Dell™ Serial-Attached SCSI 6/iR Integrated and Adapter

User's Guide

Dell™ Serial-Attached SCSI 6/iR
Integrated and Adapter

User's Guide

Model UCS-61

Notes, Notices, and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

Contents

⚠ CAUTION: Safety Instructions

Use the following safety guidelines to help ensure your own personal safety and to help protect your system and working environment from potential damage.

> **NOTE:** See the caution and safety statements in your Dell™ PowerEdge™ system or Dell Precision™ workstation.

SAFETY: General

- Observe and follow service markings. Do not service any product except as explained in your user documentation. Opening or removing covers that are marked with the triangular symbol with a lightning bolt may expose you to electrical shock. Components inside these compartments should be serviced only by a trained service technician.

- If any of the following conditions occur, unplug the product from the electrical outlet and replace the part or contact your trained service provider:

  – The power cable, extension cable, or plug is damaged.

  – An object has fallen into the product.

  – The product has been exposed to water.

  – The product has been dropped or damaged.

  – The product does not operate correctly when you follow the operating instructions.

- Use the product only with approved equipment.

- Operate the product only from the type of external power source indicated on the electrical ratings label. If you are not sure of the type of power source required, consult your service provider or local power company.

- Handle batteries carefully. Do not disassemble, crush, puncture, short external contacts, dispose of in fire or water, or expose batteries to temperatures higher than 60 degrees Celsius (140 degrees Fahrenheit). Do not attempt to open or service batteries; replace batteries only with batteries designated for the product.

SAFETY: When Working Inside Your System

Before you remove the system covers, perform the following steps in the sequence indicated.

> ⚠ **CAUTION:** Except if expressly otherwise instructed in Dell documentation, only trained service technicians are authorized to remove the system cover and access any of the components inside the system.

> ⊘ **NOTICE:** To help avoid possible damage to the system board, wait for 5 seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device.

1 Turn off the system and any devices.

2 Ground yourself by touching an unpainted metal surface on the chassis before touching anything inside the system.

3 While you work, periodically touch an unpainted metal surface on the chassis to dissipate any static electricity that might harm the internal components.

4 Disconnect your system and devices from their power sources. To reduce the potential of personal injury or shock, disconnect any telecommunication lines from the system.

In addition, take note of these safety guidelines when appropriate:

- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. As you pull the connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, make sure that both connectors are correctly oriented and aligned.

- Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a microprocessor chip by its edges, not by its pins.

SAFETY: Protecting Against Electrostatic Discharge

Electrostatic discharge (ESD) events can harm electronic components inside your computer. Under certain conditions, ESD may build up on your body or an object, such as a peripheral, and then discharge into another object, such as your computer. To prevent ESD damage, you should discharge static electricity from your body before you interact with any of your computer's internal electronic components, such as a memory module. You can protect against ESD by touching a metal grounded object (such as an unpainted metal surface on your computer's I/O panel) before you interact with anything electronic. When connecting a peripheral (including handheld digital assistants) to your computer, you should always ground both yourself and the peripheral before connecting it to the computer. In addition, as you work inside the computer, periodically touch an I/O connector to remove any static charge your body may have accumulated.

You can also take the following steps to prevent damage from electrostatic discharge:

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component. Just before unwrapping the antistatic package, be sure to discharge static electricity from your body.

- When transporting a sensitive component, first place it in an antistatic container or packaging.

- Handle all electrostatic sensitive components in a static-safe area. If possible, use antistatic floor pads and work bench pads.

2

Overview

The Dell™ Serial-Attached SCSI (SAS) 6/iR controller is Dell's next generation controller with integrated redundant array of independent disks (RAID) capabilities. SAS technology is not backward compatible with the previous generation of SCSI devices. All SAS 6/iR controllers are half-length, standard-height PCI-E cards, except for the SAS 6/iR Integrated controller on the blade servers and on the Precision workstations. The SAS 6/iR controllers are supported on platforms with PCI-E x4, x8 and x16 connectors.

Figure 2-1.   SAS 6/iR Adapter Hardware Architecture
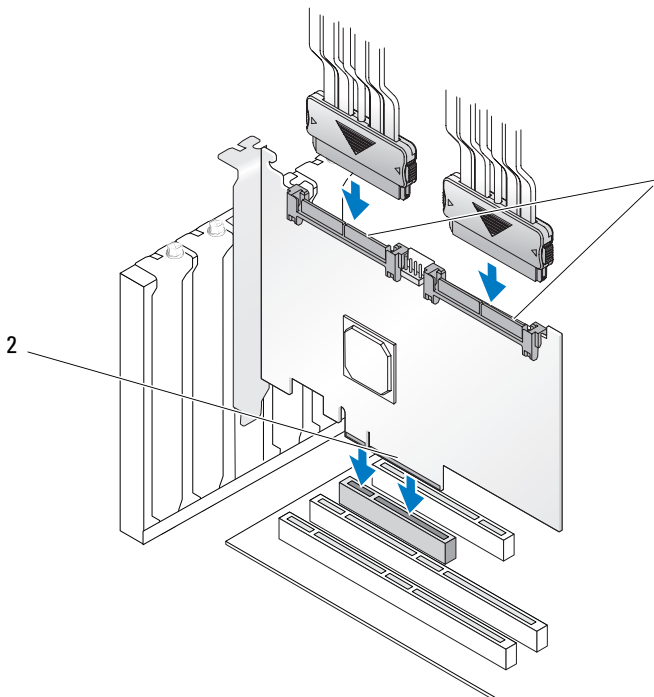
| 1 | SAS x4 internal connector | 2 | PCI-E connector |

About RAID

RAID is a group of multiple independent physical disks that provide high performance or better data availability by increasing the number of drives used for saving and accessing data. A RAID disk subsystem improves I/O performance and data availability. The physical disk group appears to the host system as a single storage unit. Data throughput improves because multiple disks can be accessed simultaneously. RAID systems also improve data storage availability and fault tolerance.

RAID Levels

RAID 0 uses disk striping to provide high data throughput, especially for large files in an environment that requires no data redundancy.

Integrated Mirroring or RAID 1 uses disk mirroring so that data written to one physical disk is simultaneously written to another physical disk. This is good for small databases or other applications that require small capacity, but complete data redundancy.

◑ **NOTICE:** Lost data on an Integrated Striping virtual disk cannot be recovered in the event of a physical disk failure.

RAID Terminology

Integrated Striping

Integrated Striping (RAID 0) allows you to write data across multiple physical disks instead of just one physical disk. Integrated Striping involves partitioning each physical disk storage space into 64 KB stripes. These stripes are interleaved in a repeated sequential manner. The part of the stripe on a single physical disk is called a stripe element.

For example, in a four-disk system using only Integrated Striping, segment 1 is written to disk 1, segment 2 is written to disk 2, and so on. Integrated Striping enhances performance because multiple physical disks are accessed simultaneously, but Integrated Striping does not provide data redundancy. Figure 2-2 shows an example of Integrated Striping.

Figure 2-2. Example of Integrated Striping (RAID 0)

stripe element 1   stripe element 2   stripe element 3   stripe element 4
stripe element 5   stripe element 6   stripe element 7   stripe element 8
stripe element 9   stripe element 10   stripe element 11   stripe element 12
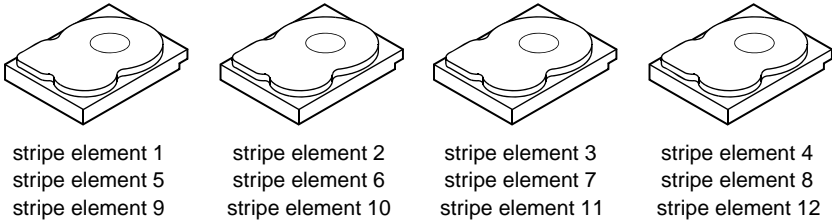
Integrated Mirroring

With Integrated Mirroring (RAID 1), data written to one disk is simultaneously written to another disk. If one disk fails, the contents of the other disk can be used to run the system and rebuild the failed physical disk. The primary advantage of Integrated Mirroring is that it provides 100 percent data redundancy. Because the contents of the disk are completely written to a second disk, the system can sustain the failure of one disk. Both disks contain the same data at all times. Either physical disk can act as the operational physical disk.

NOTE: Mirrored physical disks improve read performance by read load balance.

Figure 2-3. Example of Integrated Mirroring (RAID 1)

stripe element 1   stripe element 1 duplicated
stripe element 2   stripe element 2 duplicated
stripe element 3   stripe element 3 duplicated
stripe element 4   stripe element 4 duplicated

3
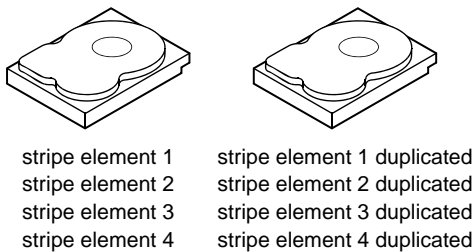
SAS 6/iR Features

This section provides the specifications of Dell™ Serial-Attached SCSI (SAS) 6/iR controller. The following table compares the specifications of the SAS 6/iR Adapter and SAS 6/iR Integrated.

Table 3-1.   Specifications of SAS 6/iR

Specification	SAS 6/iR Adapter	SAS 6/iR Integrated
SAS technology	Yes	Yes
Support for x4, x8, or x16 PCI Express Host Interface	Yes	Yes
Form Factor	Standard-Height, Half-Length PCI Adapter	Standard-Height, Half-Length PCI on all systems except on blade servers (where the dimension do not follow industry standards) and some Precision workstations (where the controller has been integrated on the mother board)
I/O controller (IOC)	LSI SAS 1068e	LSI SAS 1068e
	Core Speed: 255 MHz	Core Speed: 255 MHz
Operating voltage requirements	+12V, +3.3V, +3.3Vaux	+12V, +3.3V, +3.3Vaux
Communication to the system	PCI-E lanes	System dependent
Communication to end devices	SAS Links	SAS Links

Table 3-1. Specifications of SAS 6/iR *(continued)*

Specification	SAS 6/iR Adapter	SAS 6/iR Integrated
SAS Connectors	2 x4 Internal	2 x4 Internal connectors on all systems, with two exceptions: 4 x1 on Precision workstations with controller integrated on the motherboard, no SAS connector on the controller for the blades (I/O is routed though the PCI connector)
Lead Free	Yes	Yes
Supported operating systems	Microsoft® Windows Server® 2003 Family, Windows® XP, Microsoft Windows Server 2008 Family, Windows Vista™, Red Hat® Enterprise Linux® Versions 4 and 5, SUSE® Linux Enterprise Server Version 10.	
Dell-compliant SAS and SATA compatibility	Yes	Yes
Dell supported direct connected end devices	Dell-compliant physical disks	Dell-compliant physical disks
SMART error support through management applications	Yes	Yes
Backplane supported systems	Yes	Yes
Hardware-based RAID	RAID 0, RAID 1	RAID 0, RAID 1
Maximum number of virtual disks	2	2

Table 3-1. Specifications of SAS 6/iR *(continued)*

Specification	SAS 6/iR Adapter	SAS 6/iR Integrated
Storage management software	OpenManage™ Storage Services, SAS RAID Storage Manager	OpenManage Storage Services, SAS RAID Storage Manager
NOTE: The management software that is supported depends on the specific platform.		
Support for internal tape drive	No	No
Support for Global Hotspare	Yes	Yes
Maximum number of Hotspares	2	2

4

Hardware Installation

This chapter describes how to install the Dell™ Serial-Attached SCSI (SAS) 6/iR Adapter.

NOTE: If the SAS 6/iR Integrated is embedded on the system motherboard, it does not require any installation. See your system's *Hardware Owner's Manual* or the *User's Guide* for instructions.

Installing the SAS 6/iR Adapter

⚠ **CAUTION: For some systems, only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before performing any procedure, see the safety information that shipped with your system.**

1 Unpack the SAS 6/iR Adapter and check for damage.

NOTE: Contact Dell if the controller is damaged.

2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet. See your system's *Hardware Owner's Manual* or the *User's Guide* for more information on power supplies.

3 Disconnect the system from the network and remove the cover of the system. See your system's *Hardware Owner's Manual* or the *User's Guide* for more information on opening the system.

4 Select an appropriate PCI-E slot. Remove the blank filler bracket on the back of the system aligned with the PCI-E slot you have selected.

NOTE: For more information about your system's PCI-E slots, see your system's *Hardware Owner's Manual*.

5 Align the SAS 6/iR Adapter to the PCI-E slot you have selected.

6 Insert the controller gently, but firmly, until the controller is firmly seated in the PCI-E slot. See Figure 4-1.

Figure 4-1.   Installing a SAS 6/iR Adapter
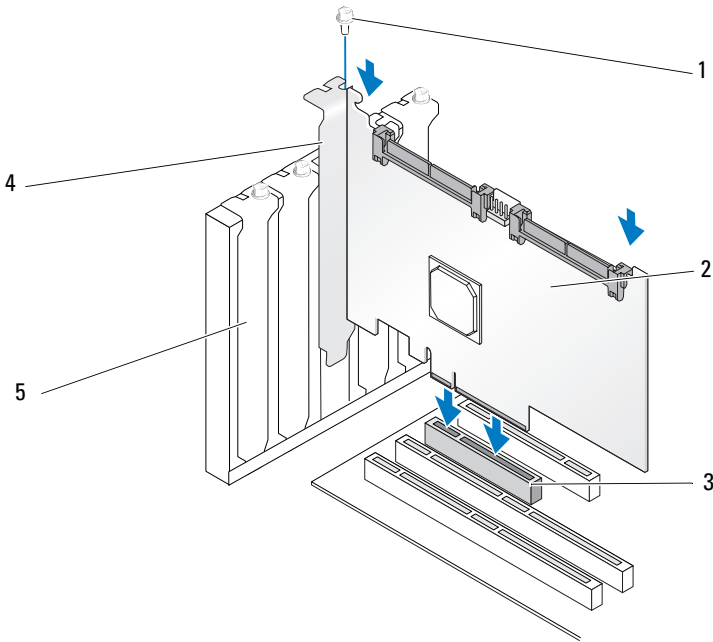
1	bracket screw	2	SAS 6/iR Adapter	3	PCI-E slot
4	PCI bracket	5	filler bracket		

7   Tighten the bracket screw, if any, or use the system's retention clips to secure the controller to the system's chassis.

8   Connect the cables from the end devices or the backplane of the system to the controller. See Figure 4-2.

Figure 4-2.   Connecting the Cable
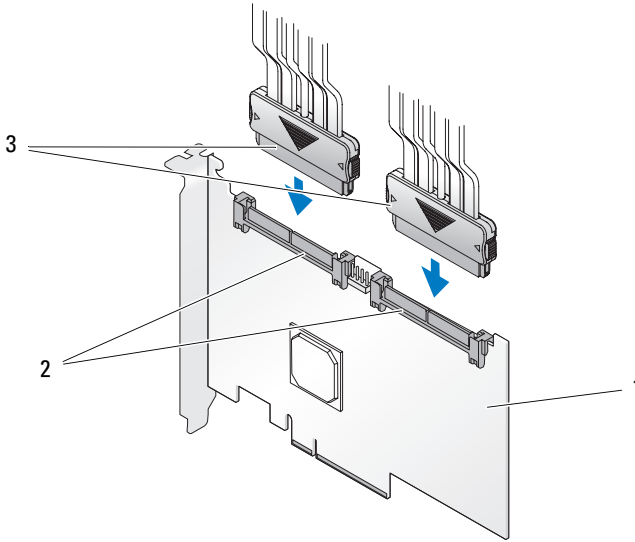
| | 1 | SAS 6/iR Adapter | 2 | SAS x4 internal connector | 3 | cable |

9   Replace the cover of the system. See your system's *Hardware Owner's Manual* or the *User's Guide* for more information on closing the system.

10 Reconnect the power cable(s) and network cables, and then turn on the system.

5

Driver Installation

The Dell™ Serial-Attached SCSI (SAS) 6/iR controller requires software drivers to operate with Microsoft® Windows®, Red Hat® Linux®, and SUSE® Linux operating systems.

This chapter contains the procedures for installing the drivers for the following operating systems:

- Microsoft Windows Server® 2003 Server family
- Microsoft Windows Server 2008 Server family
- Microsoft Windows XP
- Red Hat Linux Versions 4 and 5
- SUSE Linux Enterprise Server Version 10
- Windows Vista™

The four methods for installing a driver that are discussed in this chapter are:

- During operating system installation.
- After adding a new SAS 6/iR controller on an existing operating system.
- Updating existing drivers.
- Installing from a *Dell Precision™ Workstation Operating System* media. This media includes the drivers.

NOTE: Operating system installation on a RAID 1 or a RAID 0 virtual disk is supported only when the virtual disk is in an optimal state.

NOTE: To ensure you have the latest version of any driver mentioned in this section, check the Dell Support website at **support.dell.com**. If a newer version exists, you can download the driver to your system.

Installing the Windows Driver

This section documents the procedures used to install the Windows driver.

Creating the Driver Media

Perform the following steps to create the driver media:

1 Browse to the download section for the system from the Dell Support website at **support.dell.com**.

2 Locate and download the latest SAS 6/iR controller driver to the system.

3 Follow the instructions on the Dell Support website for extracting the driver to the media.

Pre-Installation Requirements

Before you install the operating system:

• Read the Microsoft *Getting Started* document that ships with your operating system.

• Ensure that your system has the latest BIOS, firmware, and driver updates. If required, download the latest BIOS, firmware, and driver updates from the Dell Support website at **support.dell.com**.

• Create a device driver media (diskette, USB drive, CD, or DVD).

Creating the Device Driver Media

Use one of the methods described in the following sections to create the device driver media.

Downloading Drivers From the Dell Systems Service and Diagnostic Tools Media

1 Insert the *Dell Systems Service and Diagnostics Tools* media into a system.

The **Welcome to Dell Service and Diagnostic Utilities** screen is displayed.

2 Select your server model and operating system (Microsoft Windows Server 2003).

3 Click **Continue**.

4 From the list of drivers displayed, select the driver that you require. Select the self-extracting zip file and click **Run**. Copy the driver to a diskette drive, CD, DVD, or USB drive. Repeat this step for all the drivers that you require.

5 During the operating system installation described in "Installing the Driver During a Windows Server 2003 or Windows XP Operating System Installation" on page 25 and "Installing the Driver During a Windows Server 2008 or Windows Vista Installation" on page 26, use the media that you created with the **Load Driver** option to load mass storage drivers.

Downloading Drivers From the Dell Support Site

1 Go to **support.dell.com**.

2 Click **Drivers and Downloads**.

3 Enter the service tag of your system in the **Choose by Service Tag** field or select your system's model.

4 Select the **System Type**, **Operating System**, **Driver Language**, **and Category** from the drop-down list.

5 The drivers that are applicable to your selection are displayed. From the available list, download the drivers that you require to a diskette drive, USB drive, CD, or DVD.

6 During the operating system installation described in "Installing the Driver During a Windows Server 2003 or Windows XP Operating System Installation" on page 25 and "Installing the Driver During a Windows Server 2003 or Windows XP Operating System Installation" on page 25, use the media that you created with the **Load Driver** option to load mass storage drivers.

Installing the Driver During a Windows Server 2003 or Windows XP Operating System Installation

Perform the following steps to install the driver during operating system installation.

1 Boot the system using the Microsoft Windows XP/Microsoft Windows Server 2003 media.

2 When the message **Press F6 if you need to install a third party SCSI or RAID driver** appears, press the <F6> key immediately.

Within a few minutes, a screen appears that asks for additional controllers in the system.

3 Press the <S> key.

The system prompts for the driver media to be inserted.

📝 **NOTE:** The driver can be provided using a properly formatted USB key. Check **support.dell.com** for additional details.

4 Insert the driver media in the media drive and press <Enter>.

A list of SAS controllers appears.

5 Select the right driver for the installed controller and press <Enter> to load the driver.

📝 **NOTE:** For Windows Server 2003, a message can appear that states that the driver that you provided is older or newer than the existing Windows driver. Press <S> to use the driver that is on the media.

6 Press <Enter> again to continue the installation process as usual.

Installing the Driver During a Windows Server 2008 or Windows Vista Installation

Perform the following steps to install the driver during operating system installation.

1 Boot the system using the Microsoft Windows Vista/Microsoft Windows Server 2008 media.

2 Follow on-screen instructions until you reach the "Where do you want to install Vista/2008"; then select "Load driver…"

3 The system prompts for the media to be inserted. Insert the installation media and browse to the proper location when prompted.

4 Select the appropriate SAS 6/iR controller from the list, click "Next" and continue installation as usual.

📝 **NOTE:** Windows Server 2008 and Windows Vista operating systems include native support for the SAS 6/iR RAID controller and the driver is automatically installed. Check **support.dell.com** for driver updates.

Installing a Windows Server 2003, Windows Server 2008, Windows Vista, or Windows XP Driver for a New RAID Controller

Perform the following steps to configure the driver for the RAID controller on a system that already has Windows installed.

1 Turn off the system.

2 Install the new RAID controller in the system.

3 Turn on the system.

The Windows operating system detects the new controller and displays a message to inform the user.

4 The **Found New Hardware Wizard** screen pops up and displays the detected hardware device.

> **NOTE:** Windows 2008 and Vista include a device driver to support the SAS controllers. The system automatically detects the new controller and installs the driver. Check the version of the driver installed by Windows and update if necessary.

5 Click **Next**.

6 On the **Locate device driver** screen, select **Search for a suitable driver for my device** and click **Next**.

7 Make the Driver Files available and browse to the proper location from the Locate Driver Files screen.

8 Click **Next**.

9 The wizard detects and installs the appropriate device drivers for the new RAID controller.

10 Click **Finish** to complete the installation.

11 Reboot the server if Windows request to do so.

Updating an Existing Windows Server 2003, Windows Server 2008, Windows XP, or Windows Vista Driver

Perform the following steps to update the Microsoft Windows driver for the SAS 6/iR controller already installed on your system.

NOTE: It is important that you close all applications on your system before you update the driver.

1 Select **Start**→ **Settings**→ **Control Panel**→ **System**.

The **System Properties** screen appears.

NOTE: For systems running a Microsoft Windows Server 2003 operating system, click **Start**→ **Control Panel**→ **System**.

2 Click on the **Hardware** tab.

3 Click **Device Manager**.

The **Device Manager** screen appears.

NOTE: An alternative method is to open Device Manager. In Windows Explorer, right click on "My Computer" and select "Manage". The Computer Management windows will open; select "Device Manager" in the left panel.

4 Double-click on **SCSI and RAID Controllers**.

NOTE: In Windows 2008 and Windows Vista, SAS is listed under **Storage Controllers**.

5 Double-click the RAID controller for which you want to update the driver.

6 Click the **Driver** tab and click **Update Driver**.

The **Upgrade Device Driver Wizard** screen appears.

7 Make the driver files available with the USB key, or other media.

8 Select **Install from a list or specific location**.

9 Click **Next.**

10 Follow the steps in the wizard and browse to the location of the driver files.

11 Select the INF file from the USB key or other media.

12 Click **Next** and continue the installation steps in the Wizard.

13 Click **Finish** to exit the wizard and reboot the system for the changes to take place.

Installing Linux Driver

Use the procedures in this section to install the driver for Linux. The driver is updated frequently. To ensure that you have the current version of the driver, download the updated Linux driver from the Dell Support website at **support.dell.com**.

Creating a Driver Diskette

Before beginning the installation, copy the drivers from the *Service and Diagnostic Utilities* media or download the driver appropriate for Linux from the Dell Support website at **support.dell.com.** This file includes two Red Hat Package Managers (RPMs) and driver update disk files. The package also contains the Dynamic Kernel Module Support (DKMS) Red Hat Package Manager (RPM) file, source code, and release notes.

Refer to the documentation website at **support.dell.com** for more information on DKMS.

The package is a zipped tar file. After downloading the package to a Linux system, perform the following steps.

1 Unzip the package using gunzip.

2 Untar the file using `tar -xvf`.

3 Use the **dd** command to create a driver update disk. Use the appropriate image for the purpose.

    `dd if=<name of the dd image file> of=/dev/fd0`

    NOTE: You can create a driver update disk on a Windows system using the program **dcopynt**.

    NOTE: The output file "of" might be different, depending on how your operating system maps the floppy driver. The floppy drive does not need to be mounted in order to execute the "dd" command.

4 Use the diskette for operating system installation as described later in this section.

Creating a Driver Update Diskette Using DKMS

Perform the following steps to create the DUD using the DKMS tool:

✎ **NOTE:** To work, the driver needs to be installed on the system where this procedure is carried out.

1 Install the DKMS-enabled megaraid_sas driver rpm package.

2 Type the following command in any directory:

```
dkms mkdriverdisk -m megaraid_sas -v <driver
version> -k <kernel version> -d <distro>
```

✎ **NOTE:** The values for the –d option are suse for SLES diskettes and redhat for RHEL diskettes.

✎ **NOTE:** For further information on usage of DKMS, refer to the dkms main page.

This starts the process to create the megaraid_sas DUD image. After the DUD image has been built, you can find it in the DKMS tree for the megaraid_sas driver. See the output of the dkms mkdriverdisk command for the exact path.

Installing Red Hat Enterprise Linux Operating Systems using the Driver Update Diskette

Perform the following steps to install Red Hat Enterprise Linux (versions 4 and 5) and the appropriate driver.

1 Boot normally from the Red Hat Enterprise Linux installation media.

2 At the command prompt, type:

```
linux expert dd
```

3 When the install prompts for a driver diskette, insert the diskette and press <Enter>.

Refer to "Creating a Driver Diskette" on page 29 for information about creating a driver diskette.

4 Complete the installation as directed by the installation program.

The driver will be installed.

Red Hat Enterprise Linux 5 Installation and Disk Enumeration

The operating system may not boot when Red Hat Enterprise Linux 5 is installed on a system that has a serial-attached SAS 6i/R controller connected to more than two hard drives. The issue occurs when the hard drives are configured with more than one RAID configuration or when one RAID volume along with one or two individual disks are connected to the controller. In this scenario, the Red Hat Enterprise Linux 5 installer installs the Grand Unified Bootloader (GRUB) to the incorrect hard drive. To avoid this issue, complete the following steps during the operating system installation:

1 Insert the Red Hat Enterprise Linux 5 media and proceed through the installation screens to the **Drive Selection** screen.

2 Select **Review** and **Modify Partition Layout**.

3 Click **Next**. Proceed through the installation screens to the GRUB location screen and select the **Configure Advanced Bootloader Options** tab.

4 Click **Next**.

5 Select **Change Driver Order**.

6 In the Disk Order window, change the disks to the following order:
/dev/sdb
/dev/sdc (if present)
/dev/sda

7 Click **OK** and then continue with the Red Hat Enterprise Linux 5 installation.

Installing SUSE Linux Enterprise Server Using the Driver Update Diskette

NOTE: Refer to "Creating a Driver Diskette" on page 29 for information about creating a driver diskette.

To install SUSE Linux Enterprise Server (version 9 or 10) using the DUD:

1 Insert the appropriate SUSE Linux Enterprise Server (version 9 or 10) Service Pack media in the system.

2 Select **<F5>** for the driver update disk.

NOTE: Press <F5> for SLES 10 installation and <F6> for SLES 9 installation as shown on screen.

3 Select **Installation** from the menu.

4 Press <Enter> to load the Linux kernel.

5 At the prompt `Please insert the driver update floppy`, click **OK**.

The system selects the driver from the diskette and installs it. The system then displays the message

`DRIVER UPDATE ADDED` with the description of the driver module.

6 Click **OK**.

If you want to install from another driver update medium, continue with the following steps.

7 The system displays the message `PLEASE CHOOSE DRIVER UPDATE MEDIUM`.

8 Select the appropriate driver update medium.

The system selects the driver from the disk and installs it.

> **NOTE:** SLES 9 Gold media is required when you install any SLES 9 service pack.

SUSE Linux Enterprise Server 10 Installation and Disk Enumeration

The operating system may not boot when SUSE Linux Enterprise Server 10 is installed on a system that has the SAS 6/iR controller with more than two hard drives connected. The issue occurs when the hard drives are configured with more than one RAID configuration, or when one RAID volume along with one or two individual disks are connected to the controller. In these scenarios, the SUSE Linux Enterprise Server 10 installer will install the grand unified bootloader (GRUB) to the incorrect hard drive. To avoid this issue, complete the following steps during the operating system installation:

1 Insert the SUSE Linux installation media and proceed with the installation screens to the **Installation Settings** window. Select the **Expert** tab, and then select **Booting**.

2 The Boot Loader Settings window appears.

3 Select the **Boot Loader Installation** tab and then select **Boot Loader Installation Details**.

4 In the Disk Order window, change the disks to the following order:
/dev/sdb
/dev/sdc (if present)
/dev/sda

5 Click **OK** and then click **Finish** to return to the **Installation Settings** screen.

6 Continue with the SUSE Linux Enterprise Server 10 installation.

Installing the RPM Package With DKMS Support

Perform the following steps to install the RPM package with DKMS support:

1 Uncompress the gzipped tarball driver release package

2 Install the DKMS package using the command: `rpm -ihv dkms-<version>.noarch.rpm`

3 Install the driver package using the command: `rpm -ihv megaraid_sas-<version>.noarch.rpm`

> **NOTE:** Use `rpm -Uvh` *<package name>* when updating an existing package.

4 If the previous device driver is in use, a reboot is required for the updated driver to take effect

5 Verify that the driver has been loaded.

Upgrading the Kernel

When upgrading to a new kernel, you must reinstall the DKMS-enabled driver packages. Perform the following steps to update or install the driver for the new kernel:

1 In a terminal window, type the following:

```
dkms build -m <module_name> -v <module version>
-k <kernel version>

dkms install -m <module_name> -v <module version>
-k <kernel version>
```

2 To check whether the driver is successfully installed in the new kernel, type:

```
dkms status
```

You must see a message similar to the following one on the screen to confirm installation:

```
<driver name>, <driver version>, <new kernel
version>: installed
```

3 If the previous device driver is in use, a reboot is required for the updated driver to take effect.

6

SAS 6/iR BIOS

The BIOS of the Dell™ Serial-Attached SCSI (SAS) 6/iR controller offers the following features:

- Support for multiple SAS adapters
- POST Memory Management (PMM) support
- Redundant Array of Independent Disks (RAID) configuration tool
- Read-only memory (ROM) BIOS recovery image
- POST status error messaging
- Compatibility with Console Redirection
- POST accessible, text-based configuration utility (CTRL-C)

POST Messages

During POST, the BIOS displays messages that provide the status and identification information of the SAS 6/iR controller, and also displays errors detected during the POST process.

The BIOS POST identification banner prints the BIOS identification, copyright information, and the controller version. It displays the list of controllers and devices detected at initialization in a hierarchical order. The BIOS also prompts you to start the Configuration Utility during the POST process.

BIOS Fault Code Messages

If an error is encountered in the BIOS during POST, the BIOS Configuration Utility forces you to acknowledge BIOS errors by halting the POST process after the error display. You must press any key to continue. The BIOS Configuration Utility allows you to choose to continue booting or stop booting if errors are encountered.

Configuration Utility

Starting the Configuration Utility

1 Boot the system.

2 Press <Ctrl><C> during POST when prompted.
   If you wait too long and the operating system logo appears, continue to
   wait until the operating system completes bootup. Then restart your
   system and try again.

The Configuration Utility menu screen displays.

Functions Performed

📝 **NOTE:** The screens are organized in a hierarchical fashion and navigation hints are
displayed at the bottom of each screen. See the online help for additional
information about the utility.

Table 6-1.   Functions Performed by the Configuration Utility

Function	Description
Adapter List	Lists all the SAS 6/iR controllers in the system.SAS 5 controllers will also be listed.
Global Properties	Lists static and modifiable properties applicable to all SAS 6/iR controllers in the system.
Adapter Properties	Main screen for the selected controller. Lists the static and modifiable properties for the selected SAS 6/iR controller. Provides a menu for additional screens.
Select New Array Type	Provides the option to view existing arrays or create new arrays.
Create New Array	Provides the ability to add devices to the specified new array.
View Array	Displays the properties for the existing array and the option to enter the Mange Array screen.
Manage Array	Provides options for managing the current array.
Manage Hot Spares	Provides the ability to add or remove global hot spares.
SAS Topology	Lists the physical topology for the selected controller.

Table 6-1.   Functions Performed by the Configuration Utility *(continued)*

Function	Description
Device Properties	Lists the properties of physical devices attached to the selected controller.
Advanced Adapter Properties	Lists the advanced properties for the selected controller.
Advanced Device Properties	Lists static and modifiable advanced properties for all devices attached to the selected controller.
PHY Properties	Lists the properties for the PHYs for the selected controller.

Navigating the Configuration Utility

The navigation hints are displayed at the bottom of each screen. Online help is also available in the utility.

NOTE: After you press <CTRL><C>, press <Enter> on the adapter to manage it.

Integrated RAID Configuration and Management Screens

Integrated RAID (IR) configuration and management involves many screens, all of which are accessed by selecting **RAID Properties** on the **Adapter Properties** screen.

- If no RAID arrays are currently configured, you are prompted to create a RAID array.
- If at least one RAID array is currently configured, select **View Existing Array** to manage the array(s), or select the appropriate option to configure a new array.

The screens in the RAID configuration and management properties area are:

- **Select New Array Type**
- **Create New Array**
- **View Array**
- **Manage Array**

Select New Array Type

The two options for creating a new array are **Create R1 Volume** and **Create R0 Volume**. Additional information about the disk type options appear on the screen.

Create New Array

The **Create New Array** screen allows you to select disks for a new array.

1 Press <C> to create the array once the array is configured.

2 Save the changes when prompted to do so.

3 Press <F3> to confirm the changes.

After the array is created, the utility returns to the **Adapter Properties** screen. See the table below for the array properties description.

NOTE: It is recommended that you back up your data prior to adding or updating configurations.

Table 6-2.   Array Field Descriptions

Field	Description
Array Number	Number of current array out of total arrays configured
Array Identifier	Identifier text for the current array
Array Type	Type of array (R1 or R0)
Array Scan Order	Scan order for the current array
Array Size (MB)	Size of the array
	NOTE: In order to facilitate coercion on new larger disk drives, the disk size must be coerced down with a factor of 128 MB. Additionally, to comply with the latest Disk Data Format standard, 512 MB of space must be reserved for RAID metadata on the drive. This results in several hundred MB of space being removed from the usable size of an array when it is created.

Table 6-2.   Array Field Descriptions *(continued)*

Field	Description
Array Status	Status of the current array The status definitions are given as: **Optimal**—All members of the array are online and ready. **Degraded**—One or more members of a RAID 1 array have failed or are offline. The array can be returned to the Optimal state by replacing the failed or offline member. **Disabled**—The array has been disabled **Quiesced**—The array has been quiesced **Resync**—The array is resynchronizing **Failed**—The array has failed **PermDegraded**—The array is permanently degraded. This state indicates that the failure threshold on the primary member was reached while no secondary was available for correction. The data on the array may be accessible, but the array cannot be returned to the optimal state. **Inactive**—The imported array is inactive. The array must be activated before it can be accessed.
Device Slot Number	Slot number in which the specified device sits
Device Identifier	Identifier text for the specified device
RAID Disk	Specifies whether or not the disk is part of a RAID array (Yes or No). This field is grayed out under the following conditions: • The disk does not meet the minimum requirements for use in a RAID array. • The disk is not large enough to mirror existing data on the primary physical disk. • The disk is a part of another array.
Hotspare	Specifies whether or not the disk is a hotspare

Table 6-2.   Array Field Descriptions *(continued)*

Field	Description
Drive Status	**Ok** - Disk is online and fully functional.
	Missing - Diskette is not detected.
	Failed - Disk is not accessible or has reported a failure.
	Initing - Disk is initializing.
	CfgOffln - Disk is offline at host's request.
	UserFail - Disk is marked failed at host's request.
	Offline - Disk is offline for some other reason.
	Inactive - Disk has been set to inactive.
	Not Syncd - Data on disk is not synchronized with the rest of the array.
	Primary - Disk is the primary disk for a 2 disk mirror and is OK.
	Secondary - Disk is the secondary disk for a 2 disk mirror and is OK.
	Wrg Type - Device is not compatible for use as part of a RAID array.
	Too Small - Disk is too small to mirror existing data.
	Max Dsks - Maximum # of disks allowed for this type of array reached Maximum # of total IR disks on a controller reached.
	No SMART - Disk doesn't support SMART and can't be used in a RAID array.
	Wrg Intfc - Device interface (SAS/SATA) differs from existing IR disks.
Predicted Failure	Indicates whether device SMART is predicting device failure.
Size (MB)	Actual physical size of the selected disk in the array.

NOTE: The SAS 6ir controllers do support Drive Status LED operation on Dell PowerEdge systems which include drive status LEDs. Status LED support is only supported for drives which are configured as members of a Virtual Disk or Hot Spare. SAS 6iR supported Drive Status LED states may vary from those supported by other hardware based RAID solutions such as PERC 6.

NOTE: Replacing a member of an array in the **Permanently Degraded** state will result in the new physical disk being displayed as failed since resynchronization is possible. This does not indicate an actual failure on the new physical disk.

View Array

The **View Array** screen allows you to view the current array configuration.

Press <Alt+N> to view the next array. See the table above to view descriptions of each virtual disk property.

Manage Array

The **Manage Array** screen is used to manage the current array. The options are **Manage Hotspares**, **Synchronize Mirror**, **Activate Array**, and **Delete Array**. A confirmation is requested for each action.

Table 6-3.   Manage Array Field Descriptions

Field	Description
Identifier	The identifier of the array
Type	The RAID type of the array
Scan Order	The scan order of the array
Size (MB)	The coerced size of the array **NOTE:** In order to facilitate coercion on new larger disk drives, the disk size must be coerced down with a factor of 128 MB. Additionally, to comply with the latest Disk Data Format standard, 512 MB of space must be reserved for RAID metadata on the drive. This results in several hundred MB of space being removed from the usable size of an array when it is created.
Status	The status of the array
Manage Hotspares	This option is used to create or delete global hot spares. Using this option you can also: • Assign a hot spare, (Integrated Raid 1 configurations only). • Display each drive's type, size and hot spare status.
Synchronize RAID 1	This option is used to synchronize the R1 array. This option is not accessible under the following conditions: • The array is inactive. • The array does not need to be resynchronized. • R0 array is used.

Table 6-3. Manage Array Field Descriptions *(continued)*

Field	Description
Activate Array	This option is used to activate an inactive (foreign) array. The option is grayed out if there are no inactive arrays.
Delete Array	This option is used to delete the currently displayed array.

Exit Screen

It is important to exit the SAS BIOS Configuration Utility properly, because some changes take effect only when you exit. From the **Adapter List**, press <Esc> to exit. In addition, a similar exit screen appears when you exit most other screens, and it can be used to save settings.

Performing Configuration Tasks

Creating an Integrated Striping Virtual Disk

An Integrated Striping (IS) virtual disk, also referred to as RAID 0, offers the ability to stripe data across multiple physical disks. RAID 0 volumes offer increased capacity by combining multiple physical disks into a single virtual disk. RAID 0 volumes also offer increased performance by striping disk access across multiple physical disks. Follow these steps to create a RAID 0 virtual disk on a SAS 6/iR controller.

1 Select a controller from the **Adapter List** in the Configuration Utility.

2 Select the **RAID Properties** option.

3 Select **Create RAID 0 Volume** when you are prompted to create either a RAID 0 virtual disk or a RAID 1 virtual disk.

   The next screen shows a list of disks that can be added to a virtual disk.

4 Move the cursor to the **RAID Disk** column. To add a disk to the virtual disk, change "No" to "Yes" by pressing the <+>, <->, or space bar. As disks are added, the **Virtual Disk Size** field changes to reflect the size of the new virtual disk.

   ⊘ **NOTICE:** All data will be lost upon creation of the virtual disk.

There are several limitations when creating a RAID 0 virtual disk:

- All disks must be either Dell-compliant SAS or SATA physical disks.
- SAS and SATA physical disks cannot be used in the same virtual disk.
- There must be at least 2 physical disks in a virtual disk.
- No more than 8 physical disks are allowed in a virtual disk.

5 Press <C> and then select **Save changes** when the virtual disk has been fully configured.

6 Press <F3> to confirm that existing data will be lost with the creation of the virtual disk. The Configuration Utility will pause while the virtual disk is being created.

NOTICE: RAID 0 does not provide any data protection in the event of disk failure. It is primarily used to increase performance.

NOTE: Once the number of disks in a RAID virtual disk is set, it cannot be changed.

NOTE: The maximum size of the virtual disk that contains the bootable operating system is 2 Terabytes. This is due to operating system restrictions. The maximum array size (non-bootable) is 16 Terabytes.

Creating a Integrated Mirroring Virtual Disk

An Integrated Mirroring (IM) virtual disk, also referred to as RAID 1, offers the ability to mirror data from one physical disk onto another one. RAID 1 volumes offer increased reliability by combining two physical disks into a single virtual disk such that each disk contains a mirrored copy of the other's data. Follow these steps to create a RAID 1 virtual disk on a SAS 6/iR controller that does not currently have a virtual disk configured.

1 Select a controller from the **Adapter List** in the Configuration Utility.

2 Select the **RAID Properties** option.

3 Select **Create RAID 1 Volume** when you are prompted to create either a RAID 0 virtual disk or a RAID 1 virtual disk.
   The next screen shows a list of disks that can be added to a virtual disk.

4 Move the cursor to the **RAID Disk** column. To add a disk to the virtual disk, change "No" to "Yes" by pressing the <+>, <->, or space bar.

NOTICE: Data on both disks will be lost. It is recommended that you back up all data before performing these steps.

5 There are several limitations when creating a RAID 1 virtual disk:

  - All disks must be either Dell-compliant SAS or SATA physical disks.

  - SAS and SATA physical disks cannot be used in the same virtual disk.

  - There must be 2 physical disks in a RAID 1 virtual disk.

6 Press <C> and then select **Save changes** when the virtual disk has been fully configured.

> **NOTE:** There is an option to create a hot spare for a RAID 1 virtual disk. The Create RAID 1 screen allows the option to assign a hot spare. Only drives that are compatible with the new virtual disk configuration can be selected. The maximum number of hot spares allowed is two.

7 Press <F3> to confirm that existing data will be lost with the creation of the virtual disk. The Configuration Utility will pause while the virtual disk is being created.

> **NOTE:** RAID 1 provides protection against the failure of a single physical disk. When a disk fails, the physical disk can be replaced and the data re-mirrored to the physical disk, maintaining data integrity.

Viewing Virtual Disk Properties

Follow these steps to view the properties of RAID 0 and RAID 1 virtual disks:

1 Select a controller from the **Adapter List** in the Configuration Utility.

2 Select the **RAID Properties** option.

  - If there are no existing virtual disks, you will be prompted to create a RAID 0 or a RAID 1 virtual disk.

  - If there is one existing virtual disk, select **View Existing Array**.

  - If there are two existing virtual disks, press <Alt+N> to view the next virtual disk.

  - If a compatible global hot spare exists it displays with the members of the virtual disk.

3 Press <Enter> when the **Manage Array** item is selected to manage the current virtual disk.

Synchronizing a Virtual Disk

Synchronizing a virtual disk means that the firmware synchronizes the data on the secondary disk(s) with the data on the primary disk of the mirror. Follow these steps to start synchronization for a RAID 1 virtual disk:

1 Select **Synchronize Mirror**.

2 Press **Y** to start the synchronization or **N** to cancel it.

Activating a Virtual Disk

A virtual disk can become inactive if, for example, it is removed from one SAS 6/iR controller and moved to another one. The **Activate** option allows you to reactivate an inactive virtual disk that has been added to a system. This option is only available when the selected virtual disk is currently inactive.

NOTE: Do not migrate a volume or hotspares to a different system unless that system does not currently have the maximum number of virtual disks and hotspares. The maximum number of virtual disks is two and the maximum number of hotspares is two. Exceeding this number may result in undesirable behavior.

1 Select **Activate Mirror**.

2 Press **Y** to proceed with the activation or press **N** to abandon it.

After a pause, the virtual disk will become active.

NOTE: Activation of migrated virtual disks is only supported when the migrated virtual disk(s) is in an optimal state and contains all the physical disks.

NOTE: If a virtual disk with defined hot spare drives is migrated to a SAS6/iR controller that has a native virtual disk with defined hot spares already configured, and the total number of hot spares is greater than the maximum supported number of hot spares (2) then the migrated hot spare drive(s) will be deleted. After a reboot, those drives are displayed as basic drives on the system. You can then create the desired virtual disk and hot spare drive configuration using CTRL-C or the RAID management application.

Migrating and Activating a Virtual Disk

Virtual disks and hot spares can be migrated from other SAS 6/IR controllers only. Virtual disks cannot be migrated from any other controllers, including the SAS 5 series of controllers or PERC series of controllers. During the migration process, all systems must be powered down prior to removing and

replacing drives. Volumes that are migrated to another controller will be inactive and must therefore be activated.To activate a virtual disk see "Activating a Virtual Disk" on page 45.

Deleting a Virtual Disk

NOTICE: Before deleting a virtual disk, be sure to back up all data on the virtual disk that you want to keep.

Follow these steps to delete a selected virtual disk:

1   Select **Delete Virtual Disk**.

2   Press **Y** to delete the virtual disk or press **N** to abandon the deletion.

3   Press <F3> to confirm deletion of the virtual disk. After a pause, the firmware deletes the virtual disk.

NOTICE: If the physical disks of a virtual disk are removed and the virtual disk's configuration is subsequently deleted from the SAS 6/iR controller, the physical disks show up only as simple disks with no RAID association if they are placed back onto the same SAS 6/iR controller. Once the virtual disk is removed from a SAS 6/iR controller using the BIOS Configuration Utility (regardless whether the physical disks members are present), the virtual disk cannot be restored.

Hot Spare Failover

If a RAID 1 virtual disk enters a degraded state, a compatible hot spare automatically begins rebuilding the degraded virtual disk. The "missing" or "failed" member of the degraded virtual disk displays as a 'missing' global hot spare. The "missing" or "failed" drive must be replaced with a drive compatible with an existing virtual disk(s).

Replacing and Rebuilding a Degraded Virtual Disk

In the event of a physical disk failure in a RAID 1 virtual disk, you will need to replace the disk and resynchronize the virtual disk. Synchronization occurs automatically on replacing the physical disk using the following steps.

1   Replace the failed physical disk with a blank disk of the same type and of equal or greater capacity.

2   Check your management application or the BIOS Configuration Utility (Ctrl-C) to ensure synchronization started automatically.

NOTE: During the rebuilding of a volume the synchronization will be restarted from the beginning if a hard drive is added or removed from the system. Wait until any synchronization processes have been completed before adding or removing hard drives.

NOTE: Always remove any configuration information from hard drives if they are to be removed from a system. This can be completed by deleting the RAID configuration through the BIOS configuration utility or an operating system unless you are migrating these hard drives to a different system level application. SAS 6/iR hotspare functionality requires that the slots in which hard drives are inserted be associated with the virtual disks they are a part of. Do not insert hard drives with foreign or old (out of date) configuration information stored on those hard drives into slots that are associated with existing virtual disks.

NOTE: If the system is rebooted while the rebuild is in progress, the rebuild will be restarted from the beginning. The rebuild time for a volume varies depending on the size of the member disks and any additional system activity. A system with no additional activity executes a rebuild at approximately 30 MB per second.

7

Troubleshooting

To get help with problems with your Dell™ Serial-Attached SCSI (SAS) 6/iR controller, you can Contact Dell or access the Dell Support website at **support.dell.com**.

BIOS Boot Order

If you intend to boot to the controller, ensure it is set appropriately in the system's BIOS boot order. See your system documentation for more information.

General Problems

NOTE: For additional troubleshooting information, see the *SAS RAID Storage Manager User's Guide* and the *OpenManage Storage Services User's Guide*.

Table 7-1. General Problems

Problem	Suggested Solution
`No Physical Disks Found` message appears during a CD installation of a Windows operating system.	The message appears due to one of the following reasons: • The driver is not supported on the operating system. (applicable to Windows 2003 and Windows XP operating systems only) • The controller BIOS is disabled. • Physical disks are not connected or seated properly. The corresponding solutions to the three causes of the message are: • Press <F6> to install the Device Driver during installation. • Enter the BIOS Configuration Utility to enable the BIOS. See "SAS 6/iR BIOS" on page 35. • Verify if the physical disks are connected or seated properly.

Physical Disk Related Issues

Table 7-2. Physical Disk Issues

Problem	Suggested Solution
The system does not boot from the SAS 6/iR controller.	Ensure that the boot disk is attached to the controller at the lowest ID and check the controller and the physical disk boot order in the system BIOS. **NOTE:** See your system documentation for information about boot device selection.
Physical disk is not enumerated during POST.	• Go to the Configuration Utility and ensure that the physical disk is not enumerated in the SAS topology. • Verify the cable connection. • Reseat the physical disk. • Check and reseat the cable.
One of the physical disks in the array shows the status as "Failed".	• Check the SAS cables. • Reseat the physical disk. • Check the enclosure or the backplane for damage. • Contact Dell if the problem persists.
Integrated Mirroring (IM) virtual disk does not rebuild.	• Enter the Configuration Utility and ensure the physical disk is enumerated in the SAS topology. • Ensure the new disk is of the same drive type as the other disk in the virtual disk (SAS/SATA). • Ensure the new disk is of equal or greater capacity as the other disk in the virtual disk. • Ensure the new disk is not detected as an inactive virtual disk under the RAID Properties menu. Delete the newly inserted inactive disk. • Ensure the inserted disk has the same ID as the disk it is replacing. Assign the correct ID to the disk or use the **Manage Secondary Disk** feature in the **Manage Array** menu. • Ensure the new disk is a Dell supported SAS or SATA disk.

Configuration Utility Error Messages

📝 **NOTE:** These error messages are displayed inside the Configuration Utility. Restart your system and retry if you encounter any of these.

📝 **NOTE:** If the error message continues to be displayed even after following the steps mentioned in Table 7-3 for the resolution of the error, contact Dell Support for advanced troubleshooting. For information on how to contact Dell Technical Support, see "Getting Help" on page 57.

Table 7-3.   Configuration Utility Error Messages

Message	Meaning and Suggested Solution
`An error occurred while reading non-volatile settings.`	An error reading any one of a number of settings from the firmware. Reseat the controller and reboot.
`An error occurred while reading current controller settings.`	Controller setup and initialization has failed. Reboot the system.
`Advanced Device Properties settings not found.`	Failed to read vital configuration page from firmware. Reflash the firmware and reboot.
`Error obtaining PHY properties configuration information.`	Failed to read vital configuration page from firmware.Reflash the firmware and reboot.
`Configuration Utility Options Image checksum error.`	Failed to properly read Configuration Utility options from flash. Restart and retry. If the issue persists, reflash the firmware on the controller.
`Can't load default Configuration Utility options.`	Failed to allocate memory for Configuration Utility options structure.
`An error occurred while writing non-volatile settings.`	An error occurred while writing one or more settings to the firmware.

BIOS Error Messages

Table 7-4.   BIOS Error Messages

Message	Meaning
Press <Ctrl+C> to Enable BIOS	When the BIOS is disabled, you are given the option to enable it by entering the configuration utility. You can change the setting to **Enabled** in the configuration utility.
Adapter at Baseport xxxx is not responding where xxxx is the baseport of the controller	If the controller does not respond for any reason but is detected by the BIOS, it displays this warning and continues. Shut down the system and try to reseat the controller. If this message appears again, Contact Dell.
Following SAS targets are not responding...	When the BIOS determines that previously configured physical disks are not connected to the controller, the BIOS displays this warning and continues to boot. The system continues to boot. See "Physical Disk Related Issues" on page 50 for troubleshooting tips.
Adapter configuration may have changed, reconfiguration is recommended! Press CTRL-C to run Dell SAS 6 Configuration Utility…	Start the Configuration Utility and confirm the configuration of the SAS 6/iR controller.
Initializing...	Displays while the BIOS is waiting to initialize.
SAS discovery error	Indicates that there was a discovery error reported by the firmware and may be accompanied by more such messages. Enter the Configuration Utility to investigate.

Table 7-4.   BIOS Error Messages *(continued)*

Message	Meaning
`Integrated RAID exception detected:`	The BIOS detected an exception with one or more RAID virtual disk. For additional troubleshooting information, see the error message "`Volume (xx:yy:zzz) is currently in state "STATE"`.
`Volume (xx:yy:zzz) is currently in state "STATE"`	Lists the current state of the specified virtual disk when it is not optimal. The state may include: • INACTIVE: The virtual disk is inactive, possibly foreign, or could be in any one of the states mentioned below. • DEGRADED: The virtual disk is in a degraded state and has lost redundancy. • RESYNCING: The virtual disk is degraded and currently rebuilding. • FAILED: The virtual disk has an error and is in a failed state. • MISSING: The virtual disk is no longer present though a record of it remains.
`Device not available`	Device may not be ready at this time. The device will be retried. If the problem persists, restart your system.
`Spinning up the device!`	The device currently being scanned is being spun up.
`ERROR! Device is not responding to Read Capacity`	The device did not respond to a read capacity command. Contact Dell.
`Failed to add device, too many devices!`	Could not allocate resources for additional devices.
`ERROR! Adapter Malfunctioning!`	The adapter did not initialize properly. There may be a problem with the adapter configuration. Reload the BIOS configuration. Invoke the configuration utility again and see if the issue persists.
`MPT firmware fault`	The LSI Logic MPT firmware faulted. Contact Dell.

Table 7-4. BIOS Error Messages *(continued)*

Message	Meaning
`Adapter removed from boot order!`	An controller that was previously in the boot order was not found. It has either been removed from the system or moved to a different slot.
`Updating Adapter List!`	A new adapter was found for which there is no record. A record will be created for it.
`Adapter(s) disabled by user`	An adapter was found, but it has been disabled in the Configuration Utility and will not be used by the BIOS.
`Adapter configuration may have changed, reconfiguration is suggested!`	A controller has been moved or reinstalled in the system. Add it to the boot order using the available resources.
`Memory allocation failed`	The controller could not allocate enough memory to load the Configuration Utility, its strings file, or its options file. Reboot the system.
`Invalid or corrupt image`	One of the images for the Configuration Utility, its strings file, or its options file is corrupt. Reload the BIOS. Reflash the firmware.
`Image upload failed`	Could not upload the image for the Configuration Utility, its strings file, or its options file. Reload the BIOS.Reflash the firmware.
`Image not found`	Could not locate the image for the Configuration Utility, its strings file, or its options file.
`Unable to load LSI Configuration Utility`	Could not load the Configuration Utility. This error usually follows one of the four previous messages.

`Unable to load LSI Logic Corp MPT BIOS`
 	
`MRT BIOS Fault 02h encountered at adapter PCI (XXh, XXh,XXh)`
 	
`Fusion-MPT Firmware fault code 0706h`
	The controller was downgraded from the current firmware revision to an earlier revision which cannot support the current configuration information and cannot be initialized. Contact Dell support for assistance.

A

Updating the Firmware

Updating the Dell™ Serial-Attached SCSI (SAS) 6/iR controller firmware is achieved by flashing the firmware. The firmware can be flashed while the controller is in use. The system must be restarted for the changes to the firmware to take effect. If there is a failure while flashing the firmware (such as a power outage) the controller reverts back to the earlier version of the firmware.

NOTE: If you flash the firmware while using the controller, you may notice temporary degradation in the controller's performance.

Firmware Update Utility

Firmware update utility can be run from a variety of operating systems. Firmware flash is automated and no user intervention is required. You can obtain firmware flash utility from the *Dell™ PowerEdge™ Service and Diagnostic Utilities* media that shipped with your system.

Running the firmware update utility from the operating system is not supported on Dell workstations. You have to perform a manual update. In the event of new firmware release, check the Dell Support website at support.dell.com for the latest firmware updates and the firmware update procedure.

B

Getting Help

Obtaining Assistance

⚠ **CAUTION: If you need to remove the computer cover, first disconnect the computer power and modem cables from all electrical outlets.**

If you need assistance with a technical problem, perform the following steps:

1 Complete the procedures in the section "Troubleshooting Your System" of your system's *Hardware Owner's Manual*.

2 Run the system diagnostics and record any information provided.

3 Use Dell's extensive suite of online services available at Dell Support at **support.dell.com** for help with installation and troubleshooting procedures.

   For more information, see "Online Services" on page 58.

4 If the preceding steps have not resolved the problem, call Dell for technical assistance.

✎ **NOTE:** Call the support service from a phone near or at the system so that the support staff can assist you with any necessary procedures.

✎ **NOTE:** Dell's Express Service Code system may not be available in all countries.

When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.

For instructions on using the technical support service, see "Dell Enterprise Training" on page 59 and "Before You Call" on page 60.

✎ **NOTE:** Some of the following services are not always available in all locations outside the continental U.S. Call your local Dell representative for information on availability.

Technical Support and Customer Service

Dell's support service is available to answer your questions about Dell™ hardware. Our support staff use computer-based diagnostics to provide fast, accurate answers.

To contact Dell's support service, see "Before You Call" on page 60, and then see the contact information for your region or go to **support.dell.com**.

Online Services

You can access Dell Support at **support.dell.com**. Select your region on the **WELCOME TO DELL SUPPORT** page, and fill in the requested details to access help tools and information.

You can learn about Dell products and services on the following websites:

> **www.dell.com**
>
> **www.dell.com/ap** (Asian/Pacific countries only)
>
> **www.dell.com/jp** (Japan only)
>
> **www.euro.dell.com** (Europe only)
>
> **www.dell.com/la** (Latin American and Caribbean countries)
>
> **www.dell.ca** (Canada only)

You can access Dell Support through the following websites and e-mail addresses:

- Dell Support websites

  support.dell.com

  support.jp.dell.com (Japan only)

  support.euro.dell.com (Europe only)

- Dell Support e-mail addresses

  mobile_support@us.dell.com

  support@us.dell.com

  la-techsupport@dell.com (Latin America and Caribbean countries only)

  apsupport@dell.com (Asian/Pacific countries only)

- Dell Marketing and Sales e-mail addresses

  apmarketing@dell.com (Asian/Pacific countries only)

  sales_canada@dell.com (Canada only)

- Anonymous file transfer protocol (FTP)

  ftp.dell.com/

  Log in as user: `anonymous`, and use your e-mail address as your password.

Automated Order-Status Service

To check on the status of any Dell products that you have ordered, you can go to **support.dell.com**, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. See the contact information for your region.

Dell Enterprise Training

Dell Enterprise training is available; see **www.dell.com/training** for more information. This service may not be offered in all locations.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip available when you call. See the contact information for your region.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at **www.dell.com**. For the telephone number to call to speak to a sales specialist, see the contact information for your region.

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1 Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.

   For the telephone number to call, see the contact information for your region.

2 Include a copy of the invoice and a letter describing the reason for the return.

3 Include a copy of any diagnostic information indicating the tests you have run and any error messages reported by the system diagnostics.

4 Include any accessories that belong with the item(s) being returned (such as power cables, media such as CDs and diskettes, and guides) if the return is for credit.

5 Pack the equipment to be returned in the original (or equivalent) packing materials.

   You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect-on-delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

NOTE: See your system's *Hardware Owner's Manual* for the telephone numbers and codes provided to contact Dell Support.

If possible, turn on your system before you call Dell for technical assistance and call from a telephone at or near the system. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the system itself. Ensure that the system documentation is available.

⚠ **CAUTION: Before servicing any components inside your system, see your *Product Information Guide* for important safety information.**

C

Regulatory Notices

For additional regulatory information, please go to the Regulatory Compliance Homepage on www.dell.com at the following location: **www.dell.com/regulatory_compliance**.

中国大陆 RoHS

根据中国大陆 《电子信息产品污染控制管理办法》（也称为中国大陆 RoHS），以下部分列出了 Dell 产品中可能包含的有毒和 / 或有害物质的名称和含量。中国大陆 RoHS 指令包含在中国信息产业部 MCV 标准："电子信息产品中有毒有害物质的限量要求"中。

Dell 企业产品 （服务器、存储设备及网络设备）

部件名称	有毒或有害物质及元素					
	铅 （Pb）	汞 （Hg）	镉 （Cd）	六价铬 （Cr VI）	多溴联苯 （PBB）	多溴联苯醚 （PBDE）
机箱 / 挡板	X	O	X	O	O	O
印刷电路部件 - PCA*	X	O	X	O	O	O
电缆 / 连接器	X	O	X	O	O	O
硬盘驱动器	X	O	X	O	O	O
光盘驱动器 （CD、DVD 等）	X	O	O	O	O	O
磁带 / 介质	X	O	O	O	O	O
软磁盘驱动器	X	O	O	O	O	O
其它 RMSD/ 介质	X	O	O	O	O	O
电源设备 / 电源适配器	X	O	X	O	O	O
电源线	X	O	X	O	O	O
机械部件 - 风扇	X	O	O	O	O	O
机械部件 - 散热器	X	O	O	O	O	O
机械部件 - 电机	X	O	O	O	O	O
机械部件 - 其它	X	O	X	O	O	O
电池	X	O	O	O	O	O
定点设备 （鼠标等）	X	O	O	O	O	O
键盘	X	O	O	O	O	O
快擦写存储器	X	O	O	O	O	O
不间断电源设备	X	O	X	O	O	O
完整机架 / 导轨产品	X	O	X	O	O	O
软件 （CD 等）	O	O	O	O	O	O

* 印刷电路部件包括所有印刷电路板 （PCB）及其各自的离散组件、 IC 及连接器。

"0"表明该部件所含有害和有毒物质含量低于 MCV 标准定义的阈值。

"X"表明该部件所含有害和有毒物质含量高于 MCV 标准定义的阈值。对于所有显示 X 的情况， Dell 按照 EU RoHS
采用了容许的豁免指标。

在中国大陆销售的相应电子信息产品 （EIP）都必须遵照中国大陆 《电子信息产品污染控制识要求》标
准贴上环保使用期限 （EPUP）标签。Dell 产品所采用的 EPUP 标签 （请参阅实例，徽标内部的编号适用
于指定产品）基于中国大陆的 《电子信息产品环保使用期限通则》标准。

Corporate Contact Details (Taiwan Only)

Pursuant to Article 11 of the Commodity Inspection Act, Dell provides the following corporate contact details for the certified entity in Taiwan for the products addressed by this document:

Dell B.V. Taiwan Branch

20/F, No. 218, Sec. 2, Tung Hwa S. Road,

Taipei, Taiwan

Glossary

This section defines or identifies technical terms, abbreviations, and acronyms used in this document.

A

Adapter

An adapter enables the computer system to access peripheral devices by converting the protocol of one bus or interface to another. An adapter may also provide specialized function. Adapters may reside on the system board or be an add-in card. Other examples of adapters include network and SCSI adapters.

B

BIOS

(Basic Input/Output System) The part of the operating system in a system that provides the lowest level interface to peripheral devices. BIOS also refers to the Basic Input/Input Output System of other "intelligent" devices, such as RAID controllers.

BIOS Configuration Utility

The BIOS Configuration Utility reports and enables the configuration of controller properties. The utility resides in the controller BIOS and its operation is independent of the operating systems on your system. The BIOS Configuration Utility, also known as Ctrl-C, is built on elements called controls. Each control performs a function.

C

Coercion

Coercion is the process of rounding down the number of Logical blocks used for the physical members of a virtual disk to a common number. This allows drives with different absolute capacities, which can vary between drive manufacturers and drive families, to share a common stripe size and count as members of the virtual disk. Coercion necessarily results in a smaller capacity than was available on the un-coerced basic physical drive.

Controller

A chip that controls the transfer of data between the microprocessor and memory or between the microprocessor and a peripheral device such as a physical disk or the keyboard. In Storage Management, the hardware or logic that interacts with storage devices to write and retrieve data and perform storage management. RAID controllers perform RAID functions such as striping and mirroring to provide data protection.

D

Disk

A non-volatile, randomly addressable, rewriteable mass storage device, including rotating magnetic, optical and solid-state storage devices, or non-volatile electronic storage elements.

DKMS

DKMS stands for Dynamic Kernel Module Support. It is designed to create a framework where kernel dependent module source can reside so that it is very easy to rebuild modules as you upgrade kernels. This will allow Linux vendors to provide driver drops without having to wait for new kernel releases while also taking out the guesswork for customers attempting to recompile modules for new kernels.

Driver

A device driver, often called a driver for short, is a program that allows the operating system or some other program to interface correctly with a peripheral device such as a printer, a network PC card or the SAS 6/iR controller.

DUD (Driver Update Diskette)

Acronym for driver update diskette. A DUD is an image of a diskette stored as a regular file. To use it, you have to create a real diskette from this file. The steps used to create the diskette depend on how the image is supplied.

F

Firmware

Software stored in read-only memory (ROM) or Programmable ROM (PROM). Firmware is often responsible for the behavior of a system when it is first turned on. A typical example would be a monitor program in a system that loads the full operating system from disk or from a network and then passes control to the operating system.

Flash Memory

Sometimes referred as simply "flash", is a compact, solid-state, rewriteable, non-volatile memory device that retains its data when the power is turned off. It offers fast access time, low power consumption, and relative immunity to severe shock or vibration. It is a special type of EEPROM that can be erased and reprogrammed in blocks instead of one byte at a time. Many modern PCs have their BIOS stored on a flash memory chip so that it can easily be updated if necessary. Such a BIOS is sometimes called a flash BIOS.

H

Hardware

The mechanical, magnetic, electronic, and electrical components making up a computer system constitutes its hardware.

Hot Add/Remove

It is the addition/removal of a component while the system is running and operating normally.

L

Link

A connection between any two PCI Express devices is known as a link.

M

MHz

Megahertz or one million cycles per second is a unit of frequency commonly used to measure the operating speed of a computer processor or any other electronic component.

Mirroring

The process of providing complete redundancy using two physical disks, by maintaining an exact copy of one physical disk's data on the second physical disk. If one physical disk fails, the contents of the other physical disk can be used to maintain the integrity of the system and to rebuild the failed physical disk.

N

NVDATA

This refers to non-volatile data. It is the configuration information that is part of and is used by the controller firmware and is stored in the flash memory on the controller.

O

Operating System

The software that runs a computer, including scheduling tasks, managing storage, and handling communication with peripherals and performs basic input/output functions, such as recognizing input from the keyboard, sending output to the display screen, etc. is called an operating system.

P

PCI Express (PCI-E)

PCI Express (PCI-E) is an evolutionary upgrade to the existing Peripheral Component Interconnect (PCI) bus. PCI-E is a serial connection that operates more like a network than a bus. Instead of one bus that handles data from multiple sources, PCI-E has a switch that controls several point-to-point serial

connections. These connections fan out from the switch, leading directly to the devices where the data needs to go. Every device has its own dedicated connection, so devices no longer share bandwidth like they do on a normal bus.

PHY

The interface required to transmit and receive data packets transferred across the serial bus. Each PHY can form one side of the physical link in a connection with a PHY on a different Dell-qualified SATA device. The physical link contains four wires that form two differential signal pairs. One differential pair transmits signals, while the other differential pair receives signals. Both differential pairs operate simultaneously and allow concurrent data transmission in both the receive and the transmit directions.

Physical Disk

A physical disk (also known as hard disk drive) consists of one or more rigid magnetic discs rotating about a central axle, with associated read/write heads and electronics. A physical disk is used to store information, (data), in a non-volatile and randomly accessible memory space.

POST

POST, short for Power-On Self-Test is a process performed before the operating system loads when the computer is turned on. The POST tests various system components, such as RAM, the physical disks, and the keyboard.

R

RAID

Acronym for Redundant Array of Independent Disks (originally Redundant Array of Inexpensive Disks). It is an array of multiple independent physical disks managed together to yield higher reliability and/or performance exceeding that of a single physical disk. The virtual disk appears to the operating system as a single storage unit. I/O is expedited because several disks can be accessed simultaneously. Redundant RAID levels provide data protection.

ROM

Read-only memory (ROM), also known as firmware, is an integrated circuit programmed with specific data when it is manufactured. ROM chips are used not only in computers, but in most other electronic items as well. Data stored in these chips is nonvolatile i.e., it is not lost when the power is turned off. Data stored in these chips is either unchangeable or requires a special operation such as flashing to change.

RPM

RPM, short for "Red Hat Package Manager" is a package management system primarily intended for Linux. RPM installs, updates, uninstalls, verifies and queries software. RPM is the baseline package format of the Linux Standard Base. Originally developed by Red Hat for Red Hat Linux, RPM is now used by many Linux distributions. It has also been ported to some other operating systems such as NetWare by Novell.

S

SAS

Serial-Attached SCSI, SAS, is a serial, point-to-point, enterprise-level device interface that leverages the proven SCSI protocol set. The SAS interface provides improved performance, simplified cabling, smaller connectors, lower pin count, and lower power requirements when compared to parallel SCSI.

SATA

Serial Advanced Technology Attachment, a physical storage interface standard, is a serial link that provides point-to-point connections between devices. The thinner serial cables allow for better airflow within the system and permit smaller chassis designs.

SCSI

SCSI stands for "Small Computer System Interface," a processor-independent standard interface for system-level interfacing between a computer and intelligent devices including hard-drives, floppy disks, CD-ROM, printer, scanners and many more.

SCSIport

SCSIport driver is a Microsoft® driver for Windows® XP storage architecture, delivering SCSI commands to the storage targets. The SCSIport driver works well with storage using parallel SCSI.

Serial Architecture

Serial architectures have emerged to deliver higher performance by allowing more bandwidth per device pathway than their parallel counterparts. Serial architecture connections consist of a single pair of transmission signals that contain an embedded clock for self-clocking, enabling clock speed to be easily scaled. Serial bus architectures also support a network of dedicated point-to-point device connections, versus the multi-drop architectures of parallel buses, to deliver full bandwidth to each device, eliminate the need for bus arbitration, reduce latency, and greatly simplify hot-plug and hot-swap system implementations.

Serial Technology

Serial storage technology, specifically Serial ATA, Serial-Attached SCSI and PCI Express, address the architectural limitations of their parallel counterparts to deliver highly scalable performance. The technology draws its name from the way it transmits signals - in a single stream, or serially, compared to multiple streams for parallel. The main advantage of serial technology is that while it moves data in a single stream, it wraps data bits into individual packets that are transferred up to 30 times faster than parallel technology data.

SMART

Acronym for Self-Monitoring Analysis and Reporting Technology. The self-monitoring analysis and reporting technology (SMART) feature monitors the internal performance of all motors, heads, and drive electronics to detect predictable drive failures. This feature helps monitor drive performance and reliability, and protects the data on the drive. When problems are detected on a drive, you can replace or repair the drive without losing any data. SMART-compliant disks have attributes for which data (values) can be monitored to identify changes in values and determine whether the values are within threshold limits. Many mechanical failures and some electrical failures display some degradation in performance before failure.

Storport

The Storport driver has been designed to replace SCSIport and work with Windows 2003 and beyond. In addition, it offers better performance for storage controllers, providing higher I/O throughput rates, improved manageability, and an upgraded miniport interface.

Stripe Element

A stripe element is the portion of a stripe that resides on a single physical disk.

Striping

Disk striping writes data across all physical disks in a virtual disk. Each stripe consists of consecutive virtual disk data addresses that are mapped in fixed-size units to each physical disk in the virtual disk using a sequential pattern. For example, if the virtual disk includes five physical disks, the stripe writes data to physical disks one through five without repeating any of the physical disks. The amount of space consumed by a stripe is the same on each physical disk. The portion of a stripe that resides on a physical disk is a stripe element. Striping by itself does not provide data redundancy.

W

Windows

Microsoft Windows is a range of commercial operating environments for computers. It provides a graphical user interface (GUI) to access programs and data on the computer.

X

XP

XP is a Microsoft Windows operating system. Released in 2001, it is built on the Windows 2000 kernel, making it more stable and reliable than previous versions of Windows. It includes an improved user interface and more mobility features, such as plug and play features used to connect to wireless networks.

Index

B

BIOS, 35
  Configuration Utility, 36
  fault code messages, 35
  POST messages, 35

C

Configuration Utility
  functions performed, 36
  navigating, 37
  overview, 36
  starting, 36

D

driver diskette, 24

drivers
  installation, 23
  Microsoft operating system
    installation, 25

E

electrostatic discharge. *See* ESD

ESD, 10

F

firmware
  update utility, 55
  updating, 55

I

installation
  driver, 23
  SAS 6/iR Adapter, 19

Integrated RAID
  configuration, 37, 42
  create new virtual disk, 38
  creating IM, 43
  creating IS, 42
  Integrated Mirroring, 13
  Integrated Striping, 12
  manage array, 41
  new virtual disk, 38
  rebuilding virtual disk, 46
  replacing virtual disk, 46
  view virtual disk, 41
  virtual disk activation, 45
  virtual disk deletion, 46
  virtual disk properties, 44
  virtual disk synchronization, 45

www.dell.com | support.dell.com

0JM360A01

Printed in Malaysia.

www.dell.com | support.dell.com

0JM360A01

Printed in Brazil.

www.dell.com | support.dell.com

OJM360A01

www.dell.com | support.dell.com

0JM360A01

Printed in Ireland.

www.dell.com | support.dell.com