.c`
- `include/linux/miscdevice.h`
- `include/linux/proc_fs.h`

Note: There might not be an exact match for the kernel version. Apply the closest patch set. Manual correction of any files for which the patch procedure produces *.rej file sections might be necessary. Optionally, users can hand-apply the required kernel patches by examining the kernel patch files.

8.4.2.6 Driver Build Instructions

The following example illustrates how to configure and build the Fusion-MPT driver(s) as kernel modules. Users can alternatively compile the mptbase and ScsiHost drivers into the Linux kernel.

Step 1. Run normal kernel configuration routine from the `/usr/src/linux` directory by typing:

```
$ make xconfig
```

or

```
$ make menuconfig
```

or

```
$ make config
```

or

```
$ make oldconfig
```

Step 2. Select "`Fusion-MPT Device Support`" to access the Fusion-MPT drivers submenu entries. The system displays:

```
<M> Fusion-MPT (base + ScsiHost) drivers
<M> Enhanced SCSI error reporting
< > Fusion-MPT misc device (ioctl) driver
< > Fusion-MPT LAN driver
```

Step 3. Select "`Fusion-MPT (base + ScsiHost) drivers.`"

Step 4. Enter "`m`" to build support as a module or enter "`y`" to build support into the kernel.

The enhanced SCSI error reporting and ioctl drivers are optional. LSI Logic recommends building these items as modules due to kernel size considerations.

Do not accept the Fusion-MPT LAN driver option because support for this driver is restricted to module use.

Step 5. Turn on FC driver support in the network device support section to enable LAN support.

Step 6. Save the kernel configuration changes.

Step 7. Follow the post configuration instructions and rebuild the kernel. Typically, this includes these commands:

```
# make dep
# make bzImage
```

Step 8. Rebuild the kernel modules by typing:

```
# make modules
```

Step 9. Install newly compiled kernel modules by typing:

```
# make modules_install
```

The output display is similar to:

```
Installing modules under /lib/modules/2.2.14-5.0/block
Installing modules under /lib/modules/2.2.14-5.0/net
Installing modules under /lib/modules/2.2.14-5.0/ipv4
Installing modules under /lib/modules/2.2.14-5.0/scsi
Installing modules under /lib/modules/2.2.14-5.0/fs
Installing modules under /lib/modules/2.2.14-5.0/fs
Installing modules under /lib/modules/2.2.14-5.0/cdrom
Installing modules under /lib/modules/2.2.14-5.0/video
Installing modules under /lib/modules/2.2.14-5.0/net
Installing modules under /lib/modules/2.2.14-5.0/misc
```

Step 10. You must perform the additional steps necessary to make the new kernel bootable. Typically, this involves updating /boot, creating a ramdisk image, and updating and running the boot loader. Refer to your installation documentation for details.

8.4.2.7 Loading the Drivers As Modules

These steps describe how to load the new kernel and modules:

Step 1. Load the Fusion-MPT base driver by typing:

```
# insmod mptbase
```

The system displays:

```
Fusion-MPT base driver 1.02.00
Copyright (c) 1999-2002 LSI Logic Corporation
mptbase: Initiating ioc0 bringup
ioc0: FC919: Capabilities={Initiator,Target,LAN}
mptbase: 1 MPT adapter found, 1 installed.
```

Step 2. Load the isense driver to enable enhanced SCSI error reporting by typing:

```
# insmod isense
```

The system displays:

```
SCSI-3 Opcodes & ASC/ASCQ Strings 1.02.00
mptbase: English readable SCSI-3 OPs & ASC/ASCQ
strings enabled
```

Step 3. If the Fusion-MPT controller is the only SCSI controller in the system, you might need to load the “scsi_mod” module manually. Typically, this module is auto-loaded by the kernel. If the kernel does not auto-load the module, type:

```
insmod scsi_mod
```

Step 4. Load the Fusion-MPT host driver by typing:

```
# insmod mptscsih
```

The system display depends on the attached devices. An example display is:

```
Fusion MPT SCSI Host driver 1.02.00
scsi0 : ioc0: LSIFC919, FwRev=1000h, Ports=1, MaxQ=256,
IRQ=9
scsi : 1 host.
Vendor: SEAGATE   Model: ST39102FC Rev: 0007
Type:   Direct-Access ANSI SCSI revision: 02
Detected scsi disk sda at scsi0, channel 0, id 0, lun 0
Vendor: SEAGATE   Model: ST19171FC Rev: 0017
Type:   Direct-Access ANSI SCSI revision: 02
Detected scsi disk sdb at scsi0, channel 0, id 1, lun 0
SCSI device sda: hdwr sector= 512 bytes. Sectors= 17783240
[8683 MB] [8.7 GB]
sda: sda1
SCSI device sdb: hdwr sector= 512 bytes. Sectors= 17783112
[8683 MB] [8.7 GB]
sdb: sdb1
```

When the mptscsih module loads, the installation detects the FC target devices and maps them to Linux SCSI devices, /dev/sd{a,b,c,...}. All Linux commands pertaining to SCSI disk storage management using the /dev/sdX[N] notation are now functional.

The following example illustrates a typical installation.

```
# fdisk /dev/sdb
# mke2fs /dev/sdb1
# mount /dev/sdb1 /mnt/s1
```

8.4.2.8 Boot Setup Commands

This section outlines the boot command syntax and available arguments. The boot setup commands control Domain Validation, SCSI bus width, and the SCSI synchronous factor.

Fusion-MPT passes setup commands to the mptscsih driver as a string variable by using the 'insmod' command. Specify each string argument with the 'keyword:value' format. The command line only permits digits and lowercase characters. The following example installs the driver module, set the bus width to narrow, and disables Domain Validation.

```
$ insmod mptscsih.o mptscsih="dv:n width:0"
```

Domain Validation Command Argument – This command argument enables or disables Domain Validation on SCSI device driver. This command does not affect FC devices. The command syntax is:

```
dv:n    /* disabled         */
dv:y    /* enabled [default]*/
```

To disable Domain Validation on a per-device basis, set the transfer characteristics in the BIOS to asynchronous/narrow.

Domain Validation uses an internal buffer. Some older SCSI devices freeze if they receive a Read Buffer or a Write Buffer command.

Maximum SCSI Bus Width Command Argument – This command argument enables and disables wide SCSI bus transfers and does not affect FC devices. The command syntax is:

```
width:0    /* wide SCSI disabled */
width:1    /* wide SCSI enabled  */
```

LSI Logic recommends setting the maximum allowed SCSI bus data transfer width to the minimum of the adapter capabilities and NVRAM settings.

Minimum SCSI Synchronous Factor Command Argument – This command argument sets the minimum SCSI synchronous factor for SCSI devices and does not affect FC devices. The command syntax is:

```
factor:0x08   /* Ultra320 (160 Mega-transfers / second) */
factor:0x09   /* Ultra160 ( 80 Mega-transfers / second) */
factor:0x0A   /* Ultra2   ( 40 Mega-transfers / second) */
factor:0x0C   /* Ultra    ( 20 Mega-transfers / second) */
factor:0x19   /* FAST     ( 10 Mega-transfers / second) */
factor:0x32   /* SCSI     (  5 Mega-transfers / second) */
factor:0xFF   /* 5 Mega-trasfers/s and asynchronous     */
```

LSI Logic recommends setting the minimum allowed SCSI synchronous factor to the maximum of the adapters capabilities and NVRAM setting. Programming the minimum synchronous factor to 0xFF sets the synchronous offset to 0 for asynchronous transfers.

8.4.2.9 Configuring Network Interfaces

Both `linuxconf` and `netcfg` configure the Fusion-MPT LAN connection. The following instructions are for using `linuxconf`, but they are easily adapted to `netcfg`.

Step 1. Go to Config->Networking->Client tasks->Basic host information.

Step 2. Select an adaptor.

Step 3. Set the Config mode to Manual.

Step 4. Set the Primary name.

Step 5. Set the IP Address.

Step 6. Set the Netmask. LSI Logic recommends using the default value of 255.255.255.0.

Step 7. Set Net Device to fc0 for the first LAN port, fc1 for the second LAN port, and so on.

Step 8. Select `Enabled` and type `mptlan` on the Kernel module line to activate this interface automatically at boot.

8.4.3 Debugging and Troubleshooting

This section describes several debugging tools and issues.

8.4.3.1 SCSI isense Driver

The Fusion-MPT SCSI isense driver offers enhanced driver error reporting and improved readability. An optional isense driver/shim provides SCSI-3 opcode string lookup and a sorted table of 463 SCSI-3 Additional Sense Code and Qualifier (ASC/ASCQ) strings. LSI Logic translated this table from a text file on the SCSI T10 ftp site located at `ftp://ftp.t10.org/t10/drafts/spc2/asc-num.txt`.

If the isense driver is loaded, the system displays an English-readable ASC/ASCQ string when the system generates a SCSI check condition. For example, the console might display:

```
SCSI Error Report =-=-= (ioc0,scsi5:0)
SCSI_Status=02h (CHECK_CONDITION)
Original_CDB[]: 2A 00 00 00 00 41 00 00 02 00 - "WRITE(10)"
SenseData[12h]: 70 00 02 00 00 00 00 0A 00 00 00 00 04 02 02
00 00 00
SenseKey=2h (NOT READY); FRU=02h
ASC/ASCQ=29h/00h "LOGICAL UNIT NOT READY, INITIALIZING CMD.
REQUIRED"
```

8.4.3.2 /proc Support Features

If the Linux kernel offers the `/proc` file system support, you can examine SCSI devices by typing:

```
$ cat /proc/scsi/scsi
```

You can examine the recognized Fusion-MPT adapters by typing:

```
$ cat /proc/mpt/summary
```

You can determine the Fusion-MPT driver version by typing:

```
$ cat /proc/mpt/version
```

8.4.3.3 Visible but Not Accessible LUNs in a FC RAID system

Depending on the configuration of the RAID controller(s), some of the SCSI devices in a FC RAID system are visible but not accessible. If there are two active controllers in a single subsystem and each controller connects to 8 active LUNs, then all 16 LUNs are visible through each controller. However, only 8 LUNs are accessible through each controller.

Chapter 9
Linux Integrated Mirroring Configuration Utility

This chapter describes the Linux Integrated Mirroring (IM) configuration utility (CU). This chapter contains the following sections:

9.1 Introduction

The Linux Integrated Mirroring Configuration Utility (limcu) configures the IM function on Linux-based, Fusion-MPT SCSI controllers. This utility requires no user interaction. The configuration actions initiated by limcu might not complete before the program exits. But, the configurations actions do complete, even if the system reboots.

IM requires RAID qualified drives. A RAID qualified drive is a drive that is not part of an existing IM or RAID volume, has not been previously configured as a RAID physical disk, and has a sector size of 512 bytes. The *‘-a’* option adds the requirement that the RAID qualified drive must not contain a valid partition table. The erase options (*‘-e’* and *‘-eall’*) erase the partition table.

limcu requires the *mptctl.o*, *mptbase.o,* and *mptscsih.o* drivers. Use *insmod* or *modprobe* to load the *mptctl.o* driver. LSI Logic tested limcu using the Red Hat 7.2 Linux. Users must update the Fusion-MPT bundled driver to the mptlinux-2.00.08 version or newer.

9.2 Command Line Synopsis

The command line syntax for limcu is:

```
limcu -a [-c controller_number] [-so volume_settings] [-ss] [-sz volume_size]

limcu [-c controller_number] -t target_id,target_id[,target_id] [-so volume_settings]
[-ss] [-sz volume_size]

limcu -d [-c controller_number]

limcu -e [-c controller_number] -t target_id[,target_id[,target_id]]

limcu -eall [-c controller_number]

limcu [-c controller_number] [-ve | -vd] [-re | -rd] [-so volume_settings]

limcu [-c controller_number] [-vi “vendor_id”] [-pi “product_id”] [-pr
“product_revision”] \[-vs volume_settings] [-io offset –is size [-io offset –is
size]]
```

9.2.1 Command Line Options

This section describes the command line options for the limcu command.

-a **Automatically create an IM volume**
limcu automatically selects the targets to use when creating an IM volume. This option does not require any other command options. limcu searches controllers in increasing numerical order until identifying a controller that meets the requirements for creating an IM volume. These requirements are: (1) the controller must support IM, and (2) it must have two or more drives that meet the qualifications for use in an IM volume.

limcu chooses targets by their target ID. limcu searches for targets based on valid target IDs, starting with 0 and ending at 15, and terminates the search after three targets are found. limcu must find at least two targets to create an IM volume.

-c **Controller number**

This option specifies the controller to which limcu sends all configuration requests. If this option is not specified, limcu selects the first controller that satisfies the requirements of the requested configuration action. This is typically the first controller that supports IM.

The *-a* option is the only exception. When the -a option is specified, limcu chooses the first controller that supports two or more IM-qualified drives.

-d **Delete IM volume**

This option deletes an existing IM volume and all of the underlying RAID physical disks on a controller. The data on the drives is not altered, but the controller now treats the drives as normal drives. Because this option deletes all RAID volumes and physical disks found on a controller, you can use it to correct corrupted RAID configurations.

-dc **Display Fusion-MPT configuration pages**

This option displays the following Fusion-MPT configuration pages for the selected controller: *Manufacturing page 4*, *IOC page 2, IOC page 3*, *RAID volume page 0*, and *RAID physical disk page 0*. limcu displays the last two pages zero or more times, depending on the current controller configuration. limcu prohibits use of this option with any option that creates a disk volume.

-e **Write zeroes to specified disks**

This option writes zeroes to the first 64 sectors of the specified disk drive(s) that are attached to a specific controller. The *'-t'* option specifies a maximum of three disks, or the *'-c'* option specifies a specific controller. If neither the *'-t'* or the *'-c'* options are specified, limcu writes zeroes to the first IM-capable controller found.

-eall **Write zeroes to all disks**

This option writes zeroes to the first 64 sectors of all RAID volumes or RAID qualified disk drives that are attached to a single controller. The *'-c'* option specifies the controller, or limcu chooses the first IM-capable controller found.

-i **Read options from standard input**

This option causes limcu to read command options from standard input until encountering an end-of-file (EOF). limcu parses the command line and standard input options to create the final set of command options. The *'-v'* option displays the outcome of this process. Command line options take precedence over standard input options. The option syntax does not allow the user to disable standard input options.

-io offset_value

Information offset option

This option changes the information offset to the specified value. Users can specify this option twice. Because the *'-io'* and *'-is'* options are pairs, users must specify the *'-is'* and *'-io'* options the same number of times.

-is size_value

Information size option

This option changes the information size to the specified value. Users can specify this option twice. Because the *'-io'* and *'-is'* options are pairs, users must specify the *'-is'* and *'-io'* options the same number of times.

-nr **No reboot option**

By default, limcu reboots the system after creating or deleting an IM volume. This option stops the reboot.

-pi "product_id_string"

Change product identification string

This option changes the product ID string of an IM volume. The string can be 0 to 16 characters long. If the user specifies fewer than 16 characters, the remaining characters become spaces.

-pr "product_revision_string"

Change product revision string

This option changes the product revision string of an IM volume. This string can be 0 to 4 characters long. If the user specifies fewer than 4 characters, the remaining characters become spaces.

-rd **Disable drive synchronization**

This option takes the secondary drive off line.

-re **Enable drive synchronization**
This option brings the secondary drive on line. The controller resynchronizes the drives.

-so volume_settings
Volume Settings Override
This option creates a volume or changes the volume settings on an existing volume.

-ss **Disable Disk Synchronization**
This option disables disk synchronization during creation of an IM volume. Use this option if the primary disk contains invalid data.

-sz maximum_volume_size_in_mbytes
Limit Volume Size
This option limits the size of the IM volume. The parameter for this option is the size of the volume in Mbytes and must be a number between 1 and 999,999, inclusively. Use this option when creating an IM volume.

-t target_id_list
Specify Target ID(s)
This option specifies up to three SCSI target IDs for a configuration action.

-v **Verbose**
This option prints additional information about the requested actions.

-vd **Volume Disable**
This option disables an IM volume. When a volume is disabled, the drives are no longer in sync.

-ve **Volume Enable**
This option enables an IM volume and causes the controller to resynchronize the disk volumes.

-vi “vendor_id_string”
Vendor Identification
This option changes the vendor ID string of an IM volume. This string can be 0 to 8 characters long. If the user specifies fewer than 8 characters, the remaining characters become spaces.

-vs volume_settings

Default Volume Settings

This option changes the default IM volume settings. limcu uses the default settings if the user does not specify the *'-so'* option when creating an IM volume.

9.2.2 Example Command Usage

This section provides examples of limcu command line usage.

`limcu -a`

This command line creates an IM volume on the first IM capable controller that connects with two or more available drives.

`limcu -c 0 -t 0,5,3`

This command line creates an IM volume on controller number 0, and assigns SCSI ID 0 to the primary drive, SCSI ID 5 to the secondary drive, and SCSI ID 3 to the hot spare drive.

`limcu -c 4 -t 10,8`

This command line creates an IM volume on controller number 4, and assigns SCSI ID 10 to the primary drive and SCSI ID 8 to the secondary drive. This command line does not create a hot spare drive. The SCSI ID of the IM volume is 8, because the IM volume uses the lowest ID of the primary and secondary drives.

`limcu -d`

This command line deletes all the IM volumes and RAID physical disk drives on the controller.

9.3 Error Messages

This section describes limcu error messages. The error number and message is listed in bold, and the description immediately follows. limcu stops operating after encountering an error. If multiple problems exist, multiple runs of the utility are necessary to locate them.

E001: Could not allocate memory

An attempt to allocate memory using the C library memory allocation functions failed. Unload any unneeded programs or daemons that might be running. If this is not successful, add more memory to the system. limcu allocates a number of buffers during execution, but none are large and most are freed when no longer needed.

E002: No executable options were entered on the command line

There were no executables on the command line.

E003: Bad or malformed option

limcu encountered an unrecognizable option. Check for undefined options or valid options with extraneous characters at the end of them. The option must also begin with a '-' or a '/'.

E004: Controller option entered more than once

limcu permits a single controller option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E005: Controller number format is bad

The controller number is either missing or contains an invalid character. The controller number must use the same numerical constant formats as are in the C programming language (for example., 4, 0xa, or 010).

E006: Too many target IDs were entered

limcu permits a maximum of three target IDs. To erase more than three disk drives, either invoke limcu multiple times or use the erase all option.

E007: Target ID number format is bad

The target ID number is either missing or contains an invalid character. The target ID number must use the same numerical constant formats as are in the C programming language (e.g., 4, 0xa, or 010).

E008: Volume settings override entered more than once

limcu permits a single volume settings override option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E009: Volume settings override number format is bad

The volume settings override value is either missing or contains an invalid character. This value must be entered as a 4-digit hexadecimal number.

E010: Drive maximum size option is entered more than once

limcu permits a single drive maximum size option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E011: Drive maximum size number format bad

The drive maximum size value is either missing or contains an invalid character. The drive maximum size value must use the same numerical constant formats in the C programming language (for example, 4, 0xa, or 010).

E012: Autocreate volume option entered more than once

limcu permits a auto create volume option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E013: Resynchronization disable option entered more than once

limcu permits a single disable volume resynchronization option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E014: Resynchronization disable option format is bad

The disable volume resynchronization option does not have a parameter. Check for extraneous characters at the end of the option.

E015: Resynchronization enable option entered more than once

limcu permits a single enable volume resynchronization option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E016: Resynchronization enable option format is bad

The enable volume resynchronization option does not have a parameter. Check for extraneous characters at the end of the option.

E017: Delete volume option entered more than once

limcu permits a single delete volume option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E018: Display configuration pages option entered more than once

limcu permits a single display configuration pages option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E019: Erase disks option entered more than once

limcu permits a single erase disks option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option is entered more than once in either case.

E020: Erase all disks option entered more than once

limcu permits a single erase all disks option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E021: Disable volume option entered more than once

limcu permits a single disable volume option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E022: Disable volume option format is bad

The disable volume option does not have a parameter. Check for extraneous characters at the end of the option.

E023: Enable volume option entered more than once

limcu permits a single enable volume option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E024: Enable volume option format is bad

The disable volume option does not have a parameter. Check for extraneous characters at the end of the option.

E025: Vendor ID option entered more than once

limcu permits a single vendor ID option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E026: Vendor ID string format is bad

The entered string is either too long (>8 characters, not including quotation marks), contains an opening set of double quotation marks but lacks a closing set, or contains a non-ASCII character.

E027: Persistent volume settings option entered more than once

limcu permits a single persistent volume settings option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E028: Persistent volume settings number format is bad

The persistent volume settings value is either missing or contains an invalid character. It must be entered as a hexadecimal number.

E029: Product ID option entered more than once

limcu permits a single product ID option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E030: Product ID string format is bad

The string entered is either too long (>16 characters, not including quotation marks), contains an opening set of double quotation marks but lacks a closing set, or contains a non-ASCII character.

E031: Product revision option entered more than once

limcu permits a single product revision option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E032: Product revision string format is bad

The string entered is either too long (>4 characters, not including quotation marks), contains an opening set of double quotation marks but lacks a closing set, or contains a non-ASCII character.

E033: Data offset option entered more than twice

limcu permits two data offset option entries. It is permissible to enter it twice on the command line and twice in the standard input stream. limcu flags a fatal error if the option entry occurs more than twice in either case.

E034: Data offset number format is bad

The data offset number is either missing or contains an invalid character. The drive maximum size value must use the same numerical constant formats in the C programming language (for example, 4, 0xa, or 010).

E035: Data size option entered more than twice

limcu permits two data size option entries. It is permissible to enter it twice on the command line and twice in the standard input stream. limcu flags a fatal error if the option entry occurs more than twice in either case.

E036: Data size number format is bad

The data size number is either missing or contains invalid character. The drive maximum size value must use the same numerical constant formats in the C programming language (for example, 4, 0xa, or 010).

E037: Format error encountered while reading options from standard input

limcu encountered an error while reading options from standard input. The previous error messages indicate the nature of the problem.

E038: Error reading from standard input

An I/O error occurred while reading standard input.

E039: Too many characters in the option

limcu limits the length of any individual option to 79 characters. Check for missing white space characters separating the options.

E040: Open of mptctl device node failed

limcu could not open the device node, which communicates with the driver. limcu tries to create the device node if one does not exist. Possible causes for this error are:

- The device node does not exist and limcu cannot create it.
- The driver is not loaded. The mptctl, mptscsih, and mptbase drivers must be loaded. Use lsmod to verify this.
- The user does not have the privileges to open the device node. The user must have root privileges to access the driver through the mptctl device node.

E041: I/O request failed

The *ioctl* call to the *mptctl* driver failed. The use of an older version driver usually causes this error. Use version 2.00.08 or later of the Fusion-MPT Linux driver package.

E042: Incorrect number of targets for the requested operation

The wrong number of targets was specified for the requested operation. The auto create volume ('*-a*') requires no target IDs. The create volume option requires two or three target IDs. The delete volume option

requires no target IDs. The erase all disks option require no target IDs. The erase disk option requires one to three target IDs.

E043: Cannot delete and create volumes at the same time
limcu cannot simultaneously delete and create IM volumes. To do this, run limcu twice.

E044: Number of data offsets and sizes does not match
For every instance of the '*-io*' option limcu requires a matching instance of the '*-is*' option. If this is not the case, limcu flags an error.

E045: Cannot enable and disable volumes at the same time
limcu cannot simultaneously enable and disable an IM volume. To do this, run limcu twice.

E046: Cannot enable and disable resync at the same time
limcu cannot simultaneously enable and disable drive resynchronization. To do this, run limcu twice.

E047: Cannot disable the volume and resync at the same time
limcu cannot simultaneously disable both the volume and resynchronization. Disabling the volume also disables resynchronization of the volume.

E048: If volume size is specified, must create a volume
limcu only permits specification of the maximum volume size when creating a volume. Entering a maximum size for any other option is of no value. limcu flags an error.

E049: Volume size must be between 0 and 999,999
The maximum volume size number must be between 0 and 999,999, inclusive. These numbers are decimal values.

E050: If autocreate volume, no target IDs or erase options allowed
You cannot specify target IDs or erase options when creating a volume with the auto create option.

E051: Cannot set volume settings and delete the volume at the same time
Volume settings are used when creating a volume. When deleting a volume, the volume setting has no value. limcu flags an error.

E052: Volume settings override number is too large (four hex digits max)

The volume setting is too large. Re-enter a smaller volume setting.

E053: Cannot do erase targets and erase all at the same time

limcu does not permit simultaneous entry of these options because they cannot be completed simultaneously. The erase targets option erases some but not all disks, while the erase all option erases all disks.

E054: If erase target, the user must specify at least one target ID

The erase targets option erases one to three disks. The user must specify the target disks using the '-t' option.

E055: If erase all, the user cannot specify any targets

The erase all option erases all disks. If the user enters target IDs, limcu assumes that the user is either trying to create a volume, which is not allowed when erasing disks, or is confused about which disks to erase. limcu flags this as an error, to prevent a potential catastrophe.

E056: Data offset + size is too large; must be < 256

The data window defined by a '*-io*' / '*-is*' pair cannot be outside the maximum inquiry buffer size defined by the SCSI standard.

E057: Same target ID was entered more than once

The user entered duplicate target ID values. limcu only permits unique target IDs.

E058: No reboot option format is bad

Check for extra characters on the end of the '*-nr*' option.

E059: No reboot option entered more than once

limcu permits a single no reset option entry. It is permissible to enter the option once on the command line and once in the standard input stream. limcu flags a fatal error if the option entry occurs more than once in either case.

E060: Controller number does not match that of an IM controller

The controller number provided in the '*-c*' option is that of a controller that does not support IM.

E061: Could not read manufacturing config page 4

limcu could not read manufacturing configuration page 4. Other messages accompany this error message and pinpoint the reason for the error.

E062: Manufacturing config page 4 is not writable/persistent

The IOC was not configured to allow writing this configuration page or the values written are not saved across reboots.

E063: Manufacturing config page 4 NVRAM settings write failed

An attempt to write new data for manufacturing configuration page 4 to Flash memory failed. A hardware failure typically causes this error.

E064: Bad RAID action code

This error is currently not in use.

E065: I/O request failed; bad controller status

The IOC detected an error when completing a Fusion-MPT request.

E066: Attempting to operate on a nonexistent volume.

limcu cannot locate a volume on the IOC. limcu cannot process options such as: '*-ve*,' '*-vd*,' '*-re*,' or '*-rd*.'

E067: Volume enable failed

The volume enable RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E068: Volume disable failed

The volume disable RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E069: Resync enable failed

The resynchronization enable RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E070: Resync disable failed

The resynchronization disable RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E071: Bad IM volume configuration

The RAID volume type is not IM or the configuration of the physical disks is not correct for an IM volume. All operations except delete volume are locked out.

E072: Error while attempting to override volume settings

The volume settings RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E073: Volume delete failed

The volume delete RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E074: Physical disk delete failed

The delete RAID physical disk RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E075: No controllers were found

All attempts by limcu to retrieve IOC information from the driver failed. This may be the result of controller failure. limcu stops scanning for controllers at the first failure to retrieve controller information. limcu uses an error to terminate the scan.

E076: No IM capable controllers were found

No controllers were found that support IM volumes. Check that the controllers are using the proper firmware.

E077: Unable to retrieve controller information

An error occurred while attempting to retrieve configuration pages from the IOC.

E078: Failed to delete all volumes and physical disks

After a delete volume request, the IOC configuration pages indicate that RAID volumes or physical disks are still configured on the IOC.

E079: Too few RAID qualified drives for the requested operation

Not enough qualified disks were found for an IM volume during the execution of an auto create volume request. Disks must have 512-byte sectors, be nonremovable, and must not have a valid Master Boot Record (MBR). The

most likely cause of the error is that the drive has a valid MBR. Use the erase disk or erase all options to correct this situation.

E080: Erase I/O request failed

An I/O error occurred while trying to write zeroes to a disk drive.

E081: Too many RAID volumes on the controller

The number of defined RAID volumes on the controller has reached the limit for the controller. The user must delete an existing volume before creating a new one.

E082: Can't use specified drive in a RAID volume

The drive does not meet one of the following qualifications: (1) 512-byte sectors, (2) nonremovable, (3) no valid Master Boot Record, (4) not part of an existing RAID volume, or (5) not an existing RAID physical disk.

E083: Create RAID physical disk failed

The create RAID physical disk RAID action request failed. Other error messages printed before this message provide information regarding this failure.

E084: Drive read capacity failed

A SCSI read capacity command failed. Other error messages printed before this message provide information regarding this failure.

E085: Drive is too small for the RAID volume

Based on a valid partition table found on the primary drive, limcu calculates the minimum drive size. limcu issues a SCSI read capacity command to all the disks that are to be included in the volume, and compares the values received to the minimum drive size. The size one of the drives to be included in the IM volume or the hot spare is smaller than the minimum disk drive size.

E086: Display config pages option format is bad

limcu found extraneous characters found at the end of the '*-dc*' option.

E087: Can not create a volume and display config pages at the same time

The user cannot simultaneously specify the create volume and display configuration pages options.

E088: Skip sync option entered more than once

The user entered the skip drive synchronization ('*-ss*') option multiple times.

E089: Skip sync option format is bad

limcu found extraneous characters at the end of the '*-ss*' option.

E090: if skip resync, must be creating a volume

The user can only specify the skip drive resynchronization option when creating an IM volume.

E091: Can not erase disk(s) and create a volume at the same time

limcu does not permit the user to simultaneously create IM volumes and erase disks.

E092: Persistent volume setting value too large (> 0xffff)

This value must be entered using hexadecimal digits and cannot be more the four hexadecimal digits long.

E093: Read of RAID physical disk config page 0 failed

A request to read a RAID physical disk configuration page 0 failed. Other error messages printed before this message provide information regarding this failure.

E094: Couldn't update IOC information after creating a RAID volume

After creating an IM volume, limcu attempted to and failed to retrieve current copies of the configuration pages from the IOC. Other error messages printed before this message provide information regarding this error.

E095: RAID action request to create volume failed

Other error messages printed before this message provide information regarding this failure.

E096: Read of MBR on primary disk failed during maximum volume LBA calculation

A SCSI I/O read request for sector 0 of the primary volume failed. Other error messages printed before this message provide information regarding this failure.

E097: Manufacturing config page 4 current settings write failed

An attempt to write updated configuration information to manufacturing configuration page 4 failed. Other error messages printed before this message provide information regarding this failure.

E098: No drives were found that can be erased

The erase options clears the first 64 sectors on a RAID volume or RAID qualified disk (that is, nonremovable, 512-byte sectors.) limcu did not find any drives that satisfy these requirements. If a controller has RAID qualified drives and this error occurs, use the '-c' option to specify the controller number.

E099: Sum of values entered using '-is' option too large (> 32)

The sum of the *'-is'* options cannot exceed 32.

Chapter 10
CIM Solution

This chapter describes the Fusion-MPT Common Information Model (CIM) Solution. This chapter contains the following sections:

10.1 Description

The CIM Solution enables the presentation of networked storage components through an easy to navigate user interface. The CIM Solution enables the storage system administrator to monitor multiple systems on a network easily. The administrator uses the CIM to identify and locate storage device failures quickly. The CIM Solution also provides information concerning the topology of the storage network, adapters, and devices. The CIM Solution supports IM virtual volumes and the underlying physical drives that compose the virtual volume.

The LSI Logic CIM Solution is a CIM-compliant management application for Fusion-MPT mass storage elements. This tool allows you to connect with devices through a TCP/IP based network and manage the attached Fusion-MPT host adapters, peripheral devices, and device drivers. The CIM Solution supports the LSI53C1030, LSI53C1020, LSIFC929, and LSIFC919 controllers and their associated host adapters.

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

`http://www.lsilogic.com/support/support+drivers/scsi/cimbrowser.html`

10.1.1 Components

The CIM Solution consists of two separate software components: a CIM Browser and a CIM Provider. The CIM Browser runs on the machine that monitors the storage elements and connects to any computer on a TCP/IP based network. The CIM Browser provides an easily-navigated window to monitor the attached storage elements. A single CIM Browser can monitor multiple elements on the network. The monitored elements include host adapters, peripheral devices, and device drivers.

The CIM Provider runs on the system being monitored and provides information about the Fusion-MPT controllers and the devices connected to the system running the CIM Provider. You must install the LSI Logic CIM Provider on every computer that you plan to monitor.

10.1.2 Features

The CIM Solution offers the following features:

- Multisystem manageability
- Visual acknowledgement of component failures
- Displays current information about each adapter and its attached storage devices
- Monitors the current status of Fusion-MPT IM volumes
- Supports remote management over a TCP/IP based network
- Provides graphical representation of Fusion-MPT storage elements
- Displays device and adapter hierarchy as a device tree
- Implements a highly portable user interface
- Launches the LSI Logic CIM Browser as a stand-alone application
- Launches the LSI Logic CIM Provider automatically

10.1.3 Installation and System Requirements

The tool and system requirements for the CIM installation are:

- Running either Windows NT version 4.0, Service Pack 6 or above; Windows 2000, Service Pack 2 or above; or Linux.

- 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 must be 800 by 600 pixels or greater. LSI Logic recommends using a desktop area of 1024 by 768 pixels.

On Linux-based systems, LSI Logic recommends viewing under KDE or GNOME.

10.2 CIM Browser Window Description

This section describes the CIM Browser window.

10.2.1 Connect Menu Options

The Connect menu is located on the upper left corner of the CIM Browser window. Table 10.1 provides description of the options available on the Connect menu.

Table 10.1 Connect Menu Option Description

Option	Description
Connect	This option 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 system that you plan to connect to.
Connect to Local Host	This option connects the CIM Browser to the local host.

Table 10.1 Connect Menu Option Description

Option	Description
Advanced Connections	This option connects the computer running the CIM Browser to multiple systems that are each 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 Internet Protocol (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 with information about how many systems are present.
Disconnect	Allows you to disconnect from the host. This option is only available when you click on the host in the host tree.

10.2.2 Hardware Device Tree Options

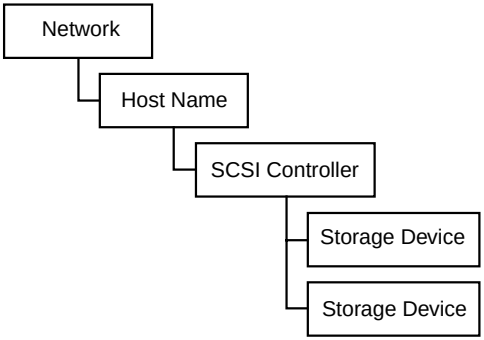
The hardware device tree provides an easily navigated list of the devices being monitored by the CIM Browser. Clicking on a device in the tree provides information about the device. Figure 10.1 illustrates the structure of the hardware device tree for SCSI, SCSI with IM, and FC systems. Table 10.2 describes each level in the device trees.

The status of the device is given by a green status icon, a yellow status icon, or a red status icon that appears in the right-hand window. A green status icon indicates that the device is functioning properly. A yellow status icon indicates that there is a problem with the device and the CIM Browser cannot identify the problem. A red status icon indicates that there is a problem with the device and the CIM Browser can identify the problem.

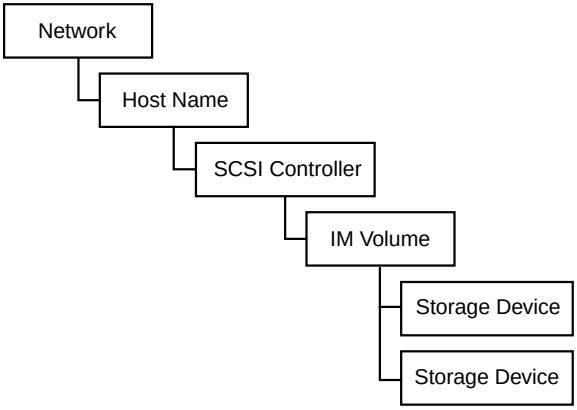
On the IM Volume and Physical Disk levels, the CIM Browser displays a floppy disk icon if the media is present. If the media is not present, as could be the case with removable media such as CD-ROMs or tape drives, the CIM Browser displays a floppy drive with an “X.”

Figure 10.1 Hardware Device Tree Structures

a) SCSI Hardware Device Tree



b) SCSI with IM Hardware Device Tree



c) FC Device Tree

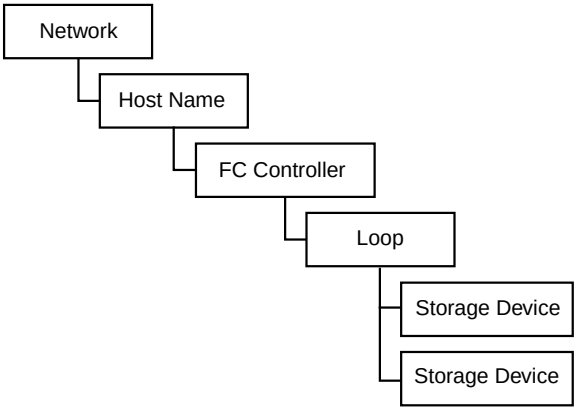


Table 10.2 Device Tree Description

Device Tree Level	Description
Network	This level displays the CIM Browser welcome window.
Host Name	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. 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.
FC or SCSI Controller	This level displays information concerning the host adapter. The CIM Browser displays a separate entry for each channel.
IM Volume	This level describes the logical IM volume. The CIM Browser only includes this level in the device tree if an IM volume is present on the monitored system. The Status field describes the status of the IM volume and has two options: “Ok” or “Unknown.” “Ok” indicates either that the IM volume is completely operational. The “Unknown” option indicates that there is problem with the IM volume that the CIM Browser cannot identify. The “Redundancy Status” field describes the status of the IM volume redundancy and has three options: “Fully Redundant”, “In Degraded Mode”, or “Redundancy Is Lost.” “Fully Redundant” indicates that the IM volume is functioning properly and that the data is fully redundant. “In Degraded Mode” indicates that the IM volume is running in a degraded mode. A possible cause of this mode is the failure of a single disk. “Redundancy is Lost” indicates that the redundant data is lost. A possible cause of this mode is the failure of both disks. The “Additional Redundancy Information” field options are “Resynch in progress” or “Resynch not in progress.” When the resynchronization is in progress, the CIM Browser displays a status bar giving the approximate percent completion and an estimate of the time until completion.
Loop	This field 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 that provides information concerning the status of the physical disk.
Storage Device	This field provides information on the storage device.

10.3 Windows Installation Instructions for the CIM Solution

This section describes a Windows installation for version 2.00.00 of the CIM Solution.

10.3.1 Installing the CIM Solution

Follow these steps to install the CIM Solution

Step 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.

Step 2. Click on “Yes.”

Step 3. Click on “Start Installer for Windows...”

The InstallAnywhere begins.

Step 4. Follow the instructions and steps in InstallAnywhere.

To verify the installation of the CIM Provider, click on the Start button and choose: “`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.

10.3.2 Uninstalling the CIM Solution

To uninstall the CIM Solution, follow these steps:

Step 1. Exit from the LSI Logic CIM Browser.

Step 2. Click on the Start button.

Step 3. Move to `Settings-->Control Panel-->Add/Remove Programs`.

Step 4. Remove the LSI Logic CIM Solution program to uninstall it.

10.4 Linux Installation Instructions for the CIM Solution

This section describes a Linux installation for version 2.00.00 of the CIM Solution.

10.4.1 Installing the CIM Solution

Follow these steps to install the CIM Solution:

Step 1. Unzip the CIM package after downloading it.

Step 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.

Step 3. Click on “Yes.”

Step 4. Click on “Start Installer for Linux...”

The InstallAnywhere begins.

Step 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`

10.4.2 Uninstalling the CIM Solution

To uninstall the CIM Solution, follow these steps:

Step 1. Exit the CIM Browser.

Step 2. Change the directory by typing:

cd `/usr/local/bin/LSICim/UninstallerData`

Step 3. At the command prompt, type:

`./Uninstall_CIM_Solution`

Step 4. Click the Uninstall button in the InstallAnywhere window.

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