Bull ESCALA

PCI–X SCSI RAID Controller
Reference Guide

Bull ESCALA

PCI–X SCSI RAID Controller
Reference Guide

Hardware

November 2003

Suggestions and criticisms concerning the form, content, and presentation of this book are invited. A form is provided at the end of this book for this purpose.

To order additional copies of this book or other Bull Technical Publications, you are invited to use the Ordering Form also provided at the end of this book.

Trademarks and Acknowledgements

We acknowledge the right of proprietors of trademarks mentioned in this book.

AIX® is a registered trademark of International Business Machines Corporation, and is being used under licence.

UNIX is a registered trademark in the United States of America and other countries licensed exclusively through the Open Group.

Linux is a registered trademark of Linus Torvalds.

Contents

Safety Information

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 usage and maintenance information regarding the PCI-X SCSI RAID Controller. Chapters 1 through 4 of this book contain general information that is intended for all users of this product. Chapter 5 contains service information intended for a service representative specifically trained on the system unit and subsystem being serviced. 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.
Italics	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 Operating System

This document may contain references to the AIX 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 provides 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
- *Adapters Information for Multiple Bus Systems,* order number 86 A1 26HX, contains information about adapters for you system.,
- *Diagnostic information for Multiple Bus Systems*, order number 86 A1 27HX, contains diagnostic information, service request numbers (SRNs), and failing function codes (FFCs).
- *AIX Syatem Management Guide: Operating System and Device*s, order number 86 A2 26EF
- *AIX Installation Guide and Reference*, order number 86 A2 07EG.

Chapter 1. PCI-X SCSI RAID Controller Overview

The PCI-X SCSI RAID Controller is a 133 MHz 64-bit PCI-X adapter. This adapter has the following features:

- PCI-X system interface
- Dual Channel, Ultra320 SCSI controllers
- Embedded PowerPC RISC Processor and Hardware XOR DMA Engine
- Non-volatile write cache
- Support for RAID (Redundant Array of Independent Disks) levels 0, 5, and 10 disk arrays
- Disk array supported as a bootable device
- Supports attachment of other devices such as non-RAID disks, tape, and optical devices
- Advanced RAID features:
  - Hot spares for RAID level 5 and 10 disk arrays
  - Ability to increase the capacity of an existing RAID level 5 disk array by adding disks
  - Background parity checking
  - Background data scrubbing
  - Disks formatted to 522 bytes/sector, providing Longitudinal Redundancy Checking (LRC) and Logically Bad Block checking

Note: Multi-initiator and High Availability (for example, HACMP) support is not provided at this time.

Feature Code	PCI Form Factor	Write Cache Size	Adapter LED/FFC	Rechargeable Battery Technology	Cache Battery Pack FFC
5703	Yes	40 MB	2523	NiMH	2526
5709*	No **	16 MB	2523	NiMH	2526
* The feature code describes the RAID Enablement Card.					
** Some PCI-X SCSI RAID Controllers do not have the form of a standard PCI adapter. The form of these controllers is a combination of SCSI and PCI-X bus interface logic integrated onto the system board and a RAID Enablement Card. The card plugs into the system board in order to connect to the SCSI and PCI-X bus interface logic.					

Note: This guide refers to various hardware and software features and functions. The realization of these features and functions depends on the limitations of your hardware and software. AIX supports 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. This guide also uses the terms *channel* and *bus* interchangeably.
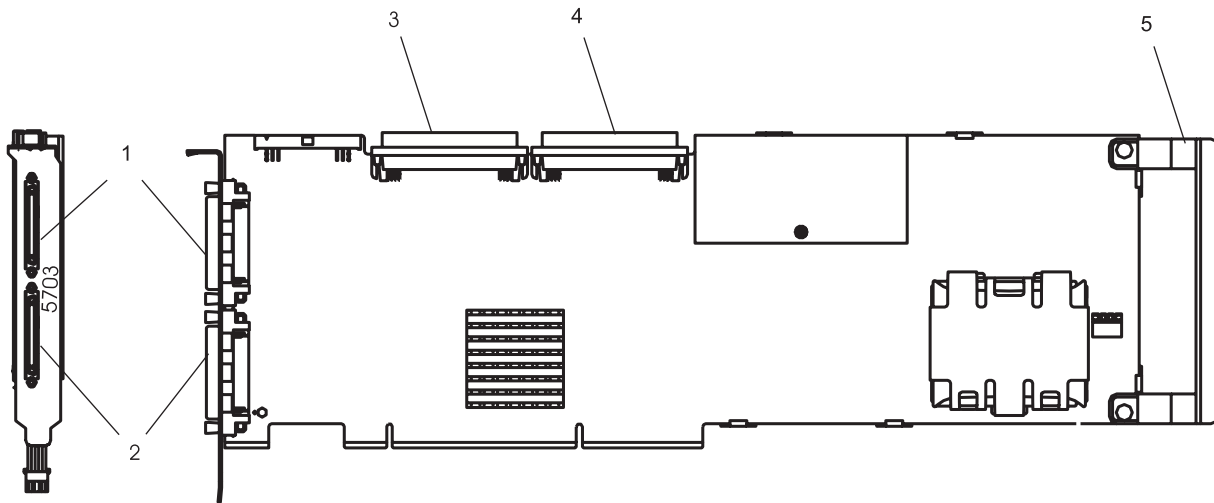
Figure 1. PCI-X SCSI RAID Controller

1   Channel 1 external, 68-position, VHDCI (very high density cable interconnect)

2   Channel 0 external, 68-position, VHDCI (very high density cable interconnect)

3   Channel 0 internal, 68-position, high-density plastic D-shell SCSI standard connector for 16-bit attachment

4   Channel 1 internal, 68-position, high-density plastic D-shell SCSI standard connector for 16-bit attachment

5   Adapter Handle

Disk Arrays

RAID technology is used to store data across a group of disks known as a *disk array*. Depending on the RAID level selected, this storage technique provides the data redundancy required to keep data secure and the system operational. If a disk failure occurs, the disk can usually be replaced without interrupting normal system operation. Disk arrays also have the potential to provide higher data transfer and input and output (I/O) rates than those provided by single large disks.

Each disk array can be used by AIX in the same way as it would a single non-RAID disk. For example, after creating a disk array, you can create a file system on the disk array or use AIX commands to make the disk array available to the system by adding the disk array to a volume group.

The PCI-X SCSI RAID Controller is managed by the PCI-X SCSI Disk Array Manager. The PCI-X SCSI Disk Array Manager serves as the interface to the RAID configuration. It is also responsible for the monitoring and recovery features of the controller.

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.

The following figure illustrates a possible disk array configuration.
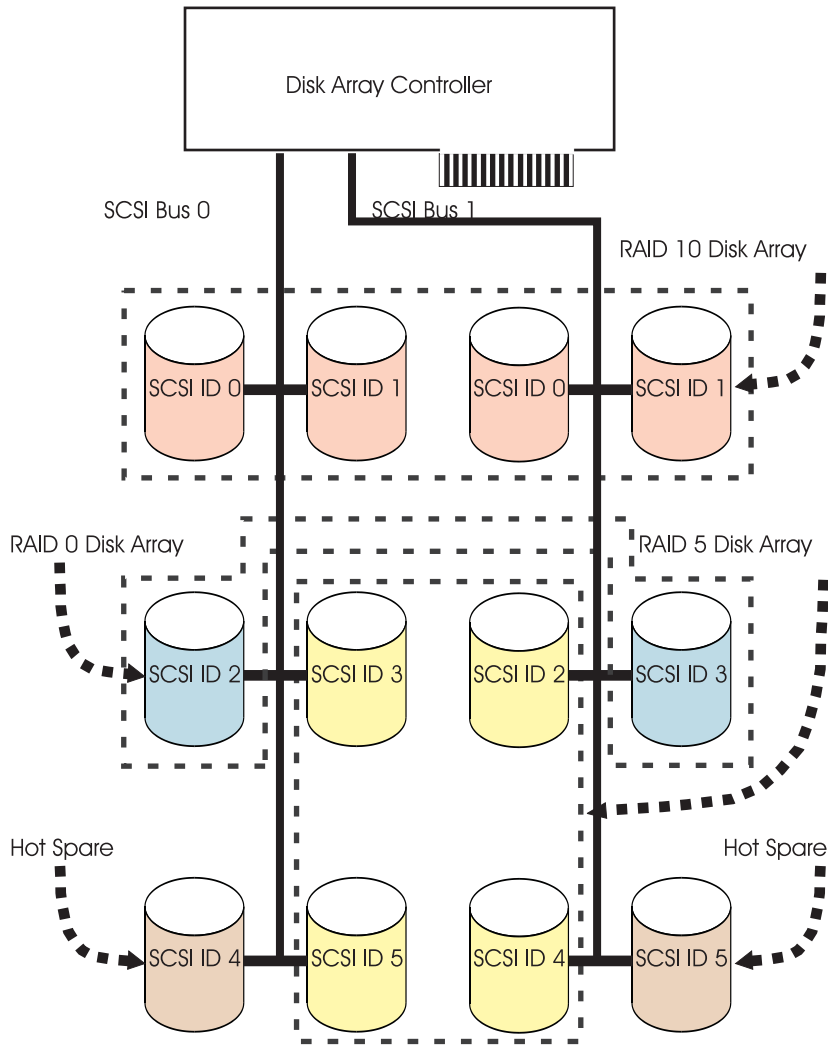
Supported RAID Levels

The RAID level of a disk array determines how data is stored on the disk array and the level of protection that is provided. When a part of the RAID system fails, different RAID levels help to recover lost data in different ways. With the exception of RAID level 0, if a single drive fails within an array, the array controller can reconstruct the data for the *Failed* disk by using the data stored on other hard drives within the array. This data reconstruction has little or no impact to current system programs and users. The PCI-X SCSI RAID Controller supports RAID levels 0, 5, and 10. Each RAID level supported by the PCI-X SCSI RAID Controller has its own attributes and uses a different method of writing data. The following information details each supported RAID level.

RAID Level 0

RAID level 0 stripes data across the disks in the array, for optimal performance. For a RAID level 0 array of three disks, data would be written in the following pattern.
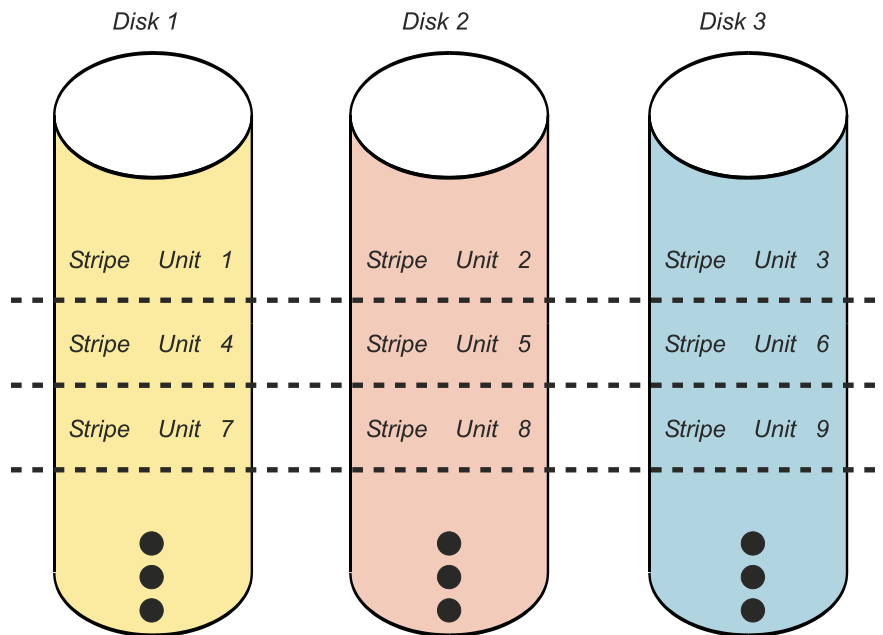
Figure 2. RAID Level 0

RAID level 0 offers a high potential I/O rate, but it is a nonredundant configuration. As a result, there is no data redundancy available for the purpose of reconstructing data in the event of a disk failure. There is no error recovery beyond what is normally provided on a single disk. Unlike other RAID levels, the array controller never marks a RAID level 0 array as *Degraded* as the result of a disk failure. If a physical disk fails in a RAID level 0 disk array, the disk array is marked as *Failed*. All data in the array must be backed up regularly to protect against data loss.

RAID Level 5

RAID level 5 stripes data across all disks in the array. RAID level 5 also writes array parity data. The parity data is spread across all the disks. For a RAID level 5 array of three disks, array data and parity information are written in the following pattern:

Disk 1	Disk 2	Disk 3
Parity	Stripe Unit 1	Stripe Unit 2
Stripe Unit 3	Parity	Stripe Unit 4
Stripe Unit 5	Stripe Unit 6	Parity
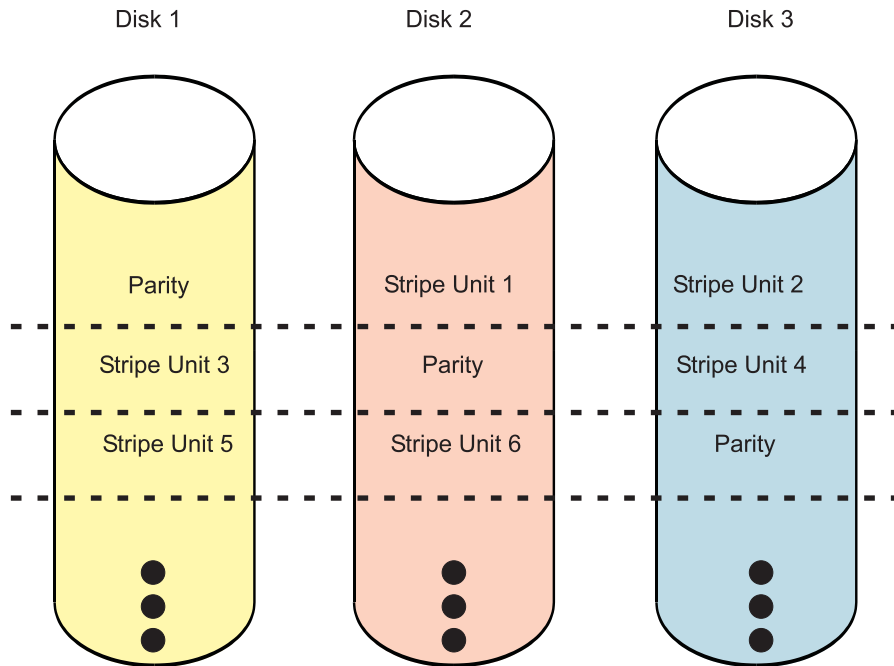
Figure 3. RAID Level 5

If a disk fails in a RAID level 5 array, you can continue to use the array normally. A RAID level 5 array operating with a single *Failed* disk is said to be operating in *Degraded* mode. Whenever data is read from a *Degraded* disk array, the array controller recalculates the data on the *Failed* disk by using data and parity blocks on the operational disks. If a second disk fails, the array will be placed in the *Failed* state and will not be accessible.

RAID Level 10

RAID level 10 uses mirrored pairs to redundantly store data. The array must contain an even number of disks. The data is striped across the mirrored pairs. For example, a RAID level 10 array of four disks would have data written to it in the following pattern:
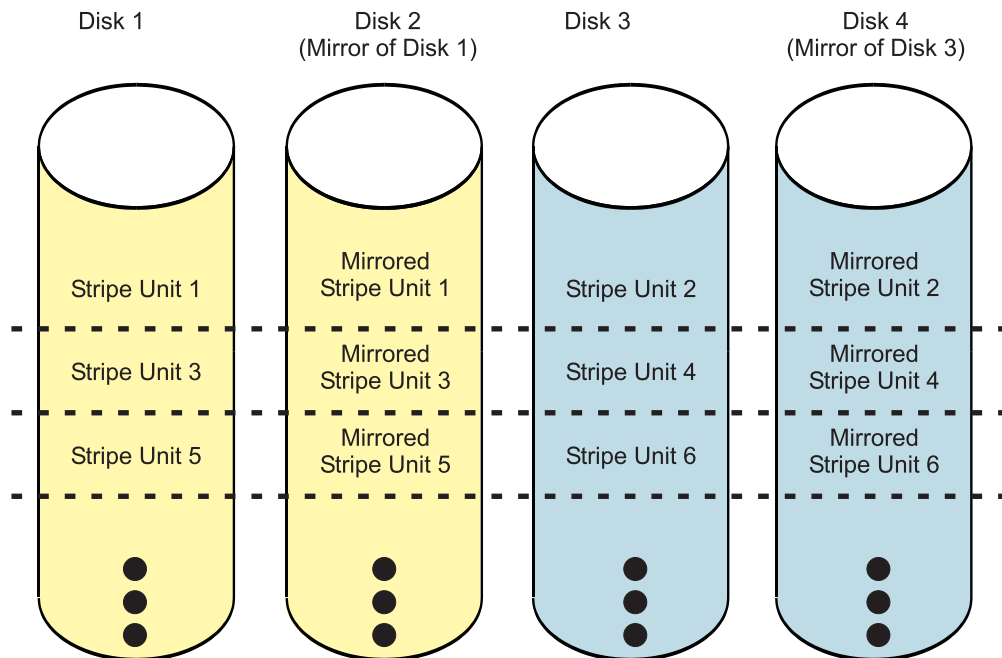
Figure 4. RAID Level 10

RAID level 10 tolerates multiple disk failures. If one disk in each mirrored pair fails, the array will still be functional, operating in *Degraded* mode. You can continue to use the array normally because for each *Failed* disk, the data is stored redundantly on its mirrored pair. However, if both members of a mirrored pair fail, the array will be placed in the *Failed* state and will not be accessible.

When a RAID level 10 disk array is created, the controller will automatically attempt to select the disks for each mirrored pair from a different SCSI bus. For example, if four disks selected for the disk array reside on one of the controller's SCSI buses and another four disks selected reside on another of the controller's SCSI buses, the controller will automatically attempt to create each mirrored pair from one disk on each SCSI bus. In the event of a SCSI bus failure, each mirrored pair will continue to operate in a *Degraded* mode.

Disk Array Capacities

The capacity of a disk array depends on the capacity of the disks used and the RAID Level of the array. To calculate the capacity of a disk array, do the following:

RAID Level 0
> Multiply the number of disks by the disk capacity.

RAID Level 5
> Multiply one fewer than the number of disks by the disk capacity.

RAID Level 10
> Multiply the number of disks by the disk capacity and divide by 2.

Note: If disks of different capacities are used in the same array, all disks are treated as if they have the capacity of the smallest disk.

RAID Level Summary

The following information provides data redundancy, usable disk capacity, read performance, and write performance for each RAID level.

RAID Level	Data Redundancy	Usable Disk Capacity	Read Performance	Write Performance
RAID 0	None	100%	Very Good	Excellent
RAID 5	Very Good	67% to 94%	Very Good	Good
RAID 10	Excellent	50%	Excellent	Very Good

RAID Level 0
> Does not support data redundancy, but provides a potentially higher I/O rate.

RAID Level 5
> Creates array parity information so that the data can be reconstructed if a disk in the array fails. Provides better capacity than RAID level 10 but possibly lower performance.

RAID Level 10
> Stores data redundantly on mirrored pairs to provide maximum protection against disk failures. Provides generally better performance than RAID level 5, but has lower capacity.

Stripe-Unit Size

With RAID technology, data is striped across an array of physical disks. This data distribution scheme complements the way the operating system requests data. The granularity at which data is stored on one disk of the array before subsequent data is stored on the next disk of the array is called the stripe-unit size. The collection of stripe units, from the first disk of the array to the last disk of the array, is called a *stripe*.

You can set the stripe-unit size of a PCI-X SCSI Disk Array to 16 KB, 64 KB, or 256 KB. You may be able to maximize the performance of your PCI-X SCSI Disk Array by setting the stripe-unit size to a value that is slightly larger than the size of the average system I/O request. For large system I/O requests, use a stripe-unit size of 256 KB. The recommended stripe size for most applications is 64 KB.

Disk Array Overview

Disk arrays are groups of disks that work together with a specialized array controller to potentially achieve higher data transfer and input and output (I/O) rates than those provided by single large disks. The array controller keeps track of how the data is distributed across the disks. RAID level 5 and 10 disk arrays also provide data redundancy, so that no data is lost if a single disk in the array fails.

PCI-X SCSI Disk Arrays are assigned names using the *hdisk* form, the same as other disk storage units in AIX. These names are automatically assigned whenever you create a disk array. The names are deleted when you delete the disk array. The individual physical disks that comprise disk arrays or serve as candidates to be used in disk arrays are represented by *pdisk* names. A *pdisk* is a disk that is formatted to 522 bytes/sector. Disks that are formatted to 512 bytes/sector are assigned names using the *hdisk* form. These disks must be formatted to 522 bytes/sector before they can be used in disk arrays. For additional information about formatting 512 bytes/sector hdisks to make them available for use in PCI-X SCSI Disk Arrays, see "Preparing Disks for Use in PCI-X SCSI Disk Arrays" on page 14.

The **List PCI-X SCSI Disk Array Configuration** option in the PCI-X SCSI Disk Array Manager can be used to display these *pdisk* and *hdisk* names, along with their associated location codes. For details regarding how to view the disk array information, see "Viewing the Disk Array Configuration" on page 15. The following sample output is displayed when the **List PCI-X SCSI Disk Array Configuration** option is invoked.

```
------------------------------------------------------------------------
Name       Location     State      Description       Size
------------------------------------------------------------------------
sisioa1    30-60        Available  PCI-X Dual Channel U320 SCSI RAID Adapter

hdisk15    30-60-ff-0,1 Optimal    Raid 5 Array      54.3GB
 pdisk0    30-60-00-5,0 Active     Array Member      18.1GB
 pdisk1    30-60-00-6,0 Active     Array Member      18.1GB
 pdisk2    30-60-01-2,0 Active     Array Member      36.4GB
 pdisk4    30-60-01-3,0 Active     Array Member      18.1GB

hdisk16    30-60-ff-0,2 Degraded   Raid 5 Array      72.8GB
 pdisk3    30-60-00-10,0 Active    Array Member      36.4GB
 pdisk5    30-60-01-5,0 Failed     Array Member      36.4GB
 pdisk6    30-60-00-11,0 Active    Array Member      36.4GB

pdisk7     30-60-00-12,0 Active    Array Candidate   36.4GB
pdisk8     30-60-00-13,0 Active    Hot Spare         72.8GB

hdisk20    30-60-01-4,0 Available  16 Bit LVD SCSI    9.0GB
hdisk21    30-60-01-6,0 Defined    16 Bit LVD SCSI    9.0GB
```

The third column in the preceding output displays the state of the device.

States for Disk Arrays (hdisks)

The six valid states for PCI-X SCSI Disk Arrays are: *Optimal, Degraded, Rebuilding, Failed, Missing*, and *Unknown.*

Optimal
> The array is functional and fully protected (RAID 5 and 10) with all *Array Member pdisks* in the *Active* state.

Degraded
> The array's protection against disk failures is degraded or its performance is degraded. When one or more *Array Member pdisks* are in the *Failed* state, the array is still functional but is no longer fully protected against disk failures. For more information about recovery procedures for disk failures, see "Recovery Procedures for Disk Failures" on page 28. When all *Array Member pdisks* are in the *Active* state, the array is not performing optimally because of a problem with the controller's nonvolatile write cache.

Rebuilding
> Redundancy data for the array is being reconstructed. After the rebuild process has completed, the array will return to the *Optimal* state. Until then, the array is not fully protected against disk failures.

Failed   The array is no longer accessible because of disk failures or configuration problems.

Missing
>A previously configured disk array no longer exists.

Unknown
>The state of the disk array could not be determined.

States for Physical Disks (pdisks)

The valid states for *pdisks* are: *Active, RWProtected, Failed, Missing,* and *Unknown*.

Active   The disk is functioning properly.

RWProtected
>The disk is unavailable because of a hardware or a configuration problem.

Failed   The controller can not communicate with the disk or the *pdisk* is the cause of the disk array being in a *Degraded* state.

Missing
>The disk was previously connected to the controller but is no longer detected.

Unknown
>The state of the disk could not be determined.

pdisk Descriptions

The fourth column in the preceding output is a description of the device. For an array, the description indicates the RAID level of the array. The description of a *pdisk* indicates whether the disk is configured as an *Array Member, Hot Spare*, or an *Array Candidate*.

Array Member
>A 522 bytes/sector *pdisk* that is configured as a member of an array.

Hot Spare
>A 522 bytes/sector *pdisk* that can be used by the controller to automatically replace a Failed disk in a *Degraded* RAID level 5 or RAID level 10 disk array. A *Hot Spare* disk is useful only if its capacity is greater than or equal to the capacity of the smallest disk in an array that becomes *Degraded*. For more information about hot spare disks, see "Using Hot Spare Disks" on page 18.

Array Candidate
>A 522 bytes/sector *pdisk* that is a candidate for becoming an *Array Member* or a *Hot Spare*.

Chapter 2. PCI-X SCSI RAID Controller Software

For the PCI-X SCSI RAID Controller to be identified and configured by AIX, the requisite device support software must be installed. The requisite software for the PCI-X SCSI RAID Controller is often preinstalled as part of the normal AIX installation. However, it may be necessary to perform operations related to the installation, verification, and maintenance of the AIX device software for the PCI-X SCSI RAID Controller.

Software for the PCI-X SCSI RAID Controller is packaged in installp format and distributed as part of the base AIX installation media, AIX update media, and through the web-based Fix Delivery Center for AIX. This information is an overview of the AIX software support required for the PCI-X SCSI RAID Controller. For complete information related to the installation and maintenance of AIX, refer to the *AIX Installation Guide and Reference*.

Note: Support of the PCI-X SCSI RAID Controller requires AIX Version 5.1 or later.

The PCI-X SCSI RAID Controller executes onboard microcode. The AIX command **lsmcode** can be used to determine the level of onboard microcode being used by the controller. Although a version of controller microcode may be distributed along with AIX, this does not necessarily represent the most recent version of microcode available for the controller. For more information regarding obtaining and downloading new PCI-X SCSI RAID Controller microcode, see "Updating the PCI-X SCSI RAID Controller Microcode" on page 24.

Verifying the Installation of the PCI-X SCSI RAID Controller Software

Support for the PCI-X SCSI RAID Controller is contained in the AIX package devices.pci.14107802. The device support package contains multiple filesets, each related to a different aspect of device support (for example, run-time environment, diagnostics support, and controller microcode).

To verify that the device support package for the PCI-X SCSI RAID Controller is installed, type:

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

Output from this command will indicate if device support software for the PCI-X SCSI RAID Controller is installed, and if so, what the corresponding levels of each fileset are.

If the output indicates that no filesets of this name are installed, you must install the package devices.pci.14107802 in order for the PCI-X SCSI RAID Controller to be made available for use. This software package is available as part of the base AIX installation media, AIX update media, and through the web-based Fix Delivery Center for AIX.

Over time, it may become necessary to install software updates in order to have the very latest available level of device software support for the PCI-X SCSI RAID Controller. Updates to the device support software are packaged, distributed, and installed through the same mechanisms used for other portions of the AIX base operating system. The standard AIX technical support procedures can be used to determine the latest available level of device software support for the PCI-X SCSI RAID Controller.

Chapter 3. Common PCI-X SCSI RAID Controller Tasks

The instructions in this chapter pertain to the various tasks that can be performed in order to manage disk arrays.

Using the PCI-X SCSI Disk Array Manager

The PCI-X SCSI Disk Array Manager can be accessed either through the System Management Interface Tool (SMIT), or for some tasks, the AIX command line. For information about using the command line interface, see Appendix C, "AIX Command-Line Interface," on page 73. The PCI-X SCSI Disk Array Manager can also be started from Diagnostics.

To start the PCI-X SCSI Disk Array Manager, do the following:

1. At the command prompt, type `smit`, and press Enter.
2. Select **Devices**.
3. Select **Disk Array**.
4. Select **IBM PCI-X SCSI Disk Array**. From the menu with options for configuring and managing the PCI-X SCSI RAID Controller, select **PCI-X SCSI Disk Array Manager** to display the following menu for managing disk arrays.

```
                         PCI-X SCSI Disk Array Manager
 Move cursor to desired item and press Enter.

   List PCI-X SCSI Disk Array Configuration
   Create an Array Candidate pdisk and Format to 522 Byte Sectors
   Create a PCI-X SCSI Disk Array
   Delete a PCI-X SCSI Disk Array
   Add Disks to an Existing PCI-X SCSI Disk Array
   Configure a Defined PCI-X SCSI Disk Array
   Change/Show Characteristics of a PCI-X SCSI Disk Array
   Reconstruct a PCI-X SCSI Disk Array
   Change/Show PCI-X SCSI pdisk Status
   Diagnostics and Recovery Options




 F1=Help            F2=Refresh         F3=Cancel           F8=Image
 F9=Shell           F10=Exit           Enter=Do
```

You can also use a SMIT fast path to start the PCI-X SCSI Disk Array Manager. On the AIX command line, type `smit pxdam`, and press Enter.

If a disk array is to be used as the boot device, you might need 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.

To start the PCI-X SCSI Disk Array Manager from Diagnostics, do the following:

1. Start Diagnostics and on the Function Selection screen, select **Task Selection**.
2. Select **RAID Array Manager** and press Enter.
3. Select **PCI-X SCSI Disk Array Manager** and press Enter.

Preparing Disks for Use in PCI-X SCSI Disk Arrays

Before a disk can be used in a PCI-X SCSI Disk Array, it must be a 522 bytes/sector *Array Candidate pdisk*. To create an *Array Candidate pdisk* and format it to 522 byte sectors, do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Create an Array Candidate pdisk and Format to 522 Byte Sectors**.
3. Select the appropriate PCI-X SCSI RAID Controller.
4. Select the disks that you want to prepare for use in the PCI-X SCSI Disk Arrays.

   Attention: Continuing with this option will format the disks. All data on the disks will be lost. Some disks require that their microcode be updated to the latest level before being formatted to 522 byte sectors. Also, some disks do not support being formatted to 522 byte sectors. The PCI-X SCSI Disk Array Manager will inform the user of these situations when they exist.
5. A message will display asking if you want to continue. To proceed with the format, select **OK** or press Enter to continue. To return to the previous menu without formatting the disks, select **Cancel**.

After the formatting is complete, the disks will be *Array Candidate pdisks* and will be ready for use in PCI-X SCSI Disk Arrays. This operation will also zero all the data on the disks. The PCI-X SCSI RAID Controller keeps track of the disks that have their data zeroed. These *Zeroed Array Candidate pdisks* can be used to create a disk array that will be immediately protected against disk failures, and they are the only disks that can be added to an existing disk array. An *Array Candidate pdisk* will lose its *Zeroed* state after it has been used in an array or is unconfigured. It will also lose its *Zeroed* state after the system has been rebooted. To return an *Array Candidate pdisk* to the *Zeroed* state, follow the steps previously described in this section for preparing disks for use in disk arrays.

Creating a PCI-X SCSI Disk Array

A disk array is created using a set of *Active Array Candidate pdisks*. For disk arrays with data redundancy (RAID level 5 and RAID level 10), if all of the *pdisks* are in the *Zeroed* state, the array will become immediately protected against failures. However, if one or more of the *pdisks* are not *Zeroed*, the newly created array will initially be in the *Rebuilding* state. It will be unprotected against disk failures until parity data on all of the disks has been recalculated. For disk arrays with no data redundancy (RAID level 0), it is of no importance whether the *pdisks* are in the *Zeroed* state. To create a PCI-X SCSI Disk Array, do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Create a PCI-X SCSI Disk Array**.
3. Select the appropriate PCI-X SCSI RAID Controller on which you want to create an array.
4. Select the RAID level for the array. For more information about selecting an appropriate RAID level, see "Supported RAID Levels" on page 3.
5. Select the stripe size in kilobytes for the array. For more information about the stripe-size parameter, see "Stripe-Unit Size" on page 7. A selection screen similar to the following displays. It will display a list of *Array Candidate pdisks* and notes regarding array requirements. The minimum and maximum number of supported disks will be specified, along with any other specific requirements for the array.
6. Select the disks that you want to use in the array according to the requirements on this screen.

```
                      Create a PCI-X SCSI Disk Array
Move cursor to desired item and press F7. Use arrow keys to scroll.
    ONE OR MORE items can be selected.
Press Enter AFTER making all selections.

  # RAID 10 supports a minimum of 2 and a maximum of 18 disks
  # The total number of disks must be a multiple of 2

  pdisk10   30-60-01-1,0  Active      Array Candidate   72.8GB
  pdisk11   30-60-00-4,0  Active      Array Candidate   72.8GB
  pdisk12   30-60-01-8,0  Active      Array Candidate   72.8GB
  pdisk18   30-60-00-2,0  Active      Array Candidate   72.8GB




F1=Help               F2=Refresh              F3=Cancel
F7=Select             F8=Image                F10=Exit
Enter=Do              /=Find                  n=Find Next
```

7. A SMIT Dialog Screen summarizes your selections. Press Enter to create the array.

You can now add the disk array to a volume group. Logical volumes and file systems can also be created. Use standard AIX procedures to perform these tasks, and treat the array in the same way that you would treat any *hdisk*.

Viewing the Disk Array Configuration

To view the configuration of arrays and disks associated with a particular PCI-X SCSI RAID Controller, do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **List PCI-X SCSI Disk Array Configuration**.
3. Choose one or more PCI-X SCSI RAID Controllers. The output displayed will be similar to the following:

```
                        COMMAND STATUS
Command: OK            stdout: yes          stderr: no

Before command completion, additional instructions may appear below.

--------------------------------------------------------------------
Name      Location      State       Description        Size
--------------------------------------------------------------------
sisioa1   30-60         Available   PCI-X Dual Channel U320 SCSI RAID Adapter

hdisk11   30-60-ff-0,1  Optimal     Raid 5 Array       54.3GB
 pdisk0   30-60-00-5,0  Active      Array Member       18.1GB
 pdisk1   30-60-00-6,0  Active      Array Member       18.1GB
 pdisk2   30-60-01-2,0  Active      Array Member       36.4GB
 pdisk4   30-60-01-3,0  Active      Array Member       18.1GB

hdisk12   30-60-ff-0,2  Degraded    Raid 5 Array       72.8GB
 pdisk3   30-60-00-10,0 Active      Array Member       36.4GB
 pdisk5   30-60-01-5,0  Failed      Array Member       36.4GB
 pdisk6   30-60-00-11,0 Active      Array Member       36.4GB

hdisk13   30-60-ff-0,3  Rebuilding  Raid 10 Array      72.8GB Create 55%
 pdisk7   30-60-00-12,0 Active      Array Member       72.8GB
 pdisk8   30-60-01-12,0 Active      Array Member       72.8GB

hdisk14   30-60-ff-0,6  Failed      Raid 5 Array       109.2GB
 pdisk14  30-60-00-0,0  RWProtected Array Member       36.4GB
 pdisk15  30-60-00-9,0  RWProtected Array Member       36.4GB
 pdisk16  30-60-00-2,0  Missing     Array Member       36.4GB
 pdisk17  30-60-00-3,0  Missing     Array Member       36.4GB

hdisk15   30-60-ff-0,8  Missing     Raid 0 Array       145.6GB

pdisk9    30-60-00-1,0  Active      Hot Spare          18.1GB
pdisk10   30-60-01-1,0  Active      Array Candidate    72.8GB
pdisk11   30-60-00-4,0  Active      Array Candidate    72.8GB Zeroed
pdisk12   30-60-01-13,0 RWProtected Array Candidate    72.8GB Format 35%

hdisk20   30-60-01-4,0  Available   16 Bit LVD SCSI     9.0GB
hdisk21   30-60-01-6,0  Defined     16 Bit LVD SCSI     9.0GB

F1=Help          F2=Refresh        F3=Cancel          F6=Command
F8=Image         F9=Shell          F10=Exit           /=Find
n=Find Next
```

The controller's name, location, status, and description are displayed first. Each PCI-X SCSI disk array *hdisk* is displayed with its *Array Member pdisks* directly underneath it.

- The first column of output is the name of the disk array (*hdisk*) or physical disk (*pdisk*).
- The second column of output is the device's location code. The format of the location code is *AB-CD-EF-G,H*. The *AB-CD* fields identify the location of the PCI-X SCSI RAID Controller. The *EF* value identifies the Controller's SCSI bus that the device is attached to. For a disk array this value will be ff which indicates a logical bus for RAID devices. The *G,H* values are the SCSI ID and Logical Unit Number (LUN) of the device.
- The third column of the above output is the state of the disk array or *pdisk*. For information about the possible disk array and *pdisk* states, see "Disk Array Overview" on page 7. For 512 byte/sector standalone disks (*hdisks*), this column is the AIX device state (for example, *Available* or *Defined*).
- The fourth column is a description of the device. For a disk array, the description is the RAID level of the array. For a *pdisk*, the description can be *Array Candidate, Hot Spare*, or *Array Member*.
- The fifth column is the capacity of the array or disk. For information about how the capacity of an array is calculated for each RAID level, see "Disk Array Capacities" on page 7.
- The sixth column is the status of a long-running command issued to a disk array or *pdisk*. This column is also used to indicate that an *Array Candidate pdisk* has had its data zeroed. The following values may be displayed:

Create nn%
> Disk array is in process of being created.

Delete nn%
> Disk array is in process of being deleted.

Rebuild nn%
> Disk array is in process of being reconstructed.

Resync nn%
> Disk array is in process of having it parity data resynchronized.

Adding nn%
> Disk array is in process of having one or more disks added to it.

Format nn%
> *pdisk* is in process of being formatted.

Zeroed
> *pdisk* has been zeroed.

Array Candidate pdisks and *Hot Spare pdisks* are displayed at the bottom of this screen. The *pdisk* names are displayed, along with location, state, description, capacity, and long-running command status. Any 512 bytes/sector standalone disks (*hdisks*) are displayed, along with location, state, description, and capacity.

Deleting a PCI-X SCSI Disk Array

Attention: After a disk array is deleted, it cannot be accessed. All data will be lost. A disk array that is currently in use or opened cannot be deleted. Also, if a disk array command (such as a disk creation command) is in progress, that disk array cannot be deleted.

To preserve the data on the disk array, you must first back up all files in the logical volumes and file systems on the disk array before removing the disk array from its volume group. To delete the array, do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Delete a PCI-X SCSI Disk Array**.
3. Select the PCI-X SCSI RAID Controller.
4. Select the disk array to delete.

When the disk array has been deleted, any *Active Array Member pdisks* will become *Active Array Candidate pdisks*.

Adding Disks to an Existing Disk Array

The PCI-X SCSI RAID Controller supports adding disks to existing RAID level 5 disk arrays, which allows you to dynamically increase the capacity of a disk array while preserving its existing data. Extensive use of this feature, however, will result in a performance penalty; because the added disks will not contain parity and the data will not be restriped.

An *Array Candidate pdisk* is not necessarily a candidate that can be added to an existing array. In addition to being an Array Candidate, the *pdisk* must also be recognized by the adapter as having its data zeroed. This situation ensures that when the disks are added to the array, the parity data will be correct and the array will remain protected against disk failures.

To add disks to an existing array, do the following:

1. Ensure that the disks to be added are *Zeroed Array Candidate pdisks*. For assistance in viewing and changing the state of the disk, see "Preparing Disks for Use in PCI-X SCSI Disk Arrays" on page 14 and "Viewing the Disk Array Configuration" on page 15.
2. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
3. Select **Add Disks to an Existing PCI-X SCSI Disk Array**.
4. Select the PCI-X SCSI Disk Array to which you want to add disks.
5. A screen will display similar to the following example. If a particular disk is not included in the list, it may not be a candidate that can be added to the array because of the following reasons:
   - The disk's capacity is less than that of the smallest disk already in the array.
   - The disk has not been formatted as a 522 bytes/sector *Array Candidate pdisk*.
   - The disk does not have its data zeroed.

   For the second and third cases, the disk can be added to an array if it is first formatted using the **Create an Array Candidate pdisk and Format to 522 Byte Sectors** option in the PCI-X SCSI Disk Array Manager.

```
            Add Disks to an Existing PCI-X SCSI Disk Array
 Move cursor to desired item and press F7. Use arrow keys to scroll.
     ONE OR MORE items can be selected.
 Press Enter AFTER making all selections.

   # Choose up to 14 of the following disks to add to hdisk2

   pdisk10   30-60-01-1,0  Active      Array Candidate   72.8GB Zeroed
   pdisk11   30-60-00-4,0  Active      Array Candidate   72.8GB Zeroed
   pdisk12   30-60-01-8,0  Active      Array Candidate   72.8GB Zeroed
   pdisk18   30-60-00-2,0  Active      Array Candidate   80.0GB Zeroed

   # Note: If a disk is not listed here it is either not a candidate
   # to be added to this array or it does not have its data zeroed
   # Use the Create an Array Candidate pdisk and Format to 522 Byte
   # Sectors option to format and zero the disk.


 F1=Help                F2=Refresh              F3=Cancel
 F7=Select              F8=Image                F10=Exit
 Enter=Do               /=Find                  n=Find Next
```

   A screen summarizes your selections and indicates the performance penalty associated with this option.
6. Press Enter to add the disks to the array. To enable higher level components in the system to use the increased capacity of the disk array, additional steps might be needed.

Using Hot Spare Disks

Hot Spare disks are used to automatically replace Failed disks in a redundant RAID environment. Hot spare disks are useful only if their capacity is greater than or equal to that of the smallest capacity disk in an array that becomes *Degraded*.

Creating Hot Spare Disks

To create hot spare disks, do the following:
1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Change/Show PCI-X SCSI pdisk Status**.
3. Select **Create a Hot Spare**.
4. Select the appropriate PCI-X SCSI RAID Controller.

5. Select the *pdisks* that you want to designate as hot spares. A screen summarizes your selections.
6. Press Enter to create the hot spares.

The disk state changes to *Hot Spare*. On subsequent disk failures, reconstruction of *Failed* disks will occur automatically for RAID level 5 and RAID level 10 disk arrays.

Note: If there is a *Degraded* disk array at the time that a *Hot Spare* is configured, reconstruction of the *Failed* disk begins automatically.

Deleting Hot Spare Disks

To delete a *Hot Spare* and change the disk to an *Array Candidate pdisk*, do the following:
1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Change/Show PCI-X SCSI pdisk Status**.
3. Select **Delete a Hot Spare**.
4. Select the appropriate PCI-X SCSI RAID Controller.
5. Select the hot spares to delete.

The *Hot Spare* becomes an *Array Candidate pdisk*.

Viewing and Changing PCI-X SCSI RAID Controller Bus Settings

To view and change settings for the PCI-X SCSI RAID Controller, do the following:
1. At the command prompt, type smit, and press Enter.
2. Select **Devices**.
3. Select **Disk Array**.
4. Select **IBM PCI-X SCSI Disk Array**.
5. Select **Change/Show PCI-X SCSI RAID Controller Bus**.
6. Select the PCI-X SCSI RAID Controller bus that you want to change settings on or view.

```
     Change/Show Characteristics of a PCI-X SCSI RAID Controller Bus
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                         [Entry Fields]
  SCSI Adapter                           scsi8
  Description                            PCI-X U320 SCSI RAID >
  Status                                 Available
  Location                               30-60-00
  Adapter card SCSI ID                   [7]                    +#
  Wide bus enabled                       yes                    +
  Maximum SCSI Bus Speed in MB/s         320                    +
  QAS (Quick Arbitration) Capability     Enable                 +
  Apply change to DATABASE only          no                     +



F1=Help         F2=Refresh      F3=Cancel       F4=List
F5=Reset        F6=Command      F7=Edit         F8=Image
F9=Shell        F10=Exit        Enter=Do
```

A screen displays information about the controller bus. The last five attributes on the screen are changeable. The following is information regarding each of the attributes:

Adapter card SCSI ID
Specifies the SCSI ID value that the controller will use to send commands as an initiator device. If multi-initiators are supported, the SCSI ID that the controller responds to when acting

as a target device will be specified. This value is usually changed to avoid a conflict or duplication of SCSI IDs among the controller and other devices on the SCSI bus. Before cabling any new device to the SCSI bus, you should verify that the device's SCSI ID is unique. If the controller does not support multi-initiators, 7 is the only valid value for the SCSI ID.

Note: Multi-initiator and High Availability (such as HACMP) support are not provided at this time.

Wide bus enabled

Specifies whether the controller will negotiate with the device for a 16-bit data transfer width on the SCSI bus. If *Yes* is specified, which is the default value, the controller negotiates for 16-bit data transfers. *Yes* can be specified when an 8-bit device is connected through an 8-bit cable to the SCSI connector. The *No* option sets the data transfer width to 8 bits. Use the *No* option when older devices are connected that may not handle the wide data transfer request, WDTR, messages properly. The WDTR messages are used to detect the data transfer width capabilities of a device.

Maximum SCSI Bus Speed in MB/s

This attribute is used to limit the maximum speed in megabytes per second (MB/s) that the adapter SCSI bus will use. Speed is negotiated between the adapter and SCSI devices. The maximum negotiated speed cannot be greater than the Maximum SCSI Bus Speed in MB/s value.

QAS (Quick Arbitration) Capability

This attribute is used to enable or disable the quick arbitration capability. Enabling QAS capability does not guarantee that QAS will actually occur for any device on a SCSI bus.

Apply Change to Database only

Indicates whether the configuration changes should be applied only to the database or to both the database and the current device operation. For devices that are in use and cannot be changed, this allows the database to be changed for the device and the changes will take effect the next time the system is rebooted.

7. After changing any PCI-X SCSI RAID Controller attribute, press Enter to make the desired changes.

Viewing PCI-X SCSI Disk Array Settings

To view the settings for a PCI-X SCSI Disk Array, do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.

2. Select the **Change/Show Characteristics of a PCI-X SCSI Disk Array** option.

3. Select the desired PCI-X SCSI Disk Array.

4. A SMIT dialog screen displays the attributes of the selected array. The output displayed will be similar to the following:

```
   Change/Show Characteristics of a PCI-X SCSI Disk Array

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                          [Entry Fields]
  RAID Array                              hdisk15
  Description                             SCSI RAID 5 Disk Arra>
  Status                                  Available
  Location                                30-60-ff-0,1
  Serial Number                           12D0E934
  Physical volume identifier              none
  Queue DEPTH                             16
  Size in Megabytes                       109200
  RAID Level                              5
  Stripe Size in KB                       64



F1=Help          F2=Refresh       F3=Cancel        F4=List
F5=Reset         F6=Command       F7=Edit          F8=Image
F9=Shell         F10=Exit         Enter=Do
```

- The **Physical volume identifier** field is a unique value assigned to the *hdisk* if the disk array is a member of a volume group. If the disk array is not a member of a volume group, this field value is none.
- The **Queue DEPTH** field is the depth of the command queue used for this disk array.
- The **Size in Megabytes** field represents the usable capacity of the disk array. For information about calculating capacities for each RAID level, see "Supported RAID Levels" on page 3.
- The **RAID Level** field is the level of protection chosen for this array.
- The **Stripe Size in KB** field is the number of contiguous kilobytes which will be written to a single disk before switching to the next disk in the disk array. It provides the host with a method to tune data striping according to the typical I/O request size.

You cannot change any of the attributes on this screen. The RAID level and stripe size must be specified when the array is created.

Viewing PCI-X SCSI pdisk Settings

To view the PCI-X SCSI *pdisk* settings, do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.

2. Select **Change/Show PCI-X SCSI pdisk Status**.

3. Select **Change/Show PCI-X SCSI pdisk**.

4. Select a *pdisk* from the list.

5. The following attributes are displayed:

```
                    Change/Show PCI-X SCSI pdisk
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                           [Entry Fields]
  Disk                                    pdisk3
  Description                             Physical SCSI Disk Drive
  Status                                  Available
  Location                                30-60-00-10,0
  Serial Number                           E3V1W93B
  Vendor and Product ID                   IBM    IC35L036UCDY10>
  Service Level
  Size in Megabytes                       60400
  Format Timeout in minutes              [120]                        +#


F1=Help          F2=Refresh       F3=Cancel        F4=List
F5=Reset         F6=Command       F7=Edit          F8=Image
F9=Shell         F10=Exit         Enter=Do
```

The **Size in Megabytes** field represents the capacity of the *pdisk*.

To display a *pdisk's* Vital Product Data (VPD), do the following:

1. Start the PCI-X SCSI Disk Array Manager by following the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.

2. Select **Change/Show PCI-X SCSI pdisk Status**.

3. Select **Display pdisk Vital Product Data**.

4. Select the appropriate PCI-X SCSI RAID Controller.

5. Select the desired *pdisk*.

Chapter 4. PCI-X SCSI RAID Controller Maintenance

This chapter provides information to assist in ensuring optimal performance of your PCI-X SCSI RAID Controller.

Do's and Don'ts

To help avoid PCI-X SCSI RAID Controller and disk array problems, use the following tips :

- Always perform a normal system shutdown before physically replacing or moving the RAID adapter or members of disk arrays. A normal shutdown of the system will flush the adapter's write cache and remove dependencies between the adapter and the *pdisks*. Using the **rmdev** command on the controller (for example, `rmdev -Rl sisioa3`) has the same effect on the controller as it would on a single adapter when the system shutdown command is used.

   Note: *pdisks* that are a *Failed* member of a *Degraded* disk array can be replaced and the disk array reconstructed while the system continues to run.

- You can physically move *pdisks* from one adapter to another. However, if the *pdisks* are members of a disk array, be sure to move all the disks as a group. Prior to attempting a disk movement, ensure that the disk array is not in a *Degraded* state because of a disk failure.

- When physically removing *pdisks* that are members of a disk array and there is no need to preserve data and no intent to use the disk array again, delete the disk array before removing the disks. This action avoids disk-array related problems the next time that these disks are used.

- Always use the SCSI and SCSI RAID Hot Plug Manager to remove and replace a *pdisk*. For instructions on how to remove and replace a disk, see "Replacing pdisks" on page 27.

- If a disk array is being used as a boot device and the system fails to boot because of a suspected disk array problem, boot using the Standalone Diagnostic media. Error Log Analysis, AIX error logs, the PCI-X SCSI Disk Array Manager, and other tools are available on the Standalone Diagnostics to help determine and resolve the problem with the disk array.

- Do not attempt to correct problems by swapping adapters and disks unless you are directed to do so by the service procedures. Use Error Log Analysis to determine what actions to perform, and when appropriate, follow the appropriate MAPs for problem determination. If multiple errors occur at approximately the same time, look at them as a whole to determine if there is a common cause. For additional information regarding problem determination, see Chapter 5, "Problem Determination and Recovery," on page 31.

- Do not confuse the Cache Directory Card, which is a small rectangular card with a round button-shaped battery, for a cache card. The nonvolatile write cache memory is integrated into the main adapter card, is not removable, and is battery-backed by the large, rechargeable Cache Battery Pack. The Cache Directory Card contains only a secondary copy of the write cache directory, no cache data, and should never be removed except under very specific cases as described in the MAPs.

- Do not unplug or exchange a Cache Battery Pack without following the procedures as outlined in this section or in the MAPs.

- When invoking diagnostic routines for a PCI-X SCSI RAID Controller, it is recommended that Problem Determination (PD) mode be used instead of System Verification (SV) mode unless there is a specific reason to use SV mode (for example, you were directed to run SV mode by a MAP).

- After diagnostic routines for a PCI-X SCSI RAID Controller are run in SV mode, it is recommended to run diagnostics in PD mode to ensure that new errors are analyzed. These actions should be performed especially when using Standalone Diagnostic media.

Updating the PCI-X SCSI RAID Controller Microcode

To determine if an update is needed for your PCI-X SCSI RAID Controller, follow the directions at: http://techsupport.services.ibm.com/server/mdownload/download.html. If updates are needed, download instructions are also located at that Web address.

To install the update to a PCI-X SCSI RAID Controller, do the following:

1. Type `smit` and press Enter.
2. Select **Devices**.
3. Select **Disk Array.**
4. Select **IBM PCI-X SCSI Disk Array.**
5. Select **Download Microcode to a PCI-X SCSI RAID Controller.**
6. Select your PCI-X SCSI RAID Controller.
7. Follow the instructions to complete the update.

Changing pdisks to hdisks

To change Array Candidate *pdisks* (522 bytes/sector) to standalone *hdisks* (512 bytes/sector), you must delete and format the *pdisks*.

Note: *pdisks* which are members of a disk array or are hot spares cannot be changed to standalone *hdisks*.

To change the *pdisks* to standalone *hdisks*, do the following:

1. Navigate to the PCI-X SCSI Disk Array Manager by using the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Change/Show PCI-X SCSI pdisk Status**.
3. Select **Delete an Array Candidate pdisk and Format to 512 Byte Sectors**.
4. Select the appropriate PCI-X SCSI RAID Controller.
5. Select the 522 bytes/sector *pdisks* to be formatted to 512 bytes/sector standalone *hdisks*.

   Attention: Continuing with this option will format the disks. All data on the disks will be lost. When the format completes, the *pdisk* will be deleted and replaced by an *hdisk*.

Rechargeable Battery Maintenance

Rechargeable battery maintenance tasks described in this section include displaying rechargeable battery information, forcing a rechargeable battery error, and replacing the rechargeable Cache Battery Pack.

Displaying Rechargeable Battery Information

To display information about the controller's rechargeable battery, do the following:

1. Navigate to the PCI-X SCSI Disk Array Manager by using the steps found in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Diagnostics and Recovery Options**.
3. Select **Controller Rechargeable Battery Maintenance**.
4. Select **Display Controller Rechargeable Battery Information**.
5. Select the PCI-X SCSI RAID Controller.
6. The screen displayed will be look similar to the following example:

```
                         COMMAND STATUS
Command: OK            stdout: yes            stderr: no

Before command completion, additional instructions may appear below.

RAID Adapter  . . . . . . . . . . . . : sisioa1
Battery Type  . . . . . . . . . . . . : Nickel Metal Hydride (NiMH)
Battery State . . . . . . . . . . . . : No battery warning/error
Power-on time (days)  . . . . . . . . : 256
Adjusted power-on time (days) . . . . : 288
Estimated time to warning (days)  . . : 512
Estimated time to error (days)  . . . : 768




F1=Help           F2=Refresh        F3=Cancel         F6=Command
F8=Image          F9=Shell          F10=Exit          /=Find
n=Find Next
```

The following are the fields displayed on the rechargeable battery information screen:

RAID Adapter
> The name of the selected controller.

Battery Type
> The type of rechargeable Cache Battery Pack.

Battery State
> Indicates if an error condition currently exists related to the rechargeable Cache Battery Pack. The possible values for this field are:

> **No battery warning/error**
>> No warning or error condition currently exists.

> **Warning condition**
>> A warning condition currently exists and an error has been logged.

> **Error condition**
>> An error condition currently exists and an error has been logged.

> **Unknown**
>> Information is not available to determine whether a warning or error condition currently exists.

Power-on time (days)
> Indicates the raw power-on time, in units of days, of the rechargeable Cache Battery Pack.

Adjusted power-on time (days)
> Indicates the adjusted (prorated) power-on time, in units of days, of the rechargeable Cache Battery Pack.

> **Note:** Some rechargeable Cache Battery Packs are negatively affected by higher temperatures and thus are prorated based on the amount of time that they spend at various ambient temperatures.

Estimated time to warning (days)
> Estimated time, in units of days, until a message is issued indicating that the replacement of the rechargeable Cache Battery Pack should be scheduled.

Estimated time to error (days)
> Estimated time, in units of days, until an error is reported indicating that the rechargeable Cache Battery Pack must be replaced.

Forcing a Rechargeable Battery Error

This option allows you to force your PCI-X SCSI RAID Controller to put its Cache Battery Pack into an error state. This state requires replacement of the battery. Typically, performing this task ensures that write caching is stopped prior to replacing a Cache Battery Pack. Forcing the battery error can be performed when you want to replace a Cache Battery Pack on one controller and you also want to replace other Cache Battery Packs on controllers in the same system that have not yet issued the cache battery warning nor cache battery error.

Forcing the battery error will result in the following:

- The system logs an error.
- Data caching becomes disabled on the selected controller.
- System performance could become significantly degraded until the Cache Battery Pack is replaced on the selected controller.

Ensure that you have the correct type and quantity of Cache Battery Packs to do the replacement. To resume normal operations, replace the Cache Battery Pack.

To force the battery error, do the following:

1. Navigate to the PCI-X SCSI Disk Array Manager by using the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Diagnostics and Recovery Options**.
3. Select **Controller Rechargeable Battery Maintenance**.
4. Select **Force Controller Rechargeable Battery Error**.
5. Select your PCI-X SCSI RAID Controller whose battery you want to replace.

   Note: Using this option places the battery into the error state, which requires it to be replaced.
6. Press Enter.
7. Replace the Cache Battery Pack as described in "Replacing the Rechargeable Cache Battery Pack."

Replacing the Rechargeable Cache Battery Pack

This section provides instructions for replacing the rechargeable Cache Battery Pack.

Note: When replacing the Cache Battery Pack, the battery must be disconnected for at least 15 seconds before connecting the new battery. This is the minimum amount of time needed for the card to recognize that the battery has been replaced.

CAUTION:
The battery is a nickel metal hydride battery. To avoid possible explosion, do not burn the battery. Exchange it with the IBM approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call.

If the Cache Battery Pack is not already in the error state, follow the steps described in "Forcing a Rechargeable Battery Error" before proceeding. After the battery is in the error state, replace it with a new battery by taking the following steps:

1. Remove the adapter from the system by referring to your system documentation.
2. Use the following illustration to locate the casing A that holds the battery pack.
3. Squeeze the casing A to remove the battery unit from the card.
4. Remove the plug that connects the battery unit and the card.

Note: The plug fits in the board only one way so that it cannot be inserted incorrectly during the replacement phase.

5. Remove the battery unit from the battery casing. Save the battery casing. The replacement battery pack does not provide a casing.

   Note: Ensure that the Cache Battery Pack is disconnected for at least 15 seconds before connecting the new battery. This is the minimum amount of time needed for the card to recognize that the battery has been replaced.

6. Install the new Cache Battery Pack by reversing this procedure.
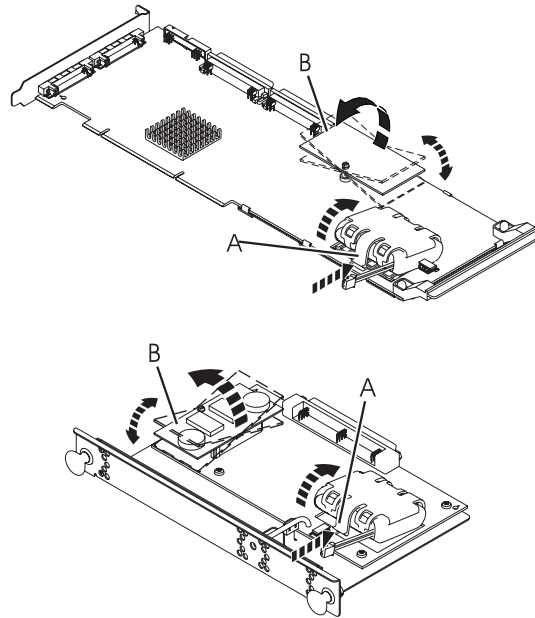
A Battery Pack Casing
B Cache Directory Card

Replacing pdisks

Replace *Failed pdisks* as soon as possible, even if a reconstruction was initiated with a hot spare by the controller. The **Replace/Remove a Device Attached to an SCSI Hot Swap Enclosure Device** option in the SCSI and SCSI RAID Hot Plug Manager can be used to replace *Failed* pdisks. The PCI-X SCSI Disk Array Manager provides a shortcut to the SCSI and SCSI RAID Hot Plug Manager. The SCSI and SCSI RAID Hot Plug Manager allows you to perform the following tasks:

- List all SCSI hot swap slots and their contents
- Set the identify indication for a device attached to a SCSI hot swap enclosure device
- Add a device to a SCSI hot swap enclosure device
- Replace and remove a hot swap device
- Configure added and replaced devices

To start the SCSI and SCSI RAID Hot Plug Manager, do the following:

1. Navigate to the PCI-X SCSI Disk Array Manager by using the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Diagnostics and Recovery Options**.
3. Select **SCSI and SCSI RAID Hot Plug Manager**.

4. Select the action you want to take, and follow the instructions on the screen to complete the selected operation.

Attention: Always use the SCSI and SCSI RAID Hot Plug Manager for devices attached to a PCI-X SCSI RAID Controller. *Do not* use utilities intended for other RAID products, such as RAID Hot Plug Devices.

Recovery Procedures for Disk Failures

The PCI-X SCSI RAID Controller handles disk failures differently, depending on the RAID level involved. For a description of disk array states, *pdisk* states, and RAID levels, see "Supported RAID Levels" on page 3. This section describes recovery procedures for each RAID level.

RAID Level 0

A single disk failure will cause a RAID level 0 array to change to the *Failed* state. After deleting the logical volumes and file systems on the disk array and removing the disk array from the volume group, delete the disk array, replace the *Failed* disk, then re-create the disk array. You must then add the disk array back to a volume group, re-create the disk array logical volumes and file systems, and copy the data back to the restored disk array from your backup media.

RAID Level 5

Single-Disk Failure
Whenever a single disk in a RAID level 5 disk array transitions to the *Failed* state, the disk array status changes to *Degraded.* The disk array remains functional because the data on the *Failed* disk can be reconstructed using parity and data on the remaining disks.

Whenever a disk is marked as *Failed*, replace it as soon as possible. If a hot spare disk was defined, the controller may reconstruct the data on the disk automatically. If a hot spare reconstruct was not initiated by the controller, replace the *Failed* disk and then initiate a reconstruct.

To initiate a reconstruct, do the following:
1. Navigate to the PCI-X SCSI Disk Array Manager by using the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Reconstruct a PCI-X SCSI Disk Array**.
3. Before you proceed, ensure that you have replaced the *Failed* disk.
4. Select the *pdisk* that you want to reconstruct.

Multiple-Disk Failures
If a second disk in a RAID level 5 disk array fails, the array will be marked as *Failed* and the data will not be accessible. After deleting the logical volumes and file systems on the disk array and removing the disk array from the volume group, delete the disk array, replace the *Failed* disks, then re-create the disk array. You must then add the disk array back to a volume group, re-create the disk array logical volumes and file systems, and copy the data back to the restored disk array from your backup media.

RAID Level 10

Single-Disk Failure
Whenever a single disk in a RAID level 10 disk array transitions to the *Failed* state, the disk array status changes to *Degraded.* The disk array remains functional because the data on the *Failed* disk is also stored on the other member of its mirrored pair.

Whenever a disk is marked as *Failed*, replace it as soon as possible. If a hot spare disk was *Defined*, the controller may reconstruct the data on the disk automatically. If a hot spare reconstruct was not initiated by the controller, then initiate a reconstruct on the *Failed* disk following replacement.

To initiate a reconstruct, do the following:

1. Navigate to the PCI-X SCSI Disk Array Manager by using the steps in "Using the PCI-X SCSI Disk Array Manager" on page 13.
2. Select **Reconstruct a PCI-X SCSI Disk Array**.
3. Before you proceed, ensure that you have replaced the *Failed* disk.
4. Select the *Failed pdisk* that you want to reconstruct.

Multiple-Disk Failures

If each *Failed* disk belongs to a different mirrored pair, then the array will be in the *Degraded* state because the data on each *Failed* disk is still available from its mirrored pair. The recovery procedure for this case is the same as the single-disk failure case. After you replace the *Failed* disks, initiate reconstruct operations.

When both members of a mirrored pair fail, the disk array status changes to *Failed*. After deleting the logical volumes and file systems on the disk array and removing the disk array from the volume group, delete the disk array, replace the *Failed* disks, then re-create the disk array. You must then add the disk array back to a volume group, re-create the disk array logical volumes and file systems, and copy the data back to the restored disk array from your backup media.

Chapter 5. Problem Determination and Recovery

Note: The procedures contained in this chapter are intended for service representatives specifically trained on the system unit and subsystem that is being serviced. Additionally, some of the service actions in this chapter might require involvement of the system administrator.

If a problem arises related to disk arrays and associated *pdisks*, use the following to identify the problem:
- Information presented by the Error Log Analysis (ELA)
- Hardware error logs viewed using the Display Hardware Error Report diagnostic task
- Disk array *hdisk* and *pdisk* status, viewed using the PCI-X SCSI Disk Array Manager

Error Log Analysis (ELA) analyzes errors presented by the adapter and recommends actions that need to be performed to correct the errors. It is sometimes recommended that you perform a Maintenance Analysis Procedure (MAP) to further determine what actions should be taken to resolve the problem. This chapter provides many of these MAPs.

The MAPs contained in this chapter are intended to address only problems directly related to disk arrays and SCSI bus-problem isolation. MAPs related to other device or adapter problems, when applicable, are located in other system documentation.

Considerations

Read the following before using these problem determination and recovery procedures:
- If a disk array is being used as a boot device and the system fails to boot because of a suspected disk-array problem, boot using the Standalone Diagnostic media. Error Log Analysis, AIX error logs, the PCI-X SCSI Disk Array Manager, and other tools are available on the Standalone Diagnostics to help determine and resolve the problem with the disk array.
- When invoking diagnostic routines for a PCI-X SCSI RAID Controller, it is recommended that Problem Determination (PD) mode be used instead of System Verification (SV) mode unless there is a specific reason to use SV mode (for example, you were directed to run SV mode by a MAP).
- After diagnostic routines for a PCI-X SCSI RAID Controller are run in SV mode, it is recommended to run diagnostics in PD mode to ensure that new errors are analyzed. These actions should be performed especially when using Standalone Diagnostic media.

Location Codes

Much of the location information contained in the hardware error logs is in the format of AIX location codes.

The AIX location code format for a SCSI device is: *AB-CD-EF-G,H* where
- *AB-CD* identifies the PCI-X SCSI RAID Controller.
- *EF* identifies the Controller's SCSI bus that the device is attached to.

  Note: For a disk array this value will be *ff*, which indicates a logical bus for RAID devices.
- *G,H* are the SCSI ID and logical unit number (LUN) of the device, respectively.

Often only a portion of the AIX location code is shown. For example:
- *AB-CD* identifies a PCI-X SCSI RAID Controller.
- *AB-CD-EF* identifies a PCI-X SCSI RAID Controller's SCSI bus.
- *EF-G,H* identifies the SCSI bus, SCSI ID, and LUN of an attached disk.

Identifying the Disk Array Problem

A disk array problem is uniquely identified by a Service Request Number (SRN). An SRN is in the format nnnn - rrrr, where the first four digits of the SRN preceding the dash (-) is known as the Failing Function Code (FFC, for example 2523) and the last four digits of the SRN following the dash (-) is known as the reason code. The reason code indicates the specific problem that has occurred and must be obtained in order to determine which MAP to use.

An SRN is provided by Error Log Analysis, which directs you to the MAPs contained in this chapter. To obtain the reason code (last four digits of the SRN) from an AIX error log, see "Finding an SRN Given an AIX Error Log" on page 64.

The SRN describes the problem that has been detected and should be considered the primary means of identifying a problem. However, the **List PCI-X SCSI Disk Array Configuration** option within the PCI-X SCSI Disk Array Manager is also useful in identifying a problem or confirming a problem described by Error Log Analysis. For additional information about the PCI-X Disk Array Manager, see "Using the PCI-X SCSI Disk Array Manager" on page 13.

Obtain the SRN and proceed to the next section to obtain a more detailed description of the problem and to determine which MAP to use.

Service Request Number (SRN) Table

Using the SRN obtained from Error Log Analysis or from the AIX error log, use the following table to determine which MAP to use. For MAPs, see "Maintenance Analysis Procedures (MAPs)" on page 34.

Note: The following table includes only SRNs that are associated with Maintenance Analysis Procedures contained in this document. A complete list of SRNs can be found in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Table 1.

SRN	Description	MAP
nnnn - 8008	Permanent Cache Battery Pack failure	MAP 3000
nnnn - 8009	Impending Cache Battery Pack failure	MAP 3000
nnnn - 9000 nnnn - 9001 nnnn - 9002	Controller detected device error during configuration discovery	MAP 3090
nnnn - 9008	Controller does not support function expected for one or more disks	MAP 3030
nnnn - 9010	Cache data associated with attached disks cannot be found	MAP 3020
nnnn - 9011	Cache data belongs to disks other than those attached	MAP 3090
nnnn - 9020 nnnn - 9021 nnnn - 9022	Two or more disks are missing from a RAID-5 Disk Array	MAP 3011
nnnn - 9023	One or more Disk Array members are not at required physical locations	MAP 3012
nnnn - 9024	Physical location of Disk Array members conflict with another Disk Array	MAP 3090
nnnn - 9025	Incompatible disk installed at degraded disk location in Disk Array	MAP 3010
nnnn - 9026	Previously degraded disk in Disk Array not found at required physical location	MAP 3090

Table 1. (continued)

SRN	Description	MAP
nnnn - 9027	Disk Array is or would become degraded and parity data is out of synchronization	MAP 3013
nnnn - 9028	Maximum number of functional Disk Arrays has been exceeded	MAP 3090
nnnn - 9029	Maximum number of functional Disk Array disks has been exceeded	MAP 3090
nnnn - 9030	Disk Array is degraded due to missing/failed disk	MAP 3010
nnnn - 9031	Automatic reconstruction initiated for Disk Array	MAP 3010
nnnn - 9041	Background Disk Array parity checking detected and corrected errors	MAP 3090
nnnn - 9050	Required cache data can not be located for one or more disks	MAP 3031
nnnn - 9051	Cache data exists for one or more missing/failed disks	MAP 3032
nnnn - 9052	Cache data exists for one or more modified disks	MAP 3090
nnnn - 9054	RAID controller resources not available due to previous problems	MAP 3021
nnnn - 9060	One or more disk pairs are missing from a RAID-10 Disk Array	MAP 3011
nnnn - 9061 nnnn - 9062	One or more disks are missing from a RAID-0 Disk Array	MAP 3011
nnnn - 9063	Maximum number of functional Disk Arrays has been exceeded	MAP 3090
nnnn - 9081 nnnn - 9082	Controller detected device error during internal media recovery	MAP 3090
nnnn - 9090	Disk has been modified after last known status	MAP 3033
nnnn - 9091	Incorrect disk configuration change has been detected	MAP 3033
nnnn - 9092	Disk requires Format before use	MAP 3034
nnnn - 9200	Identify disk to be replaced	MAP 3036
nnnn - FFF3	Disk media format bad	MAP 3035
nnnn - 719 nnnn - 720 nnnn - 721 nnnn - 3020 nnnn - 3100 nnnn - 3101 nnnn - 3109 nnnn - 3110 nnnn - FFFE	Various errors requiring SCSI bus problem isolation	MAP 3050
nnnn - 102E nnnn - 3002 nnnn - 3010 nnnn - 7001 nnnn - FFF4 nnnn - FFF6 nnnn - FFFA	Various errors which call for disk replacement, however, replacing disk did not solve problem	MAP 3051

Maintenance Analysis Procedures (MAPs)

Use the following procedures to resolve adapter, cache, or disk array problems associated with a PCI-X SCSI RAID Controller. See "Service Request Number (SRN) Table" on page 32 to identify which MAP to use.

MAP 3000

Use this MAP to resolve the following problems:
- Permanent Cache Battery Pack failure (SRN nnnn - 8008)
- Impending Cache Battery Pack failure (SRN nnnn - 8009)

Step 3000-1
Are you here because of a permanent Cache Battery Pack failure (SRN nnnn - 8008)?

NO   Go to Step 3000-2.

YES   Go to Step 3000-3.

Step 3000-2
Prior to replacing the Cache Battery Pack, it must be forced into an error state. This will ensure that write caching is stopped prior to replacing the battery pack thus preventing possible data loss. Perform the following to force the Cache Battery Pack into an error state:

Note: Ensure that you have a replacement Cache Battery Pack before proceeding.

1. Start the PCI-X SCSI Disk Array Manager.
   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
   b. Select **RAID Array Manager**.
   c. Select **PCI-X SCSI Disk Array Manager**.
2. Select **Diagnostics and Recovery Options**.
3. Select **Controller Rechargeable Battery Maintenance**.
4. Select **Force Controller Rechargeable Battery Error**.
5. Select the PCI-X SCSI RAID Controller.
6. Press Enter to continue and force the battery error.
7. Go to Step 3000-3.

Step 3000-3
Replace the Cache Battery Pack as follows:

Note: When replacing the Cache Battery Pack, the battery must be disconnected for at least 15 seconds before connecting the new battery. This is the minimum amount of time needed for the card to recognize that the battery has been replaced.

CAUTION:
The battery is a nickel metal hydride battery. To avoid possible explosion, do not burn. Exchange only with the IBM approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call.

Attention: All cards are sensitive to electrostatic discharge.

1. Using appropriate service procedures, remove the adapter from the system.

2. Locate the casing A that holds the battery pack in the following figure.
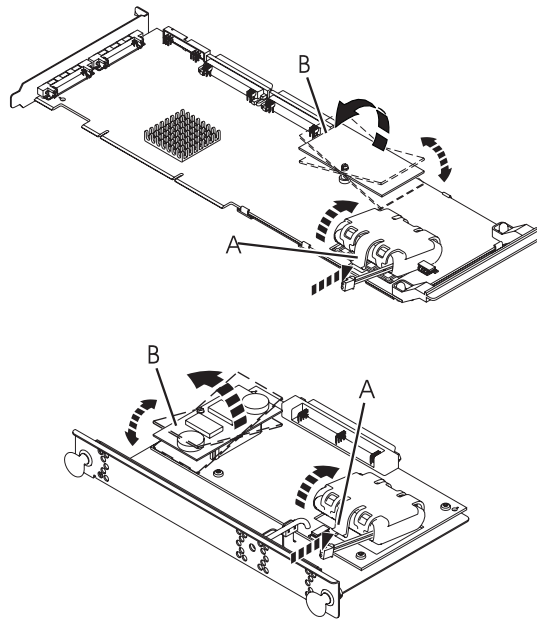
A Battery Pack Casing
B Cache Directory Card

3. Squeeze the casing A to remove the battery unit from the card.
4. Remove the plug that connects the battery unit and the card.

   Note: The plug fits in the board only one way so that it cannot be inserted incorrectly during the replacement phase.
5. Remove the battery unit from the battery casing. Save the battery casing. The replacement battery pack does not provide a casing.

   Note: Ensure that the Cache Battery Pack is disconnected for at least 15 seconds before connecting the new battery. This is the minimum amount of time needed for the card to recognize that the battery has been replaced.
6. Install the new Cache Battery Pack by reversing this procedure.

When the problem is resolved, then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3010

Use this MAP to resolve the following problems:
• Incompatible disk installed at degraded disk location in Disk Array (SRN nnnn - 9025)
• Disk Array is degraded due to missing/ failed disk (SRN nnnn - 9030)
• Automatic reconstruction initiated for Disk Array (SRN nnnn - 9031)

Step 3010-1
Identify the disk array by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem that sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. This error log displays the following disk array information under the *Array Information* heading: *Location*, *S/N*(serial number), and *RAID Level*.

7. Go to Step 3010-2.

Step 3010-2

View the current disk array configuration as follows:

1. Start the PCI-X SCSI Disk Array Manager.

   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

   b. Select **RAID Array Manager**.

   c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **List PCI-X SCSI Disk Array Configuration**.

3. Select the PCI-X SCSI RAID Controller identified in the hardware error log.

4. Go to Step 3010-3.

Step 3010-3

Does a disk array have a state of *Degraded*?

NO   Go to Step 3010-4.

YES   Go to Step 3010-5.

Step 3010-4

The affected disk array should have a state of either *Rebuilding* or *Optimal* due to the use of a hot spare disk.

Identify the *Failed* disk, which is no longer a part of the disk array, by finding the *pdisk* listed at the bottom of the screen that has a state of either *Failed* or *RWProtected*. Using appropriate service procedures, such as use of the SCSI and SCSI RAID Hot Plug Manager, remove the failed disk and replace it with a new disk to use as a hot spare:

1. Start the PCI-X SCSI Disk Array Manager.

   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

   b. Select **RAID Array Manager**.

   c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Diagnostics and Recovery Options** .

3. Select **SCSI and SCSI RAID Hot Plug Manager**.

4. Select **Identify a Device Attached to an SCSI Hot Swap Enclosure Device**.

5. Choose the location for the device you want to remove or install.

   Note: The visual indicator on the Device will blink at the Identify rate.

6. If you are removing a device:

   a. Select **Replace/Remove a Device Attached to an SCSI Hot Swap Enclosure Device**.

      Note: The visual indicator on the device will blink at the Remove rate.

   b. Remove the device.

else, if installing a device:

    a. Select **Attach a Device to an SCSI Hot Swap Enclosure Device**.

       Note: The visual indicator on the device will blink at the Remove rate.

    b. Insert the device.

If a new disk is not listed as a *pdisk*, it may first need to be prepared for use in a disk array. Do the following:

1. Start the PCI-X SCSI Disk Array Manager

    a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

    b. Select **RAID Array Manager**.

    c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Create an Array Candidate pdisk and Format to 522 Byte Sectors**.

3. Select the PCI-X SCSI RAID Controller.

4. Select the disk(s) from the list that you want to prepare for use in the disk arrays.

In order to make the new disk usable as a hot spare, do the following:

1. Start the PCI-X SCSI Disk Array Manager.

    a. Start Diagnostics and select **Task Selection** on the Function Selection screen .

    b. Select **RAID Array Manager**.

    c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Change/Show PCI-X SCSI pdisk Status**.

3. Select **Create a Hot Spare**.

4. Select the PCI-X SCSI RAID Controller.

5. Select the *pdisk* that you want to designate as a hot spare.

Note: Hot spare disks are useful only if their capacity is greater than or equal to that of the smallest capacity disk in a disk array that becomes *Degraded*.

When the problem is resolved, go to MAP 0410: Repair Checkout, in *RS/6000* @server *pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3010-5

Identify the failed disk by finding the *pdisk* listed for the degraded disk array that has a state of *Failed*. Using appropriate service procedures, such as use of the SCSI and SCSI RAID Hot Plug Manager, remove the failed disk and replace it with a new disk to use in the disk array. The SCSI and SCSI RAID Hot Plug Manager can be invoked as follows:

1. Start the PCI-X SCSI Disk Array Manager.

    a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

    b. Select **RAID Array Manager**.

    c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Diagnostics and Recovery Options**.

3. Select **SCSI and SCSI RAID Hot Plug Manager**.

4. Select **Identify a Device Attached to an SCSI Hot Swap Enclosure Device**.

5. Choose the location for the device you wish to remove/install.

    Note: The visual indicator on the device will blink at the Identify rate.

6. If removing a device:

    a. Select **Replace/Remove a Device Attached to an SCSI Hot Swap Enclosure Device**.

Note: The visual indicator on the device will blink at the Remove rate.

   b. Remove the device.

  else, if installing a device:

   a. Select **Attach a Device to an SCSI Hot Swap Enclosure Device**.

Note: The visual indicator on the device will blink at the Remove rate.

   b. Insert the device.

To bring the disk array back to a state of *Optimal*, do the following:

1. Start the PCI-X SCSI Disk Array Manager.
   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
   b. Select **RAID Array Manager**.
   c. Select **PCI-X SCSI Disk Array Manager**.
2. Select **Reconstruct a PCI-X SCSI Disk Array**.
3. Select the failed *pdisk* to reconstruct.

Note: The replacement disk should have a capacity that is greater than or equal to that of the smallest capacity disk in the degraded disk array.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3011

Use this MAP to resolve the following problems:
- Two or more disks are missing from a RAID-5 Disk Array (SRN nnnn - 9020 / nnnn - 9021 / nnnn - 9022)
- One or more disk pairs are missing from a RAID-10 Disk Array (SRN nnnn - 9060)
- One or more disks are missing from a RAID-0 Disk Array (SRN nnnn - 9061 / nnnn - 9062)

Step 3011-1

Identify the disks missing from the disk array by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.
5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, the missing disks are those listed under *Array Member Information* with an *Actual Location* of *unkwn*.
7. Go to Step 3011-2.

Step 3011-2

There are three possible ways to correct the problem. Perform only *one* of the following three options, listed in the order of preference:

- Locate the missing disks and install them in the correct physical locations (that is the *Expected Locations*) in the system. Perform only *one* of the following two options:
  - IPL the system or logical partition
  - Unconfigure and reconfigure the adapter by performing the following:
    1. Unconfigure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager.
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.
    2. Configure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- Delete the disk array, as follows:

  Attention: All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Delete a PCI-X SCSI Disk Array**.
  3. Select the PCI-X SCSI RAID Controller.
  4. Select the disk array to delete.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- Format the remaining members of the disk array, as follows

  Attention: All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Diagnostics and Recovery Options**.
  3. Select **Format Physical Disk Media (pdisk)**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3012

Use this MAP to resolve the following problem:

One or more Disk Array Members are not at required physical locations (SRN nnnn - 9023)

Step 3012-1

Identify the disks which are not at their required physical locations by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.
5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view.

   Viewing the hardware error log, the disks which are not at their required locations are those listed under *Array Member Information* with an *Expected Location* and *Actual Location* which do not match.

   Note: An *Actual Location* of *unkwn* is acceptable, and no action is needed to correct it. This *unkwn* location should only occur for the disk array member that corresponds to the *Degraded Disk S/N*.

7. Go to Step 3012-2.

Step 3012-2

There are three possible ways to correct the problem. Perform only *one* of the following three options, listed in the order of preference:

- Locate the missing disks and install them in the correct physical locations (that is the *Expected Locations*) in the system. Perform only *one* of the following two options:
  - IPL the system or logical partition
  - Unconfigure and reconfigure the adapter by performing the following:
    1. Unconfigure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager.
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.
    2. Configure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- Delete the disk array, as follows:

  Attention: All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.

     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

     b. Select **RAID Array Manager**.

     c. Select **PCI-X SCSI Disk Array Manager**.

  2. Select **Delete a PCI-X SCSI Disk Array**.

  3. Select the PCI-X SCSI RAID Controller.

  4. Select the disk array to delete.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- Format the remaining members of the disk array, as follows

  Attention: All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.

     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

     b. Select **RAID Array Manager**.

     c. Select **PCI-X SCSI Disk Array Manager**.

  2. Select **Diagnostics and Recovery Options**.

  3. Select **Format Physical Disk Media (pdisk)**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3013

Use this MAP to resolve the following problem:

Disk array is or would become degraded and parity data is out of synchronization (SRN nnnn - 9027)

Step 3013-1

Identify the adapter and disks by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.

2. Select **Display Hardware Error Report**.

3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.

4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, if the disk array member which corresponds to the *Degraded Disk S/N* has an *Actual Location* of *unkwn* and is not physically present, it may be helpful to find this disk.

7. Go to Step 3013-2.

Step 3013-2
Have the adapter card or disks been physically moved recently?

NO　　　　Contact your service support organization.

YES　　　Go to Step 3013-3.

Step 3013-3
There are three possible ways to correct the problem. Perform only *one* of the following three options, listed in the order of preference:

* Restore the adapter and disks back to their original configuration. Perform only*one* of the following two options:
  - IPL the system or logical partition
  - Unconfigure and reconfigure the adapter by performing the following:
    1. Unconfigure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager.
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.
    2. Configure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in*RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

* Delete the disk array, as follows:

  Attention:　　All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Delete a PCI-X SCSI Disk Array**.
  3. Select the PCI-X SCSI RAID Controller.
  4. Select the disk array to delete.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

* Format the remaining members of the disk array, as follows

  Attention:　　All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Diagnostics and Recovery Options**.
3. Select **Format Physical Disk Media (pdisk)**.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3020

Use this MAP to resolve the following problem:

Cache data associated with attached disks cannot be found (SRN nnnn - 9010)

Step 3020-1

Did you just exchange the adapter as the result of a failure?

NO   Go to Step 3020-3.

YES   Go to Step 3020-2.

Step 3020-2

1. Reclaim Controller Cache Storage as follows:

   Attention: Data will be lost.
   This may be performed as follows:

   a. Start the PCI-X SCSI Disk Array Manager.

      1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
      2) Select **RAID Array Manager**.
      3) Select **PCI-X SCSI Disk Array Manager**.

   b. Select **Diagnostics and Recovery Options**.

   c. Select **Reclaim Controller Cache Storage**.

   d. Select the PCI-X SCSI RAID Controller.

   e. Confirm that you wish to proceed.

   Note: On the Reclaim Controller Cache Storage results screen, the number of lost sectors is displayed. If the number is 0, there is no data loss. If the number is not 0, data has been lost and the system operator may want to restore data after this procedure is completed.

2. Using appropriate service procedures, remove the new adapter, reinstall the Cache Directory Card (label B in the following illustration) that came with the new adapter, and reinstall the new adapter. The

original Cache Directory Card from the failed adapter should be kept with the failed adapter.
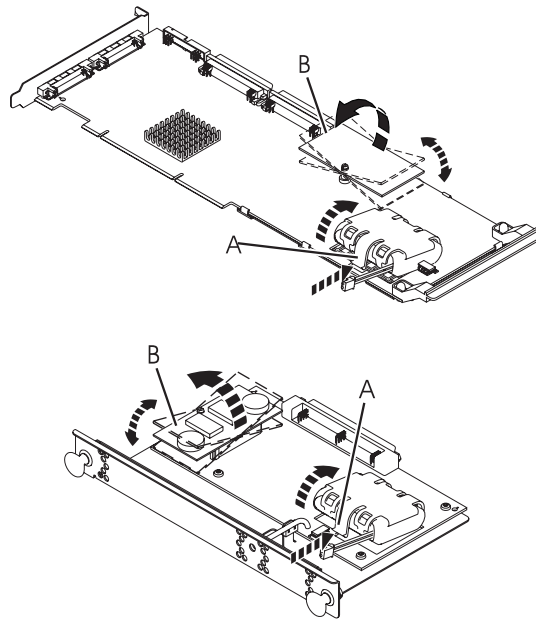
A Battery Pack Casing
B Cache Directory Card

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3020-3
Has the Cache Directory Card B been physically moved recently?

NO   Go to Step 3020-5.

YES   Go to Step 3020-4.

Step 3020-4
Restore Cache Directory Cards or adapters back to their original configuration.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3020-5
If the system has been powered off for several days after an abnormal power-down, the Cache Battery Pack may be depleted. Do *not* replace the adapter or the Cache Battery Pack. Reclaim the controller cache storage as follows:

Attention: Data will be lost.
1. Start the PCI-X SCSI Disk Array Manager.
    a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
    b. Select **RAID Array Manager**.
    c. Select **PCI-X SCSI Disk Array Manager**.
2. Select **Diagnostics and Recovery Options**.
3. Select **Reclaim Controller Cache Storage**.
4. Select the PCI-X SCSI RAID Controller.

5. Confirm that you wish to proceed

   Note: On the Reclaim Controller Cache Storage results screen, the number of lost sectors is displayed. If the number is 0, there is no data loss. If the number is not 0, data has been lost and the system operator may want to restore data after this procedure is completed.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3021

Use this MAP to resolve the following problem:

   RAID controller resources not available due to previous problems (SRN nnnn - 9054)

Step 3021-1
Perform the following:

1. Remove any new or replacement disks which have been attached to the adapter.
2. Take action on the other errors which have occurred at the same time as this error.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3030

Use this MAP to resolve the following problem:

   Controller does not support function expected by one or more disks (SRN nnnn - 9008)

Step 3030-1
Identify the affected disks by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.
5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, the *Device Errors Detected* field indicates the total number of disks which are affected. The *Device Errors Logged* field indicates the number of disks for which detailed information is provided. Under the *Device* heading, the *Location*, *Vendor/Product ID*, and *S/N* are provided for up to three disks. Additionally, the *Controller Type* and *S/N* for each of these disks indicates the adapter to which the disk was last attached when it was operational.
7. Go to Step 3030-2.

Step 3030-2
Have the adapter card or disks been physically moved recently?

NO   Contact your service support organization.

YES   Go to Step 3030-3.

Step 3030-3

There are two possible ways to correct the problem. Perform only *one* of the following two options, listed in the order of preference:

- Restore the adapter and disks back to their original configuration. Perform only*one* of the following two options:
  - – IPL the system or logical partition
  - – Unconfigure and reconfigure the adapter by performing the following:
    1. Unconfigure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager.
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.
    2. Configure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in*RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- Format the disks, as follows:

  Attention: All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Diagnostics and Recovery Options**.
  3. Select **Format Physical Disk Media (pdisk)**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3031

Use this MAP to resolve the following problem:

Required cache data cannot be located for one or more disks (SRN nnnn - 9050)

Step 3031-1

Did you just exchange the adapter as the result of a failure?

**NO**   Go to Step 3031-3.

YES   Go to Step 3031-2.

Step 3031-2

Note: The failed adapter that you have just exchanged contains cache data that is required by the disks that were attached to that adapter. If the adapter that you just exchanged is failing intermittently,

reinstalling it and IPLing the system may allow the data to be successfully written to the disks. After the cache data is written to the disks and the system is powered off normally, the adapter can be replaced without data being lost. Otherwise, continue with this procedure.

When continuing with the new adapter, perform the following:

1. Using appropriate service procedures, remove the new adapter, replace the Cache Directory Card B shown in the following figure with the original Cache Directory Card from the failed adapter, and reinstall the new adapter.
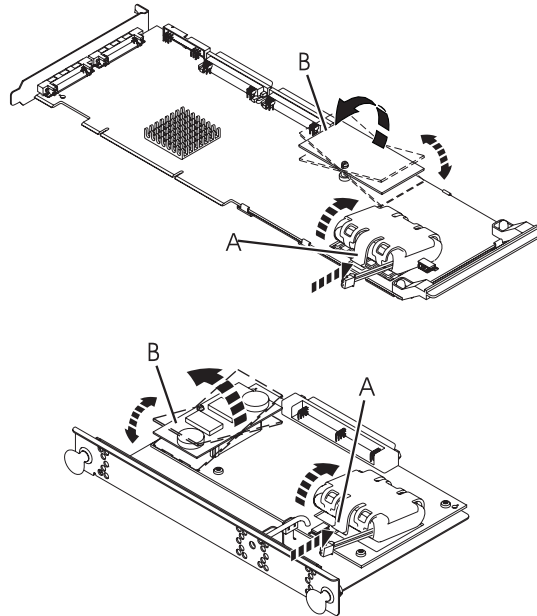
A Battery Pack Casing
B Cache Directory Card

2. An error with SRN nnnn - 9010 will occur. Ignore this error and continue with the next steps.
3. Reclaim Controller Cache Storage as follows.

   Attention: Data will be lost.

   a. Start the PCI-X SCSI Disk Array Manager.

      1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
      2) Select **RAID Array Manager**.
      3) Select **PCI-X SCSI Disk Array Manager**.

   b. Select **Diagnostics and Recovery Options**.
   c. Select **Reclaim Controller Cache Storage**.
   d. Select the PCI-X SCSI RAID Controller.
   e. Confirm that you wish to proceed.

   Note: On the Reclaim Controller Cache Storage results screen, the number of lost sectors is displayed. If the number is 0, there is no data loss. If the number is not 0, data has been lost and the system operator may want to restore data after this procedure is completed.

4. Using appropriate service procedures, remove the new adapter, reinstall the Cache Directory Card (label B in the following illustration) that came with the new adapter, and reinstall the new adapter. The

original Cache Directory Card from the failed adapter should be kept with the failed adapter.
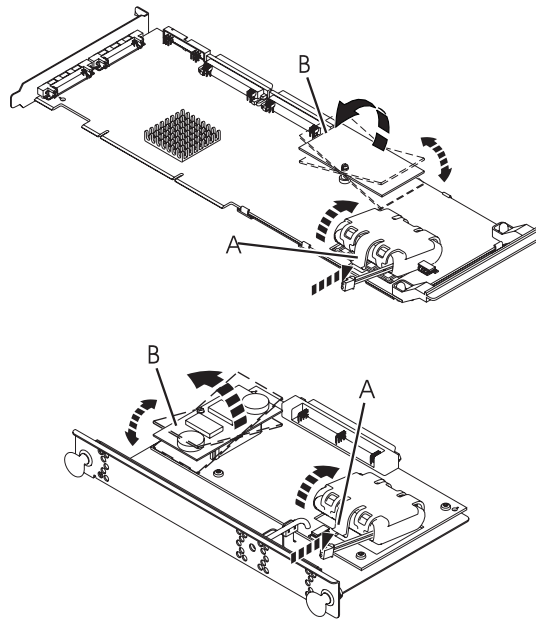
A Battery Pack Casing
B Cache Directory Card

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*

Step 3031-3
Identify the affected disks by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.
5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, the *Device Errors Detected* field indicates the total number of disks which are affected. The *Device Errors Logged* field indicates the number of disks for which detailed information is provided. Under the *Device* heading, the *Location*, *Vendor/Product ID*, and *S/N* are provided for up to three disks. Additionally, the *Controller Type* and *S/N* for each of these disks indicates the adapter to which the disk was last attached when it was operational.
7. Go to Step 3031-4.

Step 3031-4
Have the adapter card or disks been physically moved recently?

NO   Contact your service support organization.

YES   Go to Step 3031-5.

Step 3031-5
Is the data on the disks needed for this or any other system?

NO   Go to Step 3031-7.

YES   Go to Step 3031-6.

Step 3031-6
The adapter and disks, identified above, must be reunited so that the cache data can be written to the disks.

Restore the adapter and disks back to their original configuration.

Once the cache data is written to the disks and the system is powered off normally, the adapter and/or disks may be moved to another location.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3031-7
There are three possible ways to correct the problem. Perform only *one* of the following three options, listed in the order of preference:

- Reclaim Controller Cache Storage by performing the following:

  Attention: All data on the disk array will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Diagnostics and Recovery Options**.
  3. Select **Reclaim Controller Cache Storage**.
  4. Select the PCI-X SCSI RAID Controller.
  5. Confirm that you will Allow Unknown Data Loss.
  6. Confirm that you wish to proceed.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- If the disks are members of a disk array, delete the disk array.

  Attention: All data on the disk array will be lost.
  This may be performed as follows:

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Delete a PCI-X SCSI Disk Array**.
  3. Select the PCI-X SCSI RAID Controller.
  4. Select the disk array to delete.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- Format the disks, as follows:

  Attention: All data on the disks will be lost.

  1. Start the PCI-X SCSI Disk Array Manager.
     a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
     b. Select **RAID Array Manager**.
     c. Select **PCI-X SCSI Disk Array Manager**.
  2. Select **Diagnostics and Recovery Options**.
  3. Select **Format Physical Disk Media (pdisk)**.

  When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3032

Use this MAP to resolve the following problem:

   Cache data exists for one or more missing or failed disks (SRN nnnn - 9051)

The possible causes are:
- One or more disks have failed on the adapter.
- One or more disks were either moved concurrently or were removed after an abnormal power off.
- The adapter was moved from a different system or a different location on this system after an abnormal power off.
- The cache of the adapter was not cleared before it was shipped to the customer.

Step 3032-1

Identify the affected disks by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.
5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, the *Device Errors Detected* field indicates the total number of disks which are affected. The *Device Errors Logged* field indicates the number of disks for which detailed information is provided. Under the *Device* heading, the *Location*, *Vendor/Product ID*, and *S/N* are provided for up to three disks. Additionally, the *Controller Type* and *S/N* for each of these disks indicates the adapter to which the disk was last attached when it was operational.
7. Go to Step 3030-2.

Step 3032-2

Are there other disk or adapter errors which have occurred at about the same time as this error?

NO   Go to Step 3032-3.

YES   Go to Step 3032-6.

Step 3032-3

Is the data on the disks (and thus the cache data for the disks) needed for this or any other system?

NO   Go to Step 3032-7.

YES   Go to Step 3032-4.

Step 3032-4

Have the adapter card or disks been physically moved recently?

NO   Contact your service support organization.

YES   Go to Step 3032-5.

Step 3032-5

The adapter and disks must be reunited so that the cache data can be written to the disks.

Restore the adapter and disks back to their original configuration.

After the cache data is written to the disks and the system is powered off normally, the adapter and/or disks may be moved to another location.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3032-6

Take action on the other errors that have occurred at the same time as this error.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3032-7

Attention: Data will be lost.

Reclaim the Controller Cache Storage by performing the following:
1. Start the PCI-X SCSI Disk Array Manager.
    a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
    b. Select **RAID Array Manager**.
    c. Select **PCI-X SCSI Disk Array Manager**.
2. Select **Diagnostics and Recovery Options**.
3. Select **Reclaim Controller Cache Storage**.
4. Select the PCI-X SCSI RAID Controller.
5. Confirm that you will Allow Unknown Data Loss.
6. Confirm that you wish to proceed.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3033

Use this MAP to resolve the following problems:
- Disk has been modified after last known status (SRN nnnn - 9090)
- Incorrect disk configuration change has been detected (SRN nnnn - 9091)

Step 3033-1

Perform only*one* of the following two options:

*   IPL the system or logical partition
*   Unconfigure and reconfigure the adapter by performing the following:
    1. Unconfigure the adapter.
        a. Start the PCI-X SCSI Disk Array Manager.
            1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
            2) Select **RAID Array Manager**.
            3) Select **PCI-X SCSI Disk Array Manager**.
        b. Select **Diagnostics and Recovery Options**.
        c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.
    2. Configure the adapter.
        a. Start the PCI-X SCSI Disk Array Manager
            1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
            2) Select **RAID Array Manager**.
            3) Select **PCI-X SCSI Disk Array Manager**.
        b. Select **Diagnostics and Recovery Options**.
        c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

Take action on the other errors which have occurred at the same time as this error.

When the problem is resolved then go to MAP 0410: Repair Checkout, in*RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3034

Use this MAP to resolve the following problem:

> Disk requires Format before use (SRN nnnn - 9092)

The possible causes are:

*   Disk is a previously failed disk from a disk array and was automatically replaced by a hot spare disk.
*   Disk is a previously failed disk from a disk array and was removed and later reinstalled on a different adapter or different location on this adapter.
*   Appropriate service procedures were not followed when replacing disks or reconfiguring the adapter, such as not using the SCSI and SCSI RAID Hot Plug Manager when concurrently removing/installing disks or not performing a normal power down of the system prior to reconfiguring disks and adapters.
*   Disk is member of a disk array, but was detected subsequent to the adapter being configured.
*   Disk has multiple or complex configuration problems.

Step 3034-1

Identify the affected disks by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.
2. Select **Display Hardware Error Report**.
3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.
4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.
5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, the *Device Errors Detected* field indicates the total number of disks which are affected. The *Device Errors Logged* field indicates the number of disks for which detailed information is provided. Under the *Device* heading, the *Location*, *Vendor/Product ID*, and *S/N* are provided for up to three disks. Additionally, the *Controller Type* and *S/N* for each of these disks indicates the adapter to which the disk was last attached when it was operational.

7. Go to Step 3030-2.

Step 3034-2

Are there other disk or adapter errors which have occurred at about the same time as this error?

NO   Go to Step 3034-3.

YES   Go to Step 3034-5.

Step 3034-3

Have the adapter card or disks been physically moved recently?

NO   Go to Step 3034-4.

YES   Go to Step 3034-6.

Step 3034-4

Is the data on the disks not needed for this or any other system and you wish to continue to use them with this adapter?

NO   Go to Step 3034-6.

YES   Go to Step 3034-7.

Step 3034-5

Take action on the other errors which have occurred at the same time as this error.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3034-6

Perform only *one* of the following actions that is most applicable to your situation:

- Perform only *one* of the following two options:
  - IPL the system or logical partition
  - Unconfigure and reconfigure the adapter by performing the following:
    1. Unconfigure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager.
          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.
          2) Select **RAID Array Manager**.
          3) Select **PCI-X SCSI Disk Array Manager**.
       b. Select **Diagnostics and Recovery Options**.
       c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.
    2. Configure the adapter.
       a. Start the PCI-X SCSI Disk Array Manager

1) Start Diagnostics and select **Task Selection** on the Function Selection screen.

2) Select **RAID Array Manager**.

3) Select **PCI-X SCSI Disk Array Manager**.

b. Select **Diagnostics and Recovery Options**.

c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

Take action on the other errors which have occurred at the same time as this error.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

• Restore the adapter and disks to their original configuration. Once this has been done, perform only *one* of the following two options:

  – IPL the system or logical partition

  – Unconfigure and reconfigure the adapter by performing the following:

    1. Unconfigure the adapter.

       a. Start the PCI-X SCSI Disk Array Manager.

          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.

          2) Select **RAID Array Manager**.

          3) Select **PCI-X SCSI Disk Array Manager**.

       b. Select **Diagnostics and Recovery Options**.

       c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.

    2. Configure the adapter.

       a. Start the PCI-X SCSI Disk Array Manager

          1) Start Diagnostics and select **Task Selection** on the Function Selection screen.

          2) Select **RAID Array Manager**.

          3) Select **PCI-X SCSI Disk Array Manager**.

       b. Select **Diagnostics and Recovery Options**.

       c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

• Remove the disks from this adapter.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

Step 3034-7

There are two possible ways to correct the problem. Perform only *one* of these options.

• Format the disks.

Attention: All data on the disks will be lost.

This may be performed as follows:

1. Start the PCI-X SCSI Disk Array Manager.

   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

   b. Select **RAID Array Manager**.

   c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Diagnostics and Recovery Options**.

3. Select **Format Physical Disk Media (pdisk)**.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

- If the disks are members of a disk array, delete the disk array by doing the following.

   Attention: All data on the disk array will be lost.

   Note: In some rare scenarios, deleting the disk array will not have no effect on a disk and the disk must be formatted instead.

   1. Start the PCI-X SCSI Disk Array Manager.

       a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

       b. Select **RAID Array Manager**.

       c. Select **PCI-X SCSI Disk Array Manager**.

   2. Select **Delete a PCI-X SCSI Disk Array**.

   3. Select the PCI-X SCSI RAID Controller.

   4. Select the disk array to delete.

   When the problem is resolved then go to MAP 0410: Repair Checkout, in*RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3035

Use this MAP to resolve the following problem:

   Disk media format bad (SRN nnnn - FFF3)

The possible causes are:
- Disk was being formatted and was powered off during this process.
- Disk was being formatted and was reset during this process.

Step 3035-1
Identify the affected disk by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.

2. Select **Display Hardware Error Report**.

3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.

4. Select the adapter resource, or select all adapter resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

    Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, under the *Disk Information* heading, the *Location*, *Vendor/Product ID*, and *S/N* are provided for the disk.

7. Go to Step 3035-2.

Step 3035-2
Format the disk by performing the following.

Attention: All data on the disks will be lost.

1. Start the PCI-X SCSI Disk Array Manager.

    a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

    b. Select **RAID Array Manager**.

    c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Diagnostics and Recovery Options**.

3. Select **Format Physical Disk Media (pdisk)**.

When the problem is resolved then go to MAP 0410: Repair Checkout, in*RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3036

Use this MAP to resolve the following problem:

Identify disk to be replaced (SRN nnnn - 9200)

You are sent here when a *pdisk* (that is physical disk in 522 bytes/sector format) is to be replaced, however, the location of this disk was not provided.

Step 3036-1

Identify the failing disk by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.

2. Select **Display Hardware Error Report**.

3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.

4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, under the *Disk Information* heading, the *Location*, *Vendor/Product ID*, and *S/N* are provided for the disk.

7. Go to Step 3036-2.

Step 3036-2

Using appropriate service procedures, such as use of the SCSI and SCSI RAID Hot Plug Manager, remove the failed disk and replace it with a new disk. The SCSI and SCSI RAID Hot Plug Manager can be invoked as follows:

1. Start the PCI-X SCSI Disk Array Manager.

   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

   b. Select **RAID Array Manager**.

   c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **Diagnostics and Recovery Options**.

3. Select **SCSI and SCSI RAID Hot Plug Manager**.

4. Select **Identify a Device Attached to an SCSI Hot Swap Enclosure Device**.

5. Choose the location for the device you wish to remove or install

   Note: The visual indicator on the Device will blink at the Identify rate.

6. If removing a device:

   a. Select **Replace/Remove a Device Attached to an SCSI Hot Swap Enclosure Device**

      Note: The visual indicator on the Device will blink at the Remove rate.

   b. Remove the device

else if installing a device:

a. Select **Attach a Device to an SCSI Hot Swap Enclosure Device**

   Note: The visual indicator on the Device will blink at the Remove rate.

   b. Insert the device

7. Go to Step 3036-3.

Step 3036-3

1. Run diagnostics in system verification mode on the adapter
2. Take action on any other errors which may have surfaced due to removing the disk, if any, such as for degraded disk arrays

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000* @server *pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3050

Use the following to perform SCSI bus problem isolation.

Considerations:
- Remove power from the system before connecting and disconnecting cables or devices, as appropriate, to prevent hardware damage or erroneous diagnostic results.
- Some systems have SCSI and PCI-X bus interface logic integrated onto the system boards and use a pluggable RAID Enablement Card (a non-PCI form factor card) for these SCSI/PCI-X buses. An example of such a RAID Enablement Card is FC 5709. For these configurations, replacement of the RAID Enablement Card is unlikely to solve a SCSI bus-related problem because the SCSI bus interface logic is on the system board.
- Some adapters provide two connectors, one internal and one external, for each SCSI bus. For this type of adapter, it is not acceptable to use both connectors for the same SCSI bus at the same time. SCSI bus problems are likely to occur if this is done. However, it is acceptable to use an internal connector for one SCSI bus and an external connector for another SCSI bus. The internal and external connectors are labeled to indicate which SCSI bus they correspond to.

Attention: Replacing RAID adapters is not recommended without assistance from your service support organization when SCSI bus problems exist. Because the adapter may contain non-volatile write cache data and configuration data for the attached disk arrays, additional problems can be created by replacing a adapter when SCSI bus problems exist.

Attention: Removing functioning disks in a disk array is not recommended without assistance from your service support organization. A disk array may become degraded or failed if functioning disks are removed and additional problems may be created.

Common Device Removal and Installation Procedure

When this MAP calls for a device (that is disk, tape, CD-ROM, or DVD-ROM) to be removed or installed, use this common device removal and installation procedure:

If the boot device is not on this adapter *and* the device to be removed or installed is a hot-swap device, follow this procedure. If these conditions do not apply to your situation, see the *else* section located at the end of this procedure.

1. Remove or install the device by invoking the SCSI and SCSI RAID Hot Plug Manager.

   a. Start the PCI-X Disk Array Manager.

      1) Start Diagnostics and select **Task Selection** on the Function Selection screen.

      2) Select **RAID Array Manager**.

      3) Select **PCI-X SCSI Disk Array Manager**.

b. Select **Diagnostics and Recovery Options**.

c. Select **SCSI and SCSI RAID Hot Plug Manager**.

d. Select **Identify a Device Attached to an SCSI Hot Swap Enclosure Device**.

e. Choose the location for the device you wish to remove or install.

   Note: The visual indicator on the device will blink at the Identify rate.

f. If removing a device:

   1) Select **Replace/Remove a Device Attached to an SCSI Hot Swap Enclosure Device**.

      Note: The visual indicator on the device will blink at the Remove rate.

   2) Remove the device.

   3) Label the device with the slot it was removed from to ensure it can be reinstalled in the same location.

   else if installing a device:

   1) Select **Attach a Device to an SCSI Hot Swap Enclosure Device**.

      Note: The visual indicator on the device will blink at the Remove rate.

   2) Insert the device.

2. Unconfigure the adapter

   a. Start the PCI-X SCSI Disk Array Manager.

      1) Start Diagnostics and select **Task Selection** on the Function Selection screen.

      2) Select **RAID Array Manager**.

      3) Select **PCI-X SCSI Disk Array Manager**.

   b. Select **Diagnostics and Recovery Options**.

   c. Select **Unconfigure an Available PCI-X SCSI RAID Controller**.

3. Configure the adapter.

   a. Start the PCI-X SCSI Disk Array Manager.

      1) Start Diagnostics and select **Task Selection** on the Function Selection screen.

      2) Select **RAID Array Manager**.

      3) Select **PCI-X SCSI Disk Array Manager**.

   b. Select **Diagnostics and Recovery Options**.

   c. Select **Configure a Defined PCI-X SCSI RAID Controller**.

else:

1. Power off the system/logical partition

2. Remove/install the device(s)

3. Power on the system/logical partition

Step 3050-1

Identify the SCSI bus which the problem is occurring on by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.

2. Select **Display Hardware Error Report**.

3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.

4. Select the adapter resource, or select all adapter resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, under the *Disk Information* heading, the *Location* field can be used to identify which SCSI bus the error is associated with (that is the SCSI bus is the value *EF* given a location of *EF-G,H*).

7. Go to Step 3050-2.

Step 3050-2
Have recent changes been made to the SCSI configuration?

NO   Go to Step 3050-5.

YES   Go to Step 3050-3.

Step 3050-3
Check for the following problems:
- Address conflicts between devices
- Cabling problems such as; configurations that exceed the maximum cable lengths, missing termination, or excessive termination
- Both internal and external connectors for this SCSI bus are being used at the same time (only one should have a cable attached)
- Ensure the SCSI bus does not have multi-initiators (for example, set up for a high-availability configuration).

    Note: Multi-initiator and High Availability (for example, HACMP) support is not provided at this time.

For more details about supported SCSI cabling, refer to *RS/6000 @server pSeries Adapters, Devices, and Cable Information for Multiple Bus Systems*.

Did you find a problem?

NO   Go to Step 3050-5.

YES   Go to Step 3050-4.

Step 3050-4
1. Power off the system or logical partition.
2. Correct the problem.
3. Power on the system or logical partition, and run diagnostics in system verification mode on the adapter.

Did a SCSI bus-related failure occur?

NO   Go to Step 3050-16.

YES   Go to Step 3050-5.

Step 3050-5
Is problem related to the thermal fuse (that is SRN nnnn-719)?

NO   Go to Step 3050-7.

YES   Go to Step 3050-6.

Step 3050-6

The thermal fuse protects the SCSI bus from high currents due to shorts on the terminator, cable, or device. It is unlikely that the thermal fuse can be tripped by a defective adapter. A fault (short-circuit) causes an increase in resistance and temperature of the thermal fuse. The increase in temperature causes the thermal fuse to halt current flow. The thermal fuse returns to a low resistive and low temperature state when the fault is removed from the SCSI bus or when the system is turned off. Wait 10 seconds for the thermal fuse to reset itself and recover, then retest.

If the same error persists, replace the components of the failing SCSI bus in the following order. Wait 10 seconds for the thermal fuse to reset itself between steps.

1. Cable (if present)
2. DASD backplane (if present)
3. System board (if SCSI bus interface logic is on the system board)

To replace a component and verify that the problem was corrected, do the following:

1. Power off the system or logical partition.
2. Replace a component listed above.
3. Power on the system or logical partition, and run diagnostics in system verification mode on the adapter.

Did you correct the problem?

NO   Go to Step 3050-7.

YES   Go to Step 3050-16.

Step 3050-7

Determine if any of the disk arrays on the adapter are in a *Degraded* state as follows:

1. Start the PCI-X SCSI Disk Array Manager.
   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.
   b. Select **RAID Array Manager**.
   c. Select **PCI-X SCSI Disk Array Manager**.
2. Select **List PCI-X SCSI Disk Array Configuration**.
3. Select the PCI-X SCSI RAID Controller identified in the hardware error log.

Does any disk array have a State of *Degraded*?

NO   Go to Step 3050-9.

YES   Go to Step 3050-8.

Step 3050-8

1. Identify the failed disk(s) by first finding disk arrays with a state of *Degraded* and then a *pdisk* for that disk array which has a state of *Failed*.
2. Remove the failed disk from each degraded disk array by using the "Common Device Removal and Installation Procedure" on page 57.
3. Run diagnostics in system verification mode on the adapter.

Did a SCSI bus related failure occur?

NO   Go to Step 3050-16.

YES   Go to Step 3050-9.

Step 3050-9
Are there any non-essential removable media devices (for example tape, CD-ROM, or DVD-ROM) on the SCSI bus?

NO   Go to Step 3050-12.

YES   Go to Step 3050-10.

Step 3050-10
1. Remove one of the non-essential removable media devices by using the "Common Device Removal and Installation Procedure" on page 57.
2. Run diagnostics in system verification mode on the adapter.

Did a SCSI bus related failure occur?

NO   Go to Step 3050-11.

YES   Go to Step 3050-9.

Step 3050-11
The last removable media device removed from the SCSI bus may be the cause of the SCSI bus problems. Follow the repair procedures for that device.

Go to Step 3050-16.

Step 3050-12
Are there any non-essential disks which are not disk array members (for example, 512 byte/sector standalone disks, hot spare disks, or Array Candidates) on the SCSI bus?

NO   Go to Step 3050-15.

YES   Go to Step 3050-13.

Step 3050-13
1. Remove one of the non-essential disks devices by using the "Common Device Removal and Installation Procedure" on page 57.
2. Run diagnostics in system verification mode on the adapter.

Did a SCSI bus related failure occur?

NO   Go to Step 3050-14.

YES   Go to Step 3050-12.

Step 3050-14
The last disk removed from the SCSI bus may be the cause of the SCSI bus problems. Follow the repair procedures for that device.

Go to Step 3050-16.

Step 3050-15
Contact your service support organization.

Exit this procedure

Step 3050-16
1. Reinstall any good devices that were removed by using the "Common Device Removal and Installation Procedure" on page 57.

2. Run diagnostics in system verification mode on the adapter.

3. Perform the appropriate problem determination steps to resolve any other non-SCSI bus related errors that appear, if any, such as for degraded disk arrays.

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000* @server *pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3051

Use the following to determine what other FRUs, besides a disk, may need to be replaced in order to solve a problem.

You are sent here when a *pdisk* (that is physical disk in 522 bytes/sector format) was identified as the primary FRU to replace in order to solve a problem. However, if replacing the disk did not resolve the problem then other FRUs may need to be replaced.

Considerations:

- Remove power from the system before connecting and disconnecting cables or devices, as appropriate, to prevent hardware damage or erroneous diagnostic results.

- Keep in mind that some systems have SCSI and PCI-X bus interface logic integrated onto the system boards and use a pluggable RAID Enablement Card (a non-PCI form factor card) for these SCSI/PCI-X busses. An example of such a RAID Enablement Card is FC 5709. For these configurations, replacement of the RAID Enablement Card is unlikely to solve a SCSI bus related problem since the SCSI bus interface logic is on the system board.

- Some adapters provide two connectors, one internal and one external, for each SCSI bus. For this type of adapter, it is not acceptable to use both connectors for the same SCSI bus at the same time. SCSI bus problems are likely to occur if this is done. However, it is acceptable to use an internal connector for one SCSI bus and an external connector for another SCSI bus. The internal and external connectors are labeled to indicate which SCSI bus they correspond to.

Attention: Replacing RAID adapters is not recommended without assistance from your service support organization when SCSI bus problems exist. Because the adapter may contain non-volatile write cache data and configuration data for the attached disk arrays, additional problems can be created by replacing a adapter when SCSI bus problems exist.

Attention: Removing functioning disks in a disk array is not recommended without assistance from your service support organization. A disk array may become degraded or failed if functioning disks are removed and additional problems may be created.

Step 3051-1

Identify the SCSI bus which the problem is occurring on by examining the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.

2. Select **Display Hardware Error Report**.

3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.

4. Select the adapter resource, or select all adapter resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view. Viewing the hardware error log, under the *Disk Information* heading, the *Location* field can be used to identify which SCSI bus the error is associated with (that is the SCSI bus is the value *EF* given a location of *EF-G,H*).

7. Go to Step 3051-2.

Step 3051-2

While the error persists, replace the components of the failing SCSI bus in the following order.

1. Cable (if present)

2. Adapter (if SCSI bus interface logic is on the adapter) or system board (if SCSI bus interface logic is on the system board)

3. DASD backplane (if present)

To replace a component and see if the problem was corrected, do the following:

1. Power off the system/logical partition

2. Replace a component listed above

3. Power on the system/logical partition, and run diagnostics in system verification mode on the adapter

When the problem is resolved then go to MAP 0410: Repair Checkout, in *RS/6000 @server pSeries Diagnostic Information for Multiple Bus Systems*.

MAP 3090

The problem that occurred is uncommon or complex to resolve. Information should be gathered and assistance obtained from your service support organization.

Step 3090-1

Record the hardware error log. The hardware error log may be viewed as follows:

1. Start Diagnostics and select **Task Selection** on the Function Selection screen.

2. Select **Display Hardware Error Report**.

3. Select **Display Hardware Errors for PCI-X SCSI RAID Adapters**.

4. Select the adapter resource, or select all adapters resources if the adapter resource is not known.

5. On the Error Summary screen, look for an entry with a SRN corresponding to the problem which sent you here and select it.

   Note: If multiple entries exist for the SRN, some entries could be older versions or a problem has occurred on multiple entities (such as adapters, disk arrays, and devices). Older entries can be ignored, however, this MAP may need to be used multiple times if the same problem has occurred on multiple entities.

6. Select the hardware error log to view.

7. Go to Step 3090-2.

Step 3090-2

Collect any hardware error logged about the same time for the adapter.

Go to Step 3090-3.

Step 3090-3

Collect the current disk array configuration. The disk array configuration may be viewed as follows:

1. Start the PCI-X SCSI Disk Array Manager.

   a. Start Diagnostics and select **Task Selection** on the Function Selection screen.

   b. Select **RAID Array Manager**.

   c. Select **PCI-X SCSI Disk Array Manager**.

2. Select **List PCI-X SCSI Disk Array Configuration**.

3. Select the PCI-X SCSI RAID Controller identified in the hardware error log.

4. Go to Step 3090-4.

Step 3090-4

Contact your service support organization.

Exit this procedure.

Finding an SRN Given an AIX Error Log

Normally Error Log Analysis (ELA) will examine the error logs and present a Service Request Number (SRN) to the user as appropriate. If you need to determine an SRN given an AIX error log, perform the following steps:

1. Display the error log using the AIX **errpt** command (for example **errpt** for a summary followed by `errpt -a -s timestamp` or `errpt -a -N resource_name`).

2. Ensure that the Error ID is of the form SISIOA_xxxx (for example SISIOA_ARY_DEGRADED).

   Note: Only Error IDs of the form SISIOA_xxxx are potentially related to disk arrays.

3. Locate the SENSE DATA in the Detail Data.

4. Identify the bytes 24-27 of the SENSE DATA from the 32 bytes shown.

   Note: Use the following example AIX Error Log to help you identify bytes 24-27.

5. The first four digits of the SRN, known as the Failing Function Code (FFC), can be found in the following table:

Feature Code (bytes 24-25) of SENSE DATA	Failing Function Code (FFC)
5703	2523
5709	2523

6. The second four digits of the SRN, known as the Reason Code is equal to bytes 26-27 of the SENSE DATA

For the example error log:

* Bytes 24-27 of the SENSE DATA are **5703 9030**
* The first four digits of the SRN, using **5703** in the table above, is **2523**
* The second four digits of the SRN is **9030**
* Thus the SRN would be **2323 - 9030**

Example AIX Error Log (Error ID = SISIOA_ARY_DEGRADED)

```
LABEL:          SISIOA_ARY_DEGRADED
IDENTIFIER:     8267403B
Date/Time:      Wed Dec 11 15:19:54 CST
Sequence Number: 2600
Machine Id:     000B51FD4C00
Node Id:        rokon
Class:          H
Type:           TEMP
Resource Name:  sisioa0
Resource Class: adapter
Resource Type:  14107802
Location:       17-08
VPD:
        Product Specific.(  ).......PCI-X Dual Channel Ultra320 SCSI RAID
                                    Adapter
        Part Number.................21P6477
        FRU Number..................21P6477
```

```
          Serial Number...............YL3382127011
          Manufacture ID..............0038
          EC Level....................3
          ROM Level.(alterable).......03090025
          Product Specific.(Z0).......58
          Device Specific.(YL).......U0.2-P1-I1

Description
DISK ARRAY PROTECTION SUSPENDED

          Recommended Actions
          PERFORM PROBLEM DETERMINATION PROCEDURES


Detail Data
SENSE DATA
00FF FFFF 1900 00F0 066B 0200 0201 0000 0309 0025 0000 0004 5703 9030 0000 0000
                                                                 ^    ^
                                                                 |    |
                                                                 |    Last 4-digits of SRN (bytes 26-27)
                                          Feature Code of Controller (bytes 24-25)
ARRAY INFORMATION
Location  S/N      RAID Level
ff-0,0    23897FFD 5

DEGRADED DISK S/N
0023ABA7

ARRAY MEMBER INFORMATION
Expected  Actual    Vendor/
Location  Location  Product ID      S/N
00-2,0    00-2,0    IBM     DFHSS4W 00661BF3
00-1,0    00-1,0    IBM     DFHSS4W 002395F4
00-3,0    00-3,0    IBM     DFHSS4W 0023ABA7
00-4,0    00-4,0    IBM     DFHSS4W 000F4089
00-5,0    00-5,0    IBM     DFHSS4W 001B10F2



ADDITIONAL HEX DATA
E210 0080 0400 0000 06F0 0017 00BF 632B 0000 0000 0000 036C 066B 0200 00FF FFFF
FFFF FFFF 1705 B004 0000 0000 0000 0000 0000 0000 0000 0000 2020 2020 2020 2020
2020 2020 2020 2020 2020 2020 2020 2020 3030 3030 3030 3030 0000 0000
```

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

67

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

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。　　　　　ＶＣＣＩ－Ａ

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

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。

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.

The manufacturer may not offer the products, services, or features discussed in this document in other countries. Consult the manufacturer's representative for information on the products and services currently available in your area. Any reference to the manufacturer's product, program, or service is not intended to state or imply that only that product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any intellectual property right of the manufacturer may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any product, program, or service.

The manufacturer may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the manufacturer.

The following paragraph does not apply to the United Kingdom or any country where such provisions are inconsistent with local law: THIS MANUAL IS PROVIDED ″AS IS″ WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions; therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. The manufacturer may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Information concerning products made by other than the manufacturer was obtained from the suppliers of those products, their published announcements, or other publicly available sources. The manufacturer has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to products made by other than the manufacturer. Questions on the capabilities of products made by other than the manufacturer should be addressed to the suppliers of those products.

Appendix C. AIX Command-Line Interface

Many tasks used to manage the PCI-X SCSI RAID Controller can be performed by using the AIX command line instead of using the PCI-X SCSI Disk Array Manager as described throughout this guide. The following table summarizes these commands.

General Help	sisraidmgr -h
"Viewing the Disk Array Configuration" on page 15	sisraidmgr -Ll '*controller name*' -j1
"Preparing Disks for Use in PCI-X SCSI Disk Arrays" on page 14	sisraidmgr -P -z *disk list* (For example, sisraidmgr -P -z `hdisk1 hdisk2 pdisk3 pdisk4')
"Changing pdisks to hdisks" on page 24	sisraidmgr -U -z `*pdisk list*'
"Creating a PCI-X SCSI Disk Array" on page 14	sisraidmgr -C -r `raid level' -s `stripe size' -z `pdisk list'
"Deleting a PCI-X SCSI Disk Array" on page 17	sisraidmgr -D -l '*controller name*' -d `*array name*'
"Adding Disks to an Existing Disk Array" on page 17	sisraidmgr -A -l `*array name*' -z `*pdisk list*'
"Creating Hot Spare Disks" on page 18	sisraidmgr -H -z `*pdisk list*'
"Deleting Hot Spare Disks" on page 19	sisraidmgr -I -z `*pdisk list*'
"Displaying Rechargeable Battery Information" on page 24	sisraidmgr -M -o0 -l '*adapter name*'
"Forcing a Rechargeable Battery Error" on page 26	sisraidmgr -M -o1 -l '*adapter name*'
"Recovery Procedures for Disk Failures" on page 28	sisraidmgr -R -z '*pdisk list*'

Index

A
adding disk to existing array   17
AIX command-line interface   73
avoiding shock hazard   v

B
battery
   displaying information   24
   error, forcing   26
bus settings
   viewing and changing   19

C
Cache Battery Pack
   replacing   26
capacities, disk array   7
checkpoints   34
command-line interface   73
common tasks   13
controller microcode, updating   24
creating disk array   14
creating disks hot spare   18

D
deleting disks hot spare   19
deleting, disk array   17
description
   RAID Level 0   4
   RAID Level 10   6
   RAID Level 5   5
disk array
   adding disk to an existing   17
   deleting   17
   viewing configuration   15
disk array problems
   identifying   32
disk array settings
   viewing   21
disk array settings, viewing   21
disk array states   8
disk array, capacities   7
disk arrays, definitions   2
disk arrays, overview   7

E
examples
   AIX error log   64

H
hdisks, changing from pdisks   24
highlighting   ix

hot spare
adding disks   18
deleting disks   19
Hot Spare Disks   18

L
location codes   31

M
Maintenance Analysis Procedures (MAPs)   34
maintenance tips   23
MAP 3000   34
MAP 3010   35
MAP 3011   38
MAP 3012   40
MAP 3013   41
MAP 3020   43
MAP 3021   45
MAP 3030   45
MAP 3031   46
MAP 3032   50
MAP 3033   51
MAP 3034   52
MAP 3035   55
MAP 3036   56
MAP 3050   57
MAP 3051   62
MAP 3090   63

O
overview, controller   1
overview, disk arrays   7

P
PCI-X SCSI Disk Array Manager, using   13
pdisk descriptions   9
pdisk settings
   viewing   21
pdisks
   replacing   27
pdisks, changing to hdisks   24
physical disks (pdisks), states   9
preparing disks for disk array use   14
problem determination   31

R
RAID Level
   recovery procedures   28
RAID Level 0   4
   recovery procedures   28
RAID Level 10   6
   recovery procedures   28

75

Vos remarques sur ce document / Technical publication remark form

Titre / Title : Bull ESCALA PCI–X SCSI RAID Controller Reference Guide

Nº Reférence / Reference Nº : 86 A1 22EM 00

Daté / Dated : November 2003

ERREURS DETECTEES / ERRORS IN PUBLICATION

AMELIORATIONS SUGGEREES / SUGGESTIONS FOR IMPROVEMENT TO PUBLICATION

Vos remarques et suggestions seront examinées attentivement.
Si vous désirez une réponse écrite, veuillez indiquer ci-après votre adresse postale complète.

Your comments will be promptly investigated by qualified technical personnel and action will be taken as required.
If you require a written reply, please furnish your complete mailing address below.

NOM / NAME : _____   Date : _____

SOCIETE / COMPANY : _____

ADRESSE / ADDRESS : _____

Remettez cet imprimé à un responsable BULL ou envoyez-le directement à :

Please give this technical publication remark form to your BULL representative or mail to:

BULL CEDOC
357 AVENUE PATTON
B.P.20845
49008 ANGERS CEDEX 01
FRANCE

Technical Publications Ordering Form

Bon de Commande de Documents Techniques

To order additional publications, please fill up a copy of this form and send it via mail to:
Pour commander des documents techniques, remplissez une copie de ce formulaire et envoyez-la à :

BULL CEDOC
ATTN / Mr. L. CHERUBIN   **Phone** / Téléphone :   +33 (0) 2 41 73 63 96
357 AVENUE PATTON   **FAX** / Télécopie   +33 (0) 2 41 73 60 19
B.P.20845   **E–Mail** / Courrier Electronique :   srv.Cedoc@franp.bull.fr
49008 ANGERS CEDEX 01
FRANCE

Or visit our web sites at: / Ou visitez nos sites web à:
http://www.logistics.bull.net/cedoc
`http://www-frec.bull.com` `http://www.bull.com`

CEDOC Reference # Nº Référence CEDOC	**Qty** Qté	**CEDOC Reference #** Nº Référence CEDOC	**Qty** Qté	**CEDOC Reference #** Nº Référence CEDOC	**Qty** Qté
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	
__ __ ____ _ [__]		__ __ ____ _ [__]		__ __ ____ _ [__]	

[_ _] : **no revision number means latest revision** / pas de numéro de révision signifie révision la plus récente

NOM / NAME : _____   Date : _____

SOCIETE / COMPANY : _____

ADRESSE / ADDRESS : _____

_____

PHONE / TELEPHONE : _____   FAX : _____

E–MAIL : _____

For Bull Subsidiaries / Pour les Filiales Bull :
Identification: _____

For Bull Affiliated Customers / Pour les Clients Affiliés Bull :
Customer Code / Code Client : _____

For Bull Internal Customers / Pour les Clients Internes Bull :
Budgetary Section / Section Budgétaire : _____

For Others / Pour les Autres :

Please ask your Bull representative. / Merci de demander à votre contact Bull.

ORDER REFERENCE
86 A1 22EM 00

Bull

Utiliser les marques de découpe pour obtenir les étiquettes.
Use the cut marks to get the labels.

ESCALA

PCI–X SCSI RAID
Controller
Reference Guide

86 A1 22EM 00

ESCALA

PCI–X SCSI RAID
Controller
Reference Guide

86 A1 22EM 00

ESCALA

PCI–X SCSI RAID
Controller
Reference Guide

86 A1 22EM 00