

Dual Channel SCSI RAID Enablement Card

Installation and Using Guide

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Note

Before using this information and the product it supports, be sure to read the general information under "Product Warranties and Notices" included with your system unit.

First Edition (October 2003)

Before using this information and the product it supports, read the information in "Safety Information" on page v and Appendix B, "Notices," on page 21.

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Safety Information

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

Before installing or removing signal cables, ensure that the power cables for the system unit and all attached devices are unplugged.

When adding or removing any additional devices to or from the system, ensure that the power cables for those devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.

Use one hand, when possible, to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.

During an electrical storm, do not connect cables for display stations, printers, telephones, or station protectors for communication lines.

Handling Static Sensitive Devices

Attention: Static electricity can damage this device and your system unit. To avoid damage, keep this device in its anti-static protective bag until you are ready to install it. To reduce the possibility of electrostatic discharge, follow the precautions listed below:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its anti-static package, touch it to an unpainted metal part of the system unit for at least two seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it on its static-protective package. (If your device is an adapter, place it component-side up.) Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather, as heating reduces indoor humidity and increases static electricity.

About This Book

This book provides information about installing the Dual Channel SCSI RAID Enablement Card and device driver support software, as well as cabling requirements. Use this book in conjunction with your specific system unit and operating system documentation.

ISO 9000

ISO 9000 registered quality systems were used in the development and manufacturing of this product.

Highlighting

The following highlighting conventions are used in this book:

Bold	Identifies commands, subroutines, keywords, files, structures, directories, and other items whose names are predefined by the system. Also identifies graphical objects such as buttons, labels, and icons that the user selects.
<i>Italics</i>	Identifies parameters whose actual names or values are to be supplied by the user.
Monospace	Identifies examples of specific data values, examples of text similar to what you might see displayed, examples of portions of program code similar to what you might write as a programmer, messages from the system, or information you should actually type.

References to AIX[®] and Linux Operating Systems

This document contains references to the AIX and Linux operating system. If you are using another operating system, consult the appropriate documentation for that operating system.

This document may describe hardware features and functions. While the hardware supports them, the realization of these features and functions depends upon support from the operating system. AIX and Linux provide this support. If you are using another operating system, consult the appropriate documentation for that operating system regarding support for those features and functions.

Related Publications

The following publications contain related information:

- System unit documentation for information specific to your hardware configuration.
- Operating system documentation for information specific to your software configuration and disk arrays. If your operating system is AIX, refer to the *PCI-X SCSI RAID Controller Reference Guide for AIX*, order number SA23-1323. If your operating system is Linux, refer to the *PCI-X SCSI RAID Controller Reference Guide for Linux*, order number SA23-1327.
- *PCI Adapter Placement Reference*, order number SA38-0538 (for the latest version, you may need to contact your marketing representative).

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- AIX 5L™
- @server
- pSeries™
- RS/6000®

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Chapter 1. Overview

The Dual Channel SCSI RAID Enablement Card adds RAID 0, 5, or 10 disk array capability to systems containing the appropriate supporting dual channel integrated SCSI adapter. It provides an internal RAID (Redundant Array of Independent Disks) solution on supporting systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices can run at a data rate up to 320 MB/s on systems that have internal backplanes capable of running Ultra320 speeds.

Note: This guide refers to various hardware and software features and functions. The support for these features and functions depends upon the limitations of your hardware and software. AIX and Linux support all functions mentioned. If you are using another operating system, consult the appropriate documentation for that operating system regarding support for the mentioned features and functions.

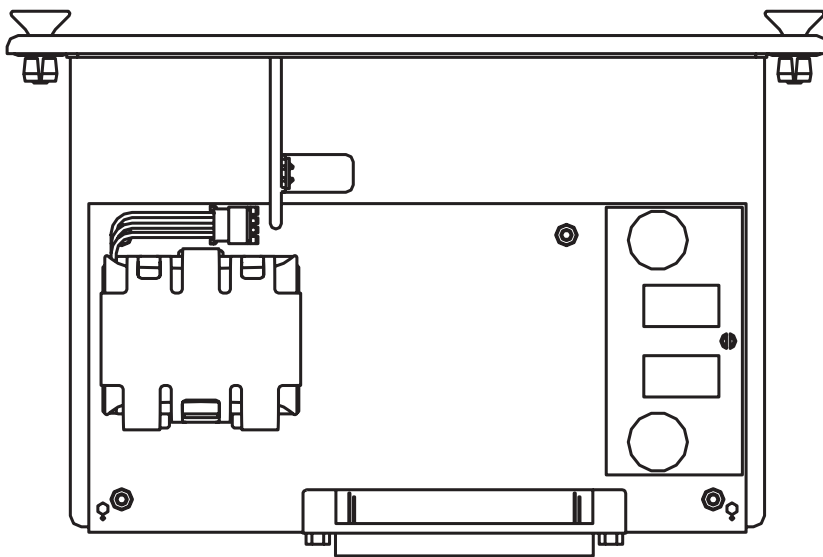


Figure 1. Dual Channel SCSI RAID Enablement Card

Verifying Operating System Requirements

Ensure that your operating system will support the Dual Channel SCSI RAID Enablement Card, use the following appropriate procedure to verify your operating system requirements.

Using AIX

The Dual Channel SCSI RAID Enablement Card is supported on the following levels of AIX or higher:

- AIX 5L Version 5.1 with the 5100-04 Recommended Maintenance Package (APAR IY44478)
- AIX 5L Version 5.2 with the 5200-01 Recommended Maintenance Package (APAR IY44479)

To determine which maintenance level is installed on your system, type `oslevel -r`. Verify that the maintenance level displayed is 5100-04, 5200-01, or higher. If no maintenance level is installed on your system, the following is an example of the data that displays on your screen:

```
No recommended maintenance level information is available.
```

If updates are needed, the latest maintenance packages and update instructions can be downloaded from the pSeries and RS/6000 Support Web site. The Web address is:

<http://techsupport.services.ibm.com/server/support>. Updates can also be ordered by calling IBM Support.

Using Linux

The Dual Channel SCSI RAID Enablement Card is supported on the following Linux distributions:

- Any distribution based on United Linux 1.0 Service Pack 3, such as SuSE Linux Enterprise Server 8 Service Pack 3 or newer
- Red Hat Enterprise Linux 3 or newer

To determine which release is installed on your system, refer to your Linux distributor's documentation. If updates are needed, obtain them from your Linux distributor or download them from the IBM Support Web Site. The Web address is: <http://www6.software.ibm.com/dl/linuxsdd/linuxsdd-p>.

Chapter 2. Preparing for Installation

This chapter helps you prepare to install the Dual Channel SCSI RAID Enablement Card. To install the Dual Channel SCSI RAID Enablement Card, you may need the following items:

- Your system unit installation guide
- Documentation provided with your SCSI devices
- IBM @server pSeries & RS/6000 Standalone Diagnostics CD-ROM (Version 5.2.0.11 or higher)

Note: This card is supported on multiple systems and may require a system firmware update. Contact your service representative for further details.

Using AIX

In addition to the preceding items listed, you will need the following AIX-specific items:

- AIX 5.1 Update CD-ROM (Recommended Maintenance Package 5100-04 or higher)
- AIX 5.2 Update CD-ROM (Recommended Maintenance Package 5200-01 or higher)
- *PCI-X SCSI RAID Controller Reference Guide for AIX*, order number SA23-1323

Using Linux

In addition to the preceding items listed, you will need the following Linux-specific items:

- Linux Operating System CD-ROMs
- *PCI-X SCSI RAID Controller Reference Guide for Linux*, order number SA23-1327

Chapter 3. Installing the Device Driver Software (AIX)

The instructions in this chapter pertain to the AIX operating system.

Note: If you are using the Linux operating system, see Chapter 7, “Installing and Setting Up Software and the Dual Channel SCSI RAID Enablement Card (Linux),” on page 13 for information regarding installing the device driver software and configuring your system. If you have another operating system installed, refer to your operating system documentation.

To install the device driver software, do the following:

1. Turn on the power to your system unit.
2. At the system prompt, log in as root user.
3. Insert the appropriate AIX 5.1 or 5.2 update CD-ROM into the media device.
4. To start SMIT, type:

```
smitty install_all
```

Press Enter.

5. The Install Additional Device Software window highlights the **INPUT device/directory for software** option.
6. Select or type the input device:
 - Press F4 to display the input device list. Select the name of the device (example: CD-ROM) that you are using and press Enter
 - OR
 - In the Entry Field, type the name of the input device you are using, and press Enter.
7. The INSTALL AND UPDATE FROM ALL AVAILABLE SOFTWARE window appears. Highlight the **SOFTWARE to install** option.
8. Press F4 to display a list of the device software you can install.
9. To display the Find window, type:
/
10. In the Find window, type:
devices.pci.14107802

Press Enter. The system finds and highlights this device software, and displays output similar to the following example:
devices.pci.14107802 A11
11. Press F7 to select the device software, and press Enter.
12. The INSTALL AND UPDATE FROM ALL AVAILABLE SOFTWARE window displays. Entry data fields are automatically updated. Highlight the **ACCEPT new license agreements?** option. Ensure that this option is set to **yes**. Press Enter to accept the data.
13. The ARE YOU SURE window displays. Press Enter to accept the data.
14. The **COMMAND STATUS** window displays.
 - The term RUNNING is highlighted to indicate that the install and configure command is in progress.
 - When RUNNING changes to OK, scroll down to the bottom of the page and locate the Installation Summary.
 - After a successful installation, SUCCESS appears in the Result column of the summary at the bottom of the page.
15. Remove the installation media from the drive.
16. Press F10 to exit SMIT.

Chapter 4. Installing the Dual Channel SCSI RAID Enablement Card

This chapter provides instructions for installing the Dual Channel SCSI RAID Enablement Card if you are using the AIX or Linux operating system. Save this guide for future reference.

Note: If you are using the Linux operating system, the device driver and utility software must first be installed before the Dual Channel SCSI RAID Enablement Card. For information regarding installing software and configuring your system, see Chapter 7, “Installing and Setting Up Software and the Dual Channel SCSI RAID Enablement Card (Linux),” on page 13. If you have another operating system installed, refer to your operating system documentation.

Attention

Be sure you have read “Handling Static Sensitive Devices” on page vii before handling your Dual Channel SCSI RAID Enablement Card.

To install the adapter, refer to the option installation documentation that shipped with your system unit to perform the following:

1. Shut down your system and place it into service mode as described in the documentation provided with your system.
2. Remove the front bezel as described in the service as described in the documentation provided with your system.
3. Plug the card into the connector on the system board as described in the documentation provided with your system.
4. Replace the front bezel as described in the service as described in the documentation provided with your system.
5. Return the system unit to the operating position and power it on. If the integrated SCSI controller was used as the boot device prior to the card installation, the controller will still boot your system.

Note: If the system unit does not power on, repeat this installation procedure. If you continue experiencing problems, contact your service representative.

Chapter 5. Setting Up the Dual Channel SCSI RAID Enablement Card (AIX)

This chapter provides AIX-specific system hardware and software installation verification, adapter configuration, and problem- determination procedures.

Note: If you are using the Linux operating system, see Chapter 7, “Installing and Setting Up Software and the Dual Channel SCSI RAID Enablement Card (Linux),” on page 13 for information regarding installing the device driver software and configuring your system. If you have another operating system installed, refer to your operating system documentation.

Verifying the Installation

Verify the initial installation by using the following procedures:

- Verify AIX Software Installation (lslpp)
- Verify Hardware Installation (lsdev)

Verifying AIX Software Installation

To verify that the device driver software for the Dual Channel SCSI RAID Enablement Card is installed, do the following:

1. If necessary, log in as root user.
2. Type:

```
lslpp -l devices.pci.14107802*
```

Press Enter.

If the Dual Channel SCSI RAID Enablement Card device driver software is installed, the following is an example of the data that displays on your screen:

Fileset	Level	State	Type	Description (Uninstaller)
devices.pci.14107802.diag	5.2.0.11	C	F	PCI-X Dual Channel Ultra320 SCSI Adapter Diagnostics
devices.pci.14107802.rte	5.2.0.11	C	F	PCI-X Dual Channel Ultra320 SCSI Adapter Software
devices.pci.14107802.ucode	5.2.0.0	C	F	PCI-X Dual Channel Ultra320 SCSI Adapter Microcode

Note: The fileset number 5.2.0.11 displayed in the example might be different from the output displayed on your screen.

If this information displays but you continue to have problems, or if no data displays on your screen, the Dual Channel SCSI RAID Enablement Card device driver did not install. Return to Chapter 3, “Installing the Device Driver Software (AIX),” on page 5. Then continue with “Verifying Hardware Installation.”

If you continue to experience problems, it may be necessary to call your system support organization. Refer to your operating system documentation for instructions.

Verifying Hardware Installation

To verify that your system unit recognizes the Dual Channel SCSI RAID Enablement Card, do the following:

1. If necessary, log in as root user.
2. Type:

```
lsdev -C | grep sis
```

Press Enter.

If the Dual Channel SCSI RAID Enablement Card did install correctly, the following is an example of the data that displays on your screen:

```
sisioa0    Available 1H-08          PCI-X Dual Channel U320 SCSI RAID Adapter
sisraid0   Available 1H-08-ff         PCI-X U320 SCSI RAID Adapter Logical bus
```

You may also see a message on your screen that shows the non-RAID adapter that existed before the integrated SCSI controller was converted to a RAID adapter, `sisscsia0`, is now Defined instead of Available, as shown:

```
sisscsia0   Defined 1H-08          PCI-X Dual Channel Ultra320 SCSI Adapter
```

3. To remove the non-RAID adapter, type:

```
rmdev -Rdl sisscsia0
```

Press Enter.

4. Type:

```
lsdev -C | grep scsi
```

Press Enter.

If the Dual Channel SCSI RAID Enablement Card did install correctly, the following is an example of the data that displays on your screen:

```
scsi4      Available 1H-08-00         PCI-X U320 SCSI RAID Adapter Physical bus
scsi5      Available 1H-08-01         PCI-X U320 SCSI RAID Adapter Physical bus
```

If the message on your screen indicates that your adapter is Defined instead of Available, shut down your machine. Check the Dual Channel SCSI RAID Enablement Card to ensure it is installed correctly. Go to Chapter 4, “Installing the Dual Channel SCSI RAID Enablement Card,” on page 7, then return to this section and repeat steps 1 and 2.

Note: If the message on your screen indicates that your adapter is Defined a second time, contact your service representative.

Updating Hard Disk Drive and Adapter Microcode

Disk drives attached to this RAID adapter must contain the latest microcode level.

The latest microcode level for your drive model and Dual Channel SCSI RAID Enablement Card can be found at the Download pSeries and RS/6000 Microcode Updates Web site:
<https://techsupport.services.ibm.com/server/mdownload/download.html>.

The drive microcode download you need should match the name of one of the drive model numbers located under the DASD Microcode listing found on the Web site. The drive machine type and model of the drive you are updating can be identified by reading its VPD (Vital Product Data). Similarly, the name of the Dual Channel SCSI RAID Enablement Card microcode download you need can be found under the Adapter Microcode listing on the Web site.

Problem Determination

If you encounter any problems with the adapter after the installation, refer to your system unit documentation for information about running diagnostics or other problem-determination procedures. Refer to the *PCI-X SCSI RAID Controller Reference Guide for AIX*, order number SA23-1323.

Chapter 6. Using Disk Arrays

This chapter provides information about using the RAID-related features of this adapter. The following tasks are beyond the scope of this installation guide and are usually performed by system administrators.

- To use the RAID-related features of the hardware, disk arrays must be created first.
- AIX and Linux use and manage the disk array in the same way as it would a single non-RAID disk.
- For optimum performance, distribute the hard disk drives equally across the available channels.

Using AIX

For an overview of RAID and detailed procedures, refer to the *PCI-X SCSI RAID Controller Reference Guide for AIX*, order number SA23-1323.

- Disk drives previously installed in this system probably have 512 bytes/sector.
- To use the drives in disk arrays with this adapter, the disk drives must be prepared by formatting them to 522 bytes/sector.
- Disk drives in 512 bytes/sector format may continue to be used as standalone disks (that is, not part of a disk array) on this RAID adapter. Additionally, drives formatted to 522 bytes/sector may be reformatted to 512 bytes/sector at a later time if desired for compatibility with previous adapters.
- Formatting of drives to 522 bytes/sector and the creation of disk arrays may require that data previously written on the drives be saved and restored after the the disk arrays are created.
- If a disk array is to be used as the boot device, it may be required to prepare the disks by booting from the Diagnostic CD and creating the disk array before installing AIX. You might want to perform this procedure when the original boot drive is to be used as part of a disk array.

Using Linux

For an overview of RAID and detailed procedures, refer to the *PCI-X SCSI RAID Controller Reference Guide for Linux*, order number SA23-1327.

- Disk drives previously installed in this system are probably JBOD drives. JBOD drives are formatted to 512 bytes/sector.
- To use the drives in disk arrays with this adapter, the disk drives must be prepared by formatting them to 522 bytes/sector.
- Disk drives in 512 bytes/sector format may continue to be used as standalone disks (that is, not part of a disk array) on this RAID adapter. Additionally, drives formatted to 522 bytes/sector for advanced function may be reformatted to 512 bytes/sector at a later time if desired for compatibility with previous adapters.
- Formatting of drives to 522 bytes/sector for advanced function and the creation of disk arrays may require that data previously written on the drives be saved and restored after the disk arrays are created.
- If a disk array is to be used as the boot device, it may be required to prepare the disks by booting into rescue mode from the Linux CD first. If your Linux distribution does not provide this feature, the Diagnostic CD may be used. You might want to perform this procedure when the original boot drive is to be used as part of a disk array.

Chapter 7. Installing and Setting Up Software and the Dual Channel SCSI RAID Enablement Card (Linux)

This chapter provides instructions for installing and verifying software that pertains to the Linux operating system. The required software should be installed before you install the Dual Channel SCSI RAID Enablement Card.

Note: If you are using AIX, see Chapter 5, “Setting Up the Dual Channel SCSI RAID Enablement Card (AIX),” on page 9. If you have another operating system installed, refer to your operating system documentation for information regarding installing the device driver software and configuring your system.

Verifying Linux Software Installation

Software for the Dual Channel SCSI RAID Enablement Card consists of a device driver and a set of utilities. This software is provided with the supported Linux distribution, and should have been installed along with the operating system.

Verify the initial software installation by using the following procedures:

- Verifying Device Driver Version (`ibmsis`)
- Verifying Utility Version (`sisconfig`)

Verifying Device Driver Version

The Dual Channel SCSI RAID Enablement Card requires Version 1 Revision 19 (or later) of the **ibmsis** device driver. To verify the version number of **ibmsis**, do the following:

1. If necessary, log in as root user.
2. Type:

```
modinfo ibmsis
```

Press Enter.

3. Type:

```
strings filename | grep "ibmsis version"
```

where *filename* is the file name displayed after the **modinfo** command was typed in the previous step. Press Enter.

The following is an example of the data that displays on your screen:

```
ibmsis version=Ver. 1 Rev. 19.10 SMP
```

Note: The version displayed in the example might be different from the output displayed on your screen.

If the version displayed is not at the recommended level and updates are needed, obtain them from your Linux distributor or download them from the IBM Support Web site. The Web address is:
<http://www6.software.ibm.com/dl/linuxsdd/linuxsdd-p>.

Verifying Utility Version

The Dual Channel SCSI RAID Enablement Card requires Version 1 Revision 19 (or later) of the **sisconfig** utility. To verify the version number of the **sisconfig** utility, do the following:

1. If necessary, log in as root user.
2. Type:

```
sisconfig --version
```

Press Enter.

The following is an example of the data that displays on your screen:

```
sisconfig: Ver. 1 Rev. 19.10
```

Note: The version displayed in the example might be different from the output displayed on your screen.

If the version displayed is not at the recommended level and updates are needed, obtain them from your Linux distributor or download them from the IBM Support Web site. The Web address is:
<http://www6.software.ibm.com/dl/linuxsdd/linuxsdd-p>.

Installing the Downloaded Device Driver and Utility Software

Software required for the Dual Channel SCSI RAID Enablement Card is usually installed when the Linux operating system is installed. Software installation is not necessary unless verification has failed.

If it is necessary to install software, obtain it from one of the following sources in the order listed:

1. Your supported Linux operating system CD-ROM
2. Your Linux distributor
3. Online at the IBM Support Web site: <http://www6.software.ibm.com/dl/linuxsdd/linuxsdd-p>

After downloading the needed software package, install the software by continuing with the instructions in this section. Then, return to “Verifying Linux Software Installation” on page 13, and follow the procedure to ensure that the installation was successful.

Installing Device Driver Software

If you downloaded the **ibmsis** device driver package, do the following:

1. Turn on the power to your system unit.
2. At the system prompt, log in as root user.
3. If necessary, untar the device driver package. Type:

```
tar -xzvf ibmsis-$ver.tgz
```

Press Enter.

4. Compile and install the device driver. For instructions on how to compile and install the **ibmsis** device driver, see the readme file located in the **ibmsis/src/** directory.
5. Reboot your system.

Installing the Utility Software

If you downloaded the **sisutils** utility package, do the following:

1. Turn on the power to your system unit.
2. At the system prompt, log in as root user.
3. If necessary, untar the utility package. Type:

```
tar -xzvf sisutils-$ver.tgz
```

Press Enter.

4. Compile and install the **sisutils** utility package. For instructions on how to compile and install the utility package, see the readme file located in the **sisutils/** directory.

Installing the Dual Channel SCSI RAID Enablement Card

If you have successfully verified your software installation, install your Dual Channel SCSI RAID Enablement Card. Follow the steps in Chapter 4, “Installing the Dual Channel SCSI RAID Enablement Card,” on page 7.

Verifying Hardware Installation

To verify that your system unit recognizes the Dual Channel SCSI RAID Enablement Card, do the following:

1. If necessary, log in as root user.
2. Type:
sisconfig

Press Enter.

3. Select the **Display disk hardware status** option and press Enter.

If the Dual Channel SCSI RAID Enablement Card installed correctly, data displays for the adapter and each disk attached to it. The following is an example of the data that displays on your screen:

```
Display Disk Hardware Status

Serial  Vendor  Product      Resource   Hardware
Number ID     ID           Model    Name      Status
03000001 IBM     5709001     001     /dev/ibmsis0 Operational
000012F0 IBM     ST3146807LC 090
00001315 IBM     ST3146807LC 079     DPY/Active
000012F5 IBM     ST3146807LC 070     DPY/Active
00001304 IBM     ST3146807LC 079     DPY/Active
E7800377 IBM     01C933F1    205     /dev/sdc   Operational

Press Enter to continue.

e=Exit      q=Cancel    r=Refresh  f=PageDn   b=PageUp
d=Display disk unit details  p=Display device parity status
```

If the message on your screen indicates your newly installed card, shown in the example as `/dev/ibmsis0`, is `Not Operational` instead of `Operational` or if it is not listed, shut down your machine. Go to Chapter 4, “Installing the Dual Channel SCSI RAID Enablement Card,” on page 7 to ensure that the Dual Channel SCSI RAID Enablement Card is installed correctly. Then return to this section, and repeat this hardware installation procedure.

Updating Hard Disk Drive and Adapter Microcode

Disk drives attached to this RAID adapter must contain the latest microcode level.

Microcode updates for hard disk drives attached to the Dual Channel SCSI RAID Enablement Card are handled automatically by the **sisupdate** utility, which executes each time the system is booted.

The latest microcode level for your drive model and Dual Channel SCSI RAID Enablement Card is shipped as part of the Linux distribution. If an update or replacement is needed, the latest microcode can be obtained from your Linux distributor, or found as part of the device driver package at the following Web site: <http://www6.software.ibm.com/dl/linuxsdd/linuxsdd-p>.

If you downloaded new microcode from the Web site, install it as follows:

1. If necessary, log in as root user.
2. Untar the package, type:

```
tar -xzvf ibmsis-$ver.tgz
```

Press Enter.

3. Change directories to **ibmsis/obj/firmware/**. Type:

```
cd ibmsis/obj/firmware/
```

4. Install the microcode. Type:

```
make install
```

5. Update the microcode. Type:

```
sisupdate
```

Press Enter.

Problem Determination

If you encounter any problems with the adapter after the installation, refer to your system unit documentation for information about running diagnostics or other problem-determination procedures. Refer to the *PCI-X SCSI RAID Controller Reference Guide for Linux*, order number SA23-1327.

Appendix A. Communications Statements

The following statement applies to this product. The statement for other products intended for use with this product appears in their accompanying documentation.

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Neither the provider nor the manufacturer is responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Union (EU) Statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. The manufacturer cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of option cards supplied by third parties. Consult with your dealer or sales representative for details on your specific hardware.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22 / European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

International Electrotechnical Commission (IEC) Statement

This product has been designed and built to comply with IEC 60950.

United Kingdom Telecommunications Safety Requirements

This equipment is manufactured to the International Safety Standard EN60950 and as such is approved in the UK under the General Approval Number NS/G/1234/J/100003 for indirect connection to the public telecommunication network.

The network adapter interfaces housed within this equipment are approved separately, each one having its own independent approval number. These interface adapters, supplied by the manufacturer, do not use or contain excessive voltages. An excessive voltage is one which exceeds 70.7 V peak ac or 120 V dc. They

interface with this equipment using Safe Extra Low Voltages only. In order to maintain the separate (independent) approval of the manufacturer's adapters, it is essential that other optional cards, not supplied by the manufacturer, do not use main voltages or any other excessive voltages. Seek advice from a competent engineer before installing other adapters not supplied by the manufacturer.

Avis de conformité aux normes du ministère des Communications du Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Canadian Department of Communications Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003..

VCCI Statement

<p>この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。</p> <p>VCCI-A</p>

The following is a summary of the VCCI Japanese statement in the box above.

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Electromagnetic Interference (EMI) Statement - Taiwan

<p>警告使用者： 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。</p>

The following is a summary of the EMI Taiwan statement above.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user will be required to take adequate measures.

Radio Protection for Germany

Dieses Gerät ist berechtigt in Übereinstimmung mit Dem deutschen EMVG vom 9.Nov.92 das EG-Konformitätszeichen zu führen.

Der Aussteller der Konformitätserklärung ist die IBM Germany.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse A. Für diese von Geräten gilt folgende Bestimmung nach dem EMVG:

Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.

(Auszug aus dem EMVG vom 9.Nov.92, Para.3, Abs.4)

Hinweis

Dieses Genehmigungsverfahren ist von der Deutschen Bundespost noch nicht veröffentlicht worden.

Appendix B. Notices

This information was developed for products and services offered in the U.S.A.

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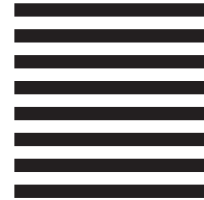
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