USER'S GUIDE

Fusion-MPT™ FCode

January 2004

Version 2.1

LSI LOGIC ®

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

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

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

Preface

This book is the primary reference and user's guide for the LSI Logic Fusion-MPT™ FCode commands. It explains how to use these commands and provides examples of each one.

Audience

This document assumes that you have some familiarity with SCSI and/or Fibre Channel devices and some experience in using a command line interface. The people who benefit from this book are

- engineers and others who need to use FCode commands with LSI Logic Solaris SPARC capable host bus adapters to perform tasks such as identifying SCSI and/or Fibre Channel devices on a system or setting up an Integrated Mirroring™ volume.

Organization

This document has the following sections:

- Section 1, "Introduction," provides a brief overview of Fusion-MPT FCode.

- Section 2, "Fusion-MPT FCode Commands," introduces the FCode commands and explains how to use a command to identify the disk adapter in your system.

- Section 3, "Fusion-MPT FCode SCSI Commands," explains the Fusion-MPT FCode commands that are used for SCSI adapters.

- Section 4, "Fusion-MPT FCode Fibre Channel Commands," explains the Fusion-MPT FCode commands that are used for Fibre Channel adapters.

- Section 5, "Fusion-MPT Special Features," explains how the Fusion-MPT FCode commands are used to implement the Integrated Mirroring™, Integrated Striping™, and Integrated RAID™ features.

Release History

Version	Date	Description
V14	12/2000	Original release
V15	12/2000	Added persistent naming
V16	06/2001	Added interrupt coalescing
V17	08/2001	Added manual selection of topology
V18	10/2001	Added SCSI section
V19	03/2002	Added IM/IR information
V20	09/2003	Added multi-pathing
V2.1	01/2004	Converted document to Tech Pubs template. Performed general editing.

Contents

1   Introduction

LSI Logic Solaris SPARC capable Fusion-MPT™ host bus adapters have FCode resident on board, allowing operation under Sun Microsystem's OpenBoot console. All basic functionality is available at OpenBoot, including the ability to display devices connected to the adapter, and boot devices on the adapter. Additional functionality, such as updating the firmware from the OpenBoot console, is also supported. See the LSI Logic web site (http://www.lsilogic.com) for additional information, current versions, and utilities.

A summary of commands available on Fusion-MPT adapters is provided below.

2   Fusion-MPT FCode Commands

Because Fusion-MPT is both portable and binary compatible, one FCode driver runs both SCSI and Fibre Channel Fusion-MPT devices. The same FCode commands are used for both SCSI and Fibre Channel devices, because the configuration for both kinds of devices is similar. For convenience, however, this document has separate SCSI and Fibre Channel command sections, with some command information repeated in both sections. See Section 3, "Fusion-MPT FCode SCSI Commands," page 2, and Section 4, "Fusion-MPT FCode Fibre Channel Commands," page 12.

2.1   Identifying the Fusion-MPT Adapter

To identify the disk adapter in your system, use the **show-disks** command at the OpenBoot prompt, as shown in the example below. This identifies all adapters that the system has identified as disk class. If the **show-disks** command fails to see your adapter, the adapter is either not correctly installed, or it is malfunctioning.

2.1.1   show-disks

ok show-disks

```
a) /pci@1f,0/pci@1/pci@1/pci@e/IntraServer-Ultra2,scsi@4,1/disk
b) /pci@1f,0/pci@1/pci@1/pci@e/IntraServer-Ultra2,scsi@4/disk
c) /pci@1f,0/pci@1/pci@1/scsi@d,1/disk
d) /pci@1f,0/pci@1/pci@1/scsi@d/disk
e) /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c,1/disk
f) /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c/disk
g) /pci@1f,0/pci@1/pci@1/IntraServer,fc@b,1/disk
h) /pci@1f,0/pci@1/pci@1/IntraServer,fc@b/disk
m) MORE SELECTIONS
q) NO SELECTION
Enter Selection, q to quit: q
```

> Note: Devices 'a' through 'f' are SCSI adapters; devices 'g' and
> 'h' are Fibre Channel. The notation scsi@ is used for SCSI
> devices; fc@ is used for Fibre Channel devices.

---

3   Fusion-MPT FCode SCSI Commands

3.1   Identifying the SCSI Disks

The **probe-scsi-all** command is used to identify all disks on your
Fusion-MPT adapters, and to identify other disk class adapters in the
system.

Use the **probe-scsi-all** command to show all Fibre Channel or SCSI
disks available from the OpenBoot prompt. All disks available on all
Fusion-MPT devices are displayed, as shown in the example below:

3.1.1   probe-scsi-all

ok probe-scsi-all

```
/pci@1f,0/pci@1/pci@1/scsi@d,1
Target 2
Unit 0 Disk SGI QUANTUM XP32150W589C
/pci@1f,0/pci@1/pci@1/scsi@d
Target 0
Unit 0 Disk SGI QUANTUM XP32150W589C
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c,1
MPT Version 1.02, Firmware Version 0.00.00
Target 0
  Unit 0 Disk   QUANTUM ATLAS IV 9 WLS 0B0B   17942584 Blocks, 8971 MB
Target 1
  Unit 0 Disk   QUANTUM ATLAS IV 9 WLS 0B0B   17942584 Blocks, 8971 MB
Target 2
  Unit 0 Disk   QUANTUM ATLAS IV 9 WLS 0B0B   17942584 Blocks, 8971 MB
Target 3
  Unit 0 Disk   QUANTUM ATLAS IV 9 WLS 0B0B   17942584 Blocks, 8971 MB
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c
MPT Version 1.02, Firmware Version 0.00.00
/pci@8,700000/IntraServer-Ultra160,scsi@3,1

/pci@8,700000/IntraServer-Ultra160,scsi@3
Target 0
  Unit 0 Disk IBM DDRS-34560D DC1B
/pci@8,700000/IntraServer,fc@2

MPT Version 1.00, Firmware Version 1.02.00
Link is ready, port is online
  WWN 100000a0b8040353 Port ID ef

Target 0
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 2100002037109d76 Port ID d9
Target 1
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 210000203710565a Port ID 17

/pci@8,700000/scsi@6
Target 6
Unit 0 Removable Read Only device PLEXTOR CD-ROM PX-20TS
```

If your system does not identify the SCSI Channel disks on your LSI Logic Fusion-MPT adapter, check the following:

1. Is the disk enclosure powered ON?

2. Do the LEDs on the adapter indicate LVD operation? Refer to the manual for the specific adapter to identify the correct operation of the LED indicators.

3. Is the SCSI bus terminated at both ends (and only at the ends) with LVD/SE terminators?

4. Does each SCSI disk have a unique SCSI ID that is different from the host's ID (host SCSI ID defaults to 7). For more information, see Section 3.5, "Setting the SCSI Initiator ID," page 10.

5. Are all the disks on the bus LVD? If there is an HVD device on the bus, no disks will show up and the LVD LED on the Fusion-MPT adapter will blink.

If your system does not identify the Fibre Channel disks on your LSI Logic Fusion-MPT adapter, check the following:

1. Is the disk enclosure powered ON?

2. Does the LED on the adapter indicate LINK? (LINK is valid only after the device is probed.)

3. Does the LED on the switch or remote enclosure indicate LINK?

4. Does the LINK-SPEED parameter selected by the adapter match that of the bus (1G, 2G or Auto)?

If you do not see disks, the following additional debug information may help to identify the problem.

3.2   Verifying Correct Installation

Use this procedure to verify installation of your Fusion-MPT adapter in the system.

1. Power on the system.

2. When the banner is displayed, press the Stop-A keys to interrupt the boot process and stop at the **ok** prompt.

3. Use the **show-devs** command to list the system devices. You should see an output similar to the following:

3.2.1 show-devs

```
ok show-devs

/SUNW,UltraSPARC-III@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/upa@8,480000/SUNW,ffb@0,0
...
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c,1
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c…
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c,1/disk
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c,1/tape
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c/disk
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@c/tape
ok
```

- /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c
  identifies the *first* Ultra320 SCSI interface on an LSI Logic 1030
  based adapter.

- /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c,1
  identifies the *second* Ultra320 SCSI interface on an LSI Logic 1030
  based adapter.

- An LSI Logic 1020 Ultra320 SCSI adapter shows only one such
  SCSI device.

  Note: The above are examples. The output of the **show-devs**
  command varies depending on your system and its
  configuration. Use the corresponding entries on your
  system, not the ones given in the examples.

If your SCSI devices are not listed, check that the adapter is correctly
installed, and reseat the adapter if necessary.

3.3 SCSI Adapter Specific Settings

In certain circumstances, the advanced user may want to change
settings for an individual adapter or port, without affecting the other
adapters in the system. Specific examples of such settings are SCSI
initiator ID and Interrupt Coalescing.

To select a specific Fusion-MPT adapter as the current adapter, use the **select** command. Selecting a port or adapter brings the port online and allows you to show or set certain adapter specific parameters.

Use caution when you issue the following commands. Using the commands incorrectly could make the bus unusable—for example, forcing the SCSI initiator ID to one that conflicts with another device on the bus.

3.3.1   select

Use the **select** OpenBoot command to select the adapter entry. This opens the port to bring the port online:

ok select /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c

> Note: Some versions of Sun Microsystem's OpenBoot console do not implement the **select** command. Use the following syntax if the **select** command is not supported. Be sure to include the space after each quotation mark:

ok " /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c" select-dev

3.3.2 .properties

Use the **.properties** command to show the adapter properties

ok .properties

```
firmware-version      1.00.00
mpt-version           1.02
scsi-initiator-id     0000000f
assigned-addresses    81036010 00000000 00001300 00000000 00000100
                      83036014 00000000 001a0000 00000000 00020000
                      8303601c 00000000 00180000 00000000 00010000
                      82036030 00000000 00400000 00000000 00100000
compatible            pci13e9,30
                      pci1000,30
model                 LSI,1030
reg                   00036000 00000000 00000000 00000000 00000000
                      01036010 00000000 00000000 00000000 00000100
                      03036014 00000000 00000000 00000000 00020000
                      0303601c 00000000 00000000 00000000 00010000
                      02036030 00000000 00000000 00000000 00100000
version               1.00.21
device_type           scsi-2
name                  LSILogic,scsi
fcode-rom-offset      0000e800
66mhz-capable
devsel-speed          00000001
class-code            00010000
interrupts            00000001
max-latency           00000006
min-grant             00000010
subsystem-id          00001000
subsystem-vendor-id   00001000
revision-id           00000000
device-id             00000030
vendor-id             00001000
```

3.3.3   show-children

Use the **show-children** command while the adapter or port is selected
to display the devices currently connected to this adapter. Select the port
or adapter shown (use the port name your system assigns):

```
ok select /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c

ok show-children

MPT Version 1.02, Firmware Version 1.00.00

Target 0
  Unit 0 Disk QUANTUM ATLAS IV 9 WLS 0B0B 17942584 Blocks, 8971 MB

Target 1
  Unit 0 Disk QUANTUM ATLAS IV 9 WLS 0B0B 17942584 Blocks, 8971 MB

Target 2
  Unit 0 Disk QUANTUM ATLAS IV 9 WLS 0B0B 17942584 Blocks, 8971 MB

Target 3
  Unit 0 Disk QUANTUM ATLAS IV 9 WLS 0B0B 17942584 Blocks, 8971 MB
```

3.4   Interrupt Coalescing

Interrupt coalescing allows the firmware on the Fusion-MPT device to
group I/Os together in order to minimize the overhead to the host system.
This feature can result in significant performance benefits when I/Os are
coming into the adapter rapidly—for example, when performing small
sequential reads from a disk.

LSI Logic has tested interrupt coalescing under multiple I/O conditions
and has determined that the following interrupt coalescing values are
beneficial over a wide range of I/O conditions:

- timeout = 160 microseconds
- depth = 4

With these settings the host is interrupted only once for four I/Os
processed by the chip, unless a time of 160 microseconds has passed
since the host was last interrupted.

Although LSI Logic has determined that these settings are optimal for a
wide variety of situations, your system's I/O load may benefit from a
deeper queue or a longer timeout. LSI Logic provides a mechanism to

modify these values and write them to the nonvolatile EEPROM on the adapter.

To change the interrupt coalescing values, first select the port or adapter shown (use the port name your system assigns). Then use the **show-interrupt-coalescing** and **set-interrupt-coalescing** commands, as shown in the example below:

```
ok select /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c

ok show-interrupt-coalescing
Interrupt coalescing timeout is a0 (160 decimal) microseconds
Interrupt coalescing depth is 4 (4 decimal)

ok set-interrupt-coalescing <- command with no arguments prints help
usage is <timeout> <depth> set-interrupt-coalescing

ok 100 8 set-interrupt-coalescing
Interrupt coalescing timeout selected is 100 (256 decimal) microseconds
Interrupt coalescing depth selected is 8 (8 decimal)
Interrupt coalescing has been set
Change will take effect after system reset
```

> Note: The system must be power cycled for the changes to take effect. It is not sufficient to execute the **reset-all** command.

3.5   Setting the SCSI Initiator ID

Each device on a SCSI bus must be given a unique ID, in the range of 0 – 15. The default setting for SCSI host adapters in a Sun Solaris environment is 7. It is seldom necessary to change the initiator ID, unless the host adapter is being used in a cluster environment where there is more than one SCSI initiator on the same physical SCSI bus.

There are three places where the SCSI initiator ID can be changed. Each has a different effect on the SCSI configuration. It is important to understand the effect of each of the methods for setting the SCSI initiator ID before you change the default setting:

Setting	Location	Default Value	Scope	Notes
scsi-initiator-id	OpenBoot Environment Variable /	7	System (all SCSI ports)	Lowest precedence is overridden if port specific value is set. Provides system-wide default. Use **printenv** to display value, **setenv** to change.
scsi-initiator-id	Itmpt driver configuration file /kernel/drv/itmpt.conf	7	All Fusion-MPT ports OR any individual port	Use **man pci** command for more information on using pci .conf files. This value overrides OpenBoot environment variable scsiinitiator-id for all specified ports.
scsi-initiator-id	Port specific OpenBoot node /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c **Note:** Your node name will vary depending on system configuration.	UNSET	Specific port	Highest precedence. Defaults to unset. If set, even to 7, will override any other initiator ID setting.

The following is an example of how to set the port-specific OpenBoot scsi-initiator-id using the Fusion-MPT FCode. Refer to your platform OpenBoot code for the system-wide scsi-initiator-id. Refer to your Solaris driver documentation for information on setting the itmpt.conf scsiinitiator-id. It is strongly recommended that you chose the appropriate location for setting the scsi-initiator-id and that you not try to change it in multiple places.

```
ok select /pci@1f,0/pci@1/pci@1/LSILogic,scsi@c

ok show-initiator-id

Initiator ID has not been set; the default value is in effect
Initiator ID is 7

ok 8 set-initiator-id
Initiator ID has been set
Change will take effect immediately

ok show-initiator-id
Initiator ID is 8

ok unset-initiator-id
Initiator ID has been unset; the default value is in effect
Change will take effect immediately

ok show-initiator-id
Initiator ID has not been set; the default value is in effect
Initiator ID is 7
```

4 Fusion-MPT FCode Fibre Channel Commands

4.1 Identifying the Fibre Channel Disks

The **probe-scsi-all** command is used to identify the Fibre Channel devices on your Fusion-MPT adapter.

Use the **probe-scsi-all** command to show all disks available from the OpenBoot prompt. All Fibre Channel or SCSI disks available on all Fusion-MPT devices will be displayed.

4.1.1 probe-scsi-all

```
ok probe-scsi-all

/pci@8,600000/SUNW,qlc@4
LiD HA LUN --- Port WWN --- ----- Disk description -----
1 1 0 2100002037e4d65b SEAGATE ST318304FSUN18G 0726
/pci@8,700000/IntraServer-Ultra160,scsi@3,1
/pci@8,700000/IntraServer-Ultra160,scsi@3

Target 0
Unit 0 Disk IBM DDRS-34560D DC1B

/pci@8,700000/IntraServer,fc@2

MPT Version 1.00, Firmware Version 1.02.00
Link is ready, port is online
  WWN 100000a0b8040353 Port ID ef

Target 0
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 2100002037109d76 Port ID d9
Target 1
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 210000203710565a Port ID 17
Target 2
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 2100002037105212 Port ID 1

pci@8,700000/scsi@6
Target 6
  Unit 0 Removable Read Only device PLEXTOR CD-ROM PX-20TS
```

If your system does not identify the Fibre Channel disks on your LSI Logic/IntraServer adapter, check the following:

1. Is the Fibre Channel enclosure powered ON?

2. Does the LED on the adapter indicate LINK? (LINK is valid only after the device is probed.)

3. Does the LED on the switch or remote enclosure indicate LINK?

4. Does the LINK-SPEED parameter selected by the adapter match that of the bus (1G, 2G or Auto)?

If you do not see disks, the following additional debug information may help to identify the problem.

4.2   Verifying Correct Installation

Use this procedure to verify installation of your Fusion-MPT adapter in the system.

1. Power on the system.

2. When the banner is displayed, press the Stop-A keys to interrupt the boot process and stop at the **ok** prompt.

3. Use the **show-devs** command to list the system devices. You should see an output similar to the following:

4.2.1 show-devs

```
ok show-devs

/SUNW,UltraSPARC-III@0,0
/virtual-memory
/memory@m0,0
/aliases
/options
/openprom
/chosen
/packages
/upa@8,480000/SUNW,ffb@0,0
...
/pci@8,700000/IntraServer,fc@2
/pci@8,700000/IntraServer,fc@1,1
/pci@8,700000/IntraServer,fc@1
...
/pci@8,700000/IntraServer,fc@2/disk
/pci@8,700000/IntraServer,fc@2/tape
/pci@8,700000/IntraServer,fc@1,1/disk
/pci@8,700000/IntraServer,fc@1,1/tape
/pci@8,700000/IntraServer,fc@1/disk
/pci@8,700000/IntraServer,fc@1/tape
/pci@8,700000/scsi@6,1/tape
/pci@8,700000/scsi@6,1/disk

ok
```

- /pci@8,700000/IntraServer,fc@1
  identifies the *first* Fibre Channel interface on an LSI Logic 929 based adapter.

- /pci@8,700000/IntraServer,fc@1,1
  identifies the *second* Fibre Channel interface on an LSI Logic 929 based adapter.

- An LSI Logic 909 based Fibre Channel adapter shows only one such Fibre Channel device.

  Note: The above are examples. The output of the **show-devs** command varies depending on your system and its configuration. Use the corresponding entries on your system, not the ones given in the examples.

If these devices are not listed, check that the adapter is correctly installed, and re-seat the adapter if necessary.

4.3 Adapter Specific Settings

In certain circumstances, the advanced user may want to change settings for an individual adapter or port, without affecting the other adapters in the system. Specific examples of such settings are Fibre Channel bus speed and Interrupt Coalescing.

To select a specific Fusion-MPT adapter as the current adapter, use the **select** command. Selecting a port or adapter brings the port online and allows you to show or set certain adapter specific parameters.

Use caution when you issue the following commands. Using the commands incorrectly could make the bus unusable—for example, forcing 1G operation on a 2G Fibre Channel loop.

4.3.1 select

Use the **select** OpenBoot command to select the adapter entry. This opens the port to bring the port online:

ok select /pci@8,700000/IntraServer,fc@1

4.3.2   .properties

Use the **.properties** command to show the adapter properties.

ok .properties

```
firmware-version       1.02.00
mpt-version            1.00
scsi-initiator-id      00 00 00 0f
assigned-addresses     81001010 00000000 00000700 00000000 00000100
                       83001014 00000000 001a0000 00000000 00020000
                       8300101c 00000000 00190000 00000000 00010000
                       82001030 00000000 02000000 00000000 00100000
compatible             70 63 69 31 33 65 39 2c 36 32 31 00 70 63 69 31
model                  LSI,909
reg                    00001000 00000000 00000000 00000000 00000000
                       01001010 00000000 00000000 00000000 00000100
                       03001014 00000000 00000000 00000000 00020000
                       0300101c 00000000 00000000 00000000 00010000
                       02001030 00000000 00000000 00000000 00100000
version        1.00.16
device_type    scsi-2
name           IntraServer,fc
fcode-rom-offset 00000000
66mhz-capable
devsel-speed   00000001
class-code     00010000
interrupts     00000001
latency-timer  00000040
cache-line-size 00000010
max-latency    00000008
min-grant      0000001e
subsystem-id   00000621
subsystem-vendor-id 000013e9
revision-id    00000001
device-id      00000621
vendor-id      00001000
```

4.3.3 show-children

While the adapter or port is selected, use the **show-children** command to display the devices currently connected to this adapter:

Select the port or adapter shown (use the port name your system assigns):

ok select /pci@8,700000/IntraServer,fc@1

ok show-children

```
MPT Version 1.00, Firmware Version 1.02.00

Link is ready, port is online
  WWN 100000a0b8040353 Port ID ef

Target 0
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 2100002037109d76 Port ID d9
Target 1
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 210000203710565a Port ID 17
Target 2
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 2100002037105212 Port ID 1
Target 3
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 2100002037103da8 Port ID 26
Target 4
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 210000203710324a Port ID 73
```

4.4 Interrupt Coalescing

Interrupt coalescing allows the firmware on the Fusion-MPT device to group I/Os together in order to minimize the overhead to the host system. This feature can result in significant performance benefits when I/Os are coming into the adapter rapidly—for example, when performing small sequential reads from a disk.

LSI Logic has tested interrupt coalescing under multiple I/O conditions and has determined that the following interrupt coalescing values are beneficial over a wide range of I/O conditions:

- timeout = 160 microseconds

- depth = 4

With these settings the host is interrupted only once for four I/Os processed by the chip, unless a time of 160 microseconds has passed since the host was last interrupted.

Although LSI Logic has determined that these settings are optimal for a wide variety of situations, your system's I/O load may benefit from a deeper queue or a longer timeout. LSI Logic provides a mechanism to modify these values and write them to the nonvolatile EEPROM on the adapter.

To change the interrupt coalescing values, first select the port or adapter shown (use the port name your system assigns). Then use the **show-interrupt-coalescing** and **set-interrupt-coalescing** commands, as shown in the example below:

```
ok select /pci@8,700000/IntraServer,fc@1

ok show-interrupt-coalescing
Interrupt coalescing timeout is a0 (160 decimal) microseconds
Interrupt coalescing depth is 4 (4 decimal)

ok set-interrupt-coalescing <- command with no arguments prints help
usage is <timeout> <depth> set-interrupt-coalescing

ok 100 8 set-interrupt-coalescing
Interrupt coalescing timeout selected is 100 (256 decimal) microseconds
Interrupt coalescing depth selected is 8 (8 decimal)
Interrupt coalescing has been set
Change will take effect after system reset
```

Note: The system must be power cycled for the changes to take effect. It is not sufficient to execute the **reset-all** command.

4.5   Multi-Pathing

The Multi-Pathing option recognizes the need to provide a unique logical ID for each port of dual ported target. If a dual ported target is attached to a single channel of the 929, enabling the Multi-Pathing option creates two logical IDs for the single drive, one for each port on the drive. If Multi-Pathing is disabled, the 929 recognizes that both ports on the target actually address the same drive, so only a single Logical ID is created for the drive. Each of these configurations has its application; however, careful analysis of the system and topology requirements is advised. The Intel BIOS, the Solaris BIOS, and the FcUtil utility all provide the Multi-

Pathing configuration option. Note that after selecting a different option, the chip must be reset in order for the change to take effect.

LSI Logic has determined that these settings are optimal for a wide variety of situations. LSI Logic also provides a mechanism to modify these values and write them to the nonvolatile EEPROM on the adapter.

Select the port or adapter shown (use the port name your system assigns):

```
ok show-disks
a) /pci@1f,0/pci@1/LSILogic,scsi@3,1/disk
b) /pci@1f,0/pci@1/LSILogic,scsi@3/disk
c) /pci@1f,0/pci@1/IntraServer,fc@2,1/disk
d) /pci@1f,0/pci@1/IntraServer,fc@2/disk
e) /pci@1f,0/pci@1,1/ide@3/cdrom
f) /pci@1f,0/pci@1,1/ide@3/disk
g) /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
q) NO SELECTION
Enter Selection, q to quit: d
/pci@1f,0/pci@1/IntraServer,fc@2/disk has been selected.
Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y
   for creating devalias mydev for
/pci@1f,0/pci@1/IntraServer,fc@2/disk
```

ok select /pci@1f,0/pci@1/IntraServer,fc@2

```
ok words
show-children diagnose get-scsi-type read-capacity
print-capacity probe-target short-data-command
short-data-command-retries no-data-command
no-data-command-retries retry-command close open
decode-unit update-flash enable-volume disable-volume
delete-volume create-volume show-volumes set-sort-by-did
set-sort-by-wwn show-sort-by set-topology
show-topology set-multi-pathing show-multi-pathing
set-link-speed show-link-speed
set-interrupt-coalescing show-interrupt-coalescing
clear-persistent-all clear-persistent
set-persistent show-persistent
disable-event-notification enable-event-notification
debug-csr-off debug-csr-on debug-off debug-on reset
selftest execute-command reset-all-ports
reset-scsi-bus timeout? set-timeout timeout
set-address lun target close-hardware
reclose-hardware open-hardware reopen-hardware
print-config unmap map chip1-base
chip-base max-transfer dma-map-out dma-map-in dma-free
dma-alloc
```

```
ok show-multi-pathing
Multi-pathing is enabled

ok set-multi-pathing
usage is <0 | 1> set-multi-pathing

ok 1 set-multi-pathing
Multi-pathing is being enabled
Multi-pathing has been set
Change will take effect after system reset
```

> Note: The system must be power cycled for the changes to take effect. It is not sufficient to execute the **reset-all** command.

4.6   Setting Fibre Channel Link Speed

There are two modes of operation for Fibre Channel: 1 Gbit/sec and 2 Gbit/sec. It is important to match the speed of the port with the speed of the loop or fabric to which the port is attached.

LSI Logic has implemented auto-negotiation on the 2 Gbit-capable Fusion-MPT devices. Use the following procedure if you are experiencing difficulty with the auto-negotiate algorithm on your fabric or loop, or if you wish to manually set or show the link speed for the adapter. Select the port or adapter shown (use the port name your system assigns):

```
ok select /pci@8,700000/IntraServer,fc@1

ok show-link-speed

Link speed selected is 1 Gbaud
Current link speed is 1 Gbaud

ok set-link-speed <- command with no arguments prints help
usage is <link-speed> set-link-speed

  link-speed = 1 1 Gbaud
  link-speed = 2 2 Gbaud
  link-speed = a autobaud

ok a set-link-speed
Link speed selected is autobaud
Link speed has been set
Change will take effect after system power cycle

ok show-link-speed
Link speed selected is autobaud
Current link speed is 1 Gbaud
```

> Note: The system must be power cycled for the changes to take effect. It is not sufficient to execute the **reset-all** command.

4.7   Persistent Device Naming

Under certain configurations, such as when the Fibre Channel disk is the boot device of a system, it may be preferable to lock a target disk to a unit number. LSI Logic/IntraServer FCode lets the system administrator write a nonvolatile map of IDs to the Fibre Channel controller. The following is an example of how to map devices in the persistent device table. Select the controller you want to modify, as follows:

ok show-disks

```
a) /pci@1f,0/pci@1/IntraServer,fc@2/disk
b) /pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/disk
c) /pci@1f,0/pci@1,1/ide@3/cdrom
d) /pci@1f,0/pci@1,1/ide@3/disk
e) /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
q) NO SELECTION

Enter Selection, q to quit: a
/pci@1f,0/pci@1/IntraServer,fc@2/disk has been selected.

Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y for creating devalias mydev for
/pci@1f,0/pci@1/IntraServer,fc@2/disk
```

ok select /pci@1f,0/pci@1/IntraServer,fc@2
ok show-children

```
MPT Firmware Version 1.00
Target 0
  Unit 0 Disk SEAGATE ST39173FC 6615
  WWN 200000203710c4e8 PortID a3
```

ok set-persistent   <- command with no arguments prints help
```
usage is <current-target-id> <persistent-target-id> set-persistent
```

ok 0 0 set-persistent

ok show-persistent
```
Entry 1 WWN 200000203710c4e8 Target 0
```

To clear an entry in the persistent device map, use the **clear-persistent** command:

ok 1 clear-persistent
Entry 1 has been cleared

ok show-persistent

ok

Entry 1 has been deleted from the table, and the table is now empty.

4.8   Manual Selection of Fibre Channel Topology

Under certain configurations, you may want to force the selection of Fibre Channel topology and disable the auto detect mechanism in the Fibre Channel adapter. This can be done on a port-by-port basis by using the following procedure.

Note: It should not be necessary to change from auto detect of topology. Firmware version 1.00.03 is the minimum revision to support this functionality.

The following is an example of how select a manual topology N_Port or NL_Port on a selected Fibre Channel port.

Select the controller you want to modify, as shown in the following example:

ok show-disks

```
a) /pci@1f,0/pci@1/IntraServer,fc@2/disk
b) /pci@1f,0/pci@1/IntraServer,Ultra2-scsi@1/disk
c) /pci@1f,0/pci@1,1/ide@3/cdrom
d) /pci@1f,0/pci@1,1/ide@3/disk
e) /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
q) NO SELECTION

Enter Selection, q to quit: a
/pci@1f,0/pci@1/IntraServer,fc@2/disk has been selected.

Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y for creating devalias mydev for
/pci@1f,0/pci@1/IntraServer,fc@2/disk
```

ok select /pci@1f,0/pci@1/IntraServer,fc@2
ok show-topology

```
Topology selected is auto
Current topology is unknown (no link)
```

ok set-topology <- Command with no options provides help

```
usage is <topology> set-topology

  topology = 1 NL_Port
  topology = 2 N_Port
  topology = a auto
```

ok 1 set-topology

```
Topology selected is NL_Port
Topology has been set

Change will take effect after system power cycle
```

ok 2 set-topology

```
Topology selected is N_Port
Topology has been set

Change will take effect after system power cycle
```

ok a set-topology

```
Topology selected is auto
Topology has been set

Change will take effect after system power cycle
```

> Note: The system must be power cycled for the changes to take effect. It is not sufficient to execute the **reset-all** command.

5 Fusion-MPT Special Features

This section describes the FCode interface-to-Fusion-MPT advanced features. The LSI Logic Fusion-MPT Architecture defines several special features that can be implemented in the controller chip. These features include Integrated Mirroring (IM), Integrated Striping (IS), and Integrated RAID (IR). If your LSI Logic Host Bus Adapter implements one of the special features, use the information below to access the advanced functionality.

> Note: Not all advanced features are implemented on every host bus adapter. Check with LSI Logic to determine which host bus adapters implement which of the advanced features.

5.1 Integrated Mirroring

Disk mirroring, also known as RAID 1, is a storage configuration in which two physical disks are paired, or "mirrored," with each other into a set such that writes to either physical disk are duplicated to the other disk. The principle advantage of disk mirroring is the ability of the disk set to survive the failure of a physical disk drive. If a mirrored disk fails, the Fusion-MPT system instantly switches to the other disk without any loss of data or service.

To use the Integrated Mirroring feature, you should become familiar with the following terminology used for mirrored disk sets.

Term	Meaning	Related FCode Commands	Notes
Physical Disk	A physical disk drive	show-disks show-children	OpenBoot presents volumes as disks at the **show-disks** command. Use the **select** command first, to make the desired device active before using the **show-children** command.
Volume	Two physical disks presented to the system as a single virtual disk	show-volumes	Use the **select** command first, to make the desired device active.
Member	One of the physical disks currently in a mirrored volume	show-volumes show-children	Use the **select** command first, to make the desired device active.

Term	Meaning	Related FCode Commands	Notes
Optimal	The mirrored volume is fully functional; the primary and secondary disks are synchronized		This is the normal run-time state of a mirrored volume.
Degraded	One of the members of the set is unavailable		Service must be performed on the set in order to bring the mirrored volume back to Optimal state.
Re-Synchronizing	The data from the primary member is being copied to the secondary member		This state is non-optimal, but is normal. When the data copy is complete, the set will transition to the optimal state without manual intervention.
Failed	The volume set is no longer available to the system		Service must be performed on the set to return it to operation.

5.1.1 Setting Up a SCSI or Fibre Channel Mirrored Volume

After determining that the adapter is functioning correctly in your system, you are ready to create a mirrored set, as shown in the example below.

Note: A SCSI device is used in the following examples. The Fibre Channel syntax and commands are identical.

5.1.2 show-disks

Use the **show-disks** OpenBoot command to determine the name of the adapter with the disks you intend to include in a mirrored volume:

```
ok show-disks
a) /pci@1f,0/pci@1/pci@1/IntraServer,fc@f,1/disk
b) /pci@1f,0/pci@1/pci@1/IntraServer,fc@f/disk
c) /pci@1f,0/pci@1/pci@1/LSILogic,scsi@b/disk
d) /pci@1f,0/pci@1,1/scsi@2/disk
e) /pci@1f,0/pci@1,1/ebus@1/fdthree@14,3203f0
q) NO SELECTION
Enter Selection, q to quit: c
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@b/disk has been selected.
Type ^Y ( Control-Y ) to insert it in the command line.
e.g. ok nvalias mydev ^Y
  for creating devalias mydev for
/pci@1f,0/pci@1/pci@1/LSILogic,scsi@b/disk
```

5.1.3 select

Use the **select** OpenBoot command to select the adapter entry; this opens the adapter and bring the port online:

ok select /pci@1f,0/pci@1/pci@1/LSILogic,scsi@b

5.1.4 .properties

Use the **.properties** command to show the adapter properties. To use Integrated Mirroring, you must be using FCode version V1.00.23 or higher; V1.00.24 is recommend.

```
ok .properties

firmware-version       0.00.09.00
mpt-version            1.02
assigned-addresses     81035810 00000000 00001100 00000000 00000100
                       83035814 00000000 00110000 00000000 00010000
                       8303581c 00000000 00120000 00000000 00010000
                       82035830 00000000 00200000 00000000 00100000
compatible             pci13e9,30
                       pci1000,30
model                  LSI,1030
reg                    00035800 00000000 00000000 00000000 00000000
                       01035810 00000000 00000000 00000000 00000100
                       03035814 00000000 00000000 00000000 00010000
                       0303581c 00000000 00000000 00000000 00010000
                       02035830 00000000 00000000 00000000 00100000
version                1.00.24 <--- FCode Version
device_type            scsi-2
name                   LSILogic,scsi
fcode-rom-offset       0000f800
66mhz-capable
devsel-speed           00000001
class-code             00010000
interrupts             00000001
max-latency            00000006
min-grant              00000010
subsystem-id           00001000
subsystem-vendor-id    00001000
revision-id            00000001
device-id              00000030
vendor-id              00001000
```

5.1.5 show-children

While you have the adapter or port selected, use the **show-children** command to display the devices currently connected to this adapter. Note that IM volumes are considered children of the adapter port, and therefore this command is used to show physical disks or volume sets:

```
ok show-children

MPT Version 1.02, Firmware Version 0.00.09.00

Initiator ID is 7

Target 1
  Unit 0 Disk SEAGATE ST336737LC 5040 71132960 Blocks, 36 GB
Target 2
  Unit 0 Disk SEAGATE ST336737LC 5040 71132960 Blocks, 36 GB
```

5.1.6 show-volumes

The **show-volumes** OpenBoot command is used to display the currently configured volumes. If no volumes have been configured an error message is displayed, as shown in this example:

```
ok show-volumes
No volumes to show
```

5.1.7 create-volume

The **create-volume** OpenBoot command is used to create an IM volume from two physical disks. After the command completes, the new IM Volume can be displayed by the **show-children** command. To see the members of a set, use the **show-volumes** command.

```
ok 0 1 2 create-volume
Target 1 size is 71132960 Blocks, 36 GB
Target 2 size is 71132960 Blocks, 36 GB
The volume can be any size from 1 MB to 36420 MB
What size do you want? [36420]
Volume 0 size will be 71132960 Blocks, 36 GB
PhysDisk 0 has been created for target 1
PhysDisk 1 has been created for target 2
Volume 0 has been created
```

The syntax for the **create-volume** command is as follows:

```
[volume ID] [first member] [second member] create-volume
```

Note that the IDs of the first and second member are no longer presented to the system. Note also that you must give a volume ID that does not conflict with an ID that remains on the bus after the volume is created.

```
ok show-volumes

Volume 0 Enabled Resync In Progress Degraded Mode 71132960 Blocks, 36 GB
 Disk 0 Primary
  Channel 0 Target 1 SEAGATE ST336737LC 5040
 Disk 1 Secondary Out Of Sync
  Channel 0 Target 2 SEAGATE ST336737LC 5040
```

Subsequent **show-children** commands show only the resultant volume and the remaining nonmember disks, if any.

```
ok show-children

MPT Version 1.02, Firmware Version 0.00.09.00

Initiator ID is 7

Volume 0
 Unit 0   Disk   LSILOGIC1030 IM   1000   71132960 Blocks, 36 GB
```

At this point the IM set is created and is in the Re-synchronizing state. Although the volume is usable at this point, it does not operate at maximum performance or be redundant until it reaches the Optimal state.

You do not need to wait for the disk to reach the Optimal state at this point. In fact, the disk will reach the optimal state more quickly under the operating system driver, after Solaris is booted, because the runtime driver uses the performance features of the Fusion-MPT architecture.

Check the file /var/adm/messages for messages regarding state changes for the volume set as it progresses from the Re-synchronizing state to the Optimal state.

5.2   Integrated Striping

Disk striping, also known as RAID 0, pairs two drives together into a volume set to achieve better performance. Unlike a mirrored volume, however, a striped volume does not write data to both disks and therefore does not provide data redundancy if one of the disks fails.

For a striped disk set, reads and writes are issued to the two physical members as a joined volume. This method has the advantage of doubling the data rate for reads from the physical platters, in the case where the physical limitations of a single disk is the limiting performance factor.

Integrated Striping will be available on LSI Logic 1030 based Ultra320 SCSI controllers in the future, and will be documented here when available.

5.3   Integrated RAID

Integrated RAID technology will be supported in future versions of LSI Logic Fusion-MPT devices, starting with the 1035 device. When this functionality is available, it will be documented here.

Customer Feedback

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

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

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

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

Reader's Comments

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

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

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

What could we do to improve this document?

_____

_____

_____

_____

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

_____

_____

_____

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

Name _____ Date _____

Telephone _____ Fax _____

Title _____

Department _____ Mail Stop _____

Company Name _____

Street _____

City, State, Zip _____