



Netfinity SYMplicity Storage Manager
for Windows NT

Installation and User's Handbook

Before using this information and product it supports, be sure to read the general information under "Appendix B. Notices".

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Chapter 1. Introduction

This chapter gives an overview of the software, the software requirements, and steps you must take before installing the software.

About This Handbook

This *Installation and User's Handbook* provides installation and setup information for SYMlicity™ Storage Manager software version 6.20 in a Microsoft® Windows NT™ environment. Use this *Installation and User's Handbook* to do the following:

- Determine the hardware and software required to install this software
- Install the software
- Set up software parameters
- Identify storage management features unique to the NT operating system
- Troubleshoot the installation and NT operation

This handbook is accompanied by the *SYMlicity Storage Manager User's Handbook*. The *User's Handbook* describes how to use the storage management software after installation. Some procedures in that book may be affected by information given in this book (for example, see the information in this handbook on creating and deleting LUNs).

You should use this *Installation and User's Handbook* after installing the RAID controller unit hardware. After you install and set up the software, go to the *User's Handbook* for further information on using the software and maintaining the RAID controller units.

Understanding the Restrictions

Always check for a readme file on any installation media. This file may contain important information that was not available at the time this *Installation and User's Handbook* was prepared.

Restrictions For Windows NT

The following table explains the restrictions that apply when using Windows NT.

Table 1: Windows NT Restrictions And Notes

Restriction/Note	Application	Workaround
<p>The SymArray driver must be loaded <i>before</i> the Windows NT SCSI class driver or RDAC will not work.</p>	<p>Installation and Setup</p>	<p>None. The installation procedure sets up the SymArray driver to load before the native NT SCSI class driver. This is necessary to provide RDAC protection in the event of a connection failure. Note that this means that internal SCSI drives appear after RAID controller unit drives in the Disk Administrator utility. Also, “sticky” drive letters must be assigned before the storage management software is loaded.</p> <p>Care must be taken when using applications that expect the internal SCSI drives to be mapped first (see also "Accessing Raw Partitions" on page 58). If it is necessary that the NT SCSI driver be loaded first, RDAC must be disabled.</p>
<p>Multi-host has <i>only</i> been tested with the Microsoft Cluster Server (MSCS) environment. Without additional host-based clustering software to manage conflicts between the host machines, Windows NT alone does <i>not</i> support the multi-host configuration.</p>	<p>Installation and Setup</p>	<p>Use only the Single-host or Independent Controller Host-RAID controller unit configurations if not using the Cluster Server environment.</p> <p>For more information on the types of Host-RAID controller unit configurations supported by the storage management software, see the <i>User's Handbook</i>, “Types of Host-RAID Controller Unit Configurations Supported.” For information on the Cluster Server environment, see "Cluster Server References" on page 92.</p>

Table 1: Windows NT Restrictions And Notes (continued)

Restriction/Note	Application	Workaround
<p>IBM does not recommend using the RAID controller unit as a boot device (that is, install the Windows NT operating system and the storage management software on LUN 0 of the RAID controller). However, if you require this configuration, you must prepare the host machine to boot from the module before installing any software.</p> <p>NOTE The storage management software has been tested with the RAID controller unit as the boot device <i>only</i> for a single host-RAID controller unit configuration.</p>	<p>Installation and Setup</p>	<p>Call the IBM PC Help Center.</p> <p>CAUTION If you use the RAID controller unit as a boot device, you must never delete LUN 0 or use File → Reset Configuration (Configuration Application) or you will lose your boot device and operating system.</p>
<p>RDAC failover does not work during system dump if the dump/swap device is a RAID controller unit LUN different from the LUN used for the boot device.</p>	<p>Installation and Setup</p>	<p>Do not create a RAID controller unit LUN having only dump/swap areas. It is acceptable to put the dump/swap area on the same LUN as the boot device.</p>
<p>Do <i>not</i> use Microsoft's Network Monitor™ service with the storage management software. Monitoring the network connections with this service can result in problems, such as blue screens.</p>	<p>Installation and Setup</p>	<p>Stop the Network Monitor service if you have it installed before using the storage management software:</p> <ol style="list-style-type: none"> 1 Select Control Panel → Services. 2 Highlight the Network Monitor service. 3 Select Stop.
<p>The raidutil utility does not always generate an error message even when an operation fails. For example, using raidutil -R to reset the controller battery age without LUN 0 created causes the operation to fail. However, there is no error message.</p>	<p>General</p>	<p>Anytime you use raidutil to perform an operation, it is a good idea to verify that the operation was completed successfully. For example, after creating LUNs, you might want to use the lad utility to verify your configuration.</p>
<p>Cannot reliably change font size in the storage management software's displays.</p>	<p>General</p>	<p>None.</p>

Table 1: Windows NT Restrictions And Notes (continued)

Restriction/Note	Application	Workaround
<p>Selecting some operations may result in an error message for the selected RAID controller unit indicating that I/Os were occurring or filesystems were present.</p> <p>This occurs when a second application/option requests exclusive access while the affected LUNs and Windows NT drive letters are already locked by another operation.</p>	<p>Configuration, Recovery, Maintenance/Tuning</p>	<p>1 Wait for any operation that requires exclusive access to finish before performing another operation on the affected RAID controller unit or drive group/LUNs.</p> <p>2 If no other storage management operations are running, then some other Windows NT application may be using/displaying the drive letters. If you suspect this is the case, close other Windows NT applications, such as File Manager, then reselect the storage management software and try the operation again.</p> <p>Operations requiring exclusive access include: Delete for LUNs and File → Reset Configuration (Configuration); formatting a LUN with Options → Manual Recovery → Logical Units (Recovery); and Firmware Upgrade → Offline method (Maintenance/Tuning).</p>
<p>When creating or deleting LUNs, or using File → Reset Configuration, the Windows NT host requires a restart in order to see the configuration changes properly.</p>	<p>Configuration</p>	<p>Restart the host system anytime you create or delete drive groups/LUNs.</p>

Restrictions For The Cluster Server Environment

Table 2: Cluster Server Restrictions And Notes

Restriction/Note	Application	Workaround
Groups do <i>not</i> revert back to the preferred node after the Cluster Service is resumed.	Installation and Setup	<p>Most likely, the Groups are not set to a preferred node. Do <i>one</i> of the following:</p> <ul style="list-style-type: none"> • Set the preferred node option: <ul style="list-style-type: none"> a Select the node. b Select Group → Properties. c Set the Preferred Node option for the desired node. • Manually move the Groups back to the node: <ul style="list-style-type: none"> a Select the node. b Select File → Pause Node. c Select the Group you want the node to own, and select File → Move Group. Repeat for every group that you want the node to own. d Select the node again. e Select File → Resume Node.
Drive letters of shared logical units do <i>not</i> match in Disk Administrator on both nodes.	Installation and Setup	<p>Use the Tools → Assign Drive Letters in the Disk Administrator on the appropriate node to ensure that the drive letters are the same as those assigned to node A.</p> <p>For example, if node A had an internal hard disk at drive letter c: and node B had two internal hard disks at c: and d:, then the shared disk letters would not match (node A would start at drive d: and node B would start at drive e:; therefore, you would have to change the drive letter at node A to start at drive e:).</p>
Both node names do <i>not</i> appear in the Cluster Administrator window.	Installation and Setup	<ol style="list-style-type: none"> 1 Select Control Panel → Add/Remove Programs to uninstall the storage management software on both systems. 2 Verify that there is not an IP conflict on the network and that all cabling is installed correctly and securely. 3 Begin this procedure again, starting with "Upgrading from a Previous Installation" on page 9.

Hardware and Software Requirements

Before installing the storage management software, make sure you have the following components installed.

- Hardware Configuration
- Operating System
- Host Adapters

In addition, make sure you have checked the hardware.

Hardware Configuration

The following hardware is required:

- At least an 800 x 600 resolution graphics card and mouse.
- RAID controller unit with Series 4 controllers (see "Appendix A. Specifications" for a list of supported controllers and firmware requirements).
- A minimum controller firmware version depending on your controller model (see Table "Firmware Specifications" starting on page 92 for a list of firmware levels).
- One or two host machines with a Host-RAID controller unit configuration supported by this software (see "Appendix A. Specifications" for information on supported configurations).

Operating System

Windows NT Server 4.0 (for the standard environment) or Windows NT 4.0 Enterprise Edition (for the Cluster Server environment) operating system installed on the host machines connected via Fibre Channel cable to the RAID controller units,

This software was tested with Microsoft Service Pack 3.

Host Adapters

See "Appendix A. Specifications" for a list of the host adapters tested with this software.

Checking the Hardware

Use the following checklist to make sure that the RAID controller units have been connected correctly to your host system. If necessary, refer to the documentation supplied with your RAID controller unit:

- Cable connections correct and secure?
- Host-Side IDs set properly?

IMPORTANT For the greatest level of I/O path protection, provide each controller in a RAID controller unit with its own data path connection (that is, cable, hub, and host adapter) into the host system.

Continue with "Setting Up Fibre Channel Host Adapters" on page 7.

Setting Up Fibre Channel Host Adapters

If you are using Fibre Channel, you must set up the host adapters. Use the following procedure:

1. Go to the \hba directory on this software's Installation CD.
2. Consult any readme file in that folder. This file will give specific instructions on what you need to do to set up your Fibre Channel host adapters.
3. Perform any required operations.

Selecting the Correct Installation Procedure

The procedure you need to use to install the storage management software depends upon the configuration of the system.

If You Want To:	See
Install the software on a standard, Host-RAID controller unit configuration.	"Chapter 2. Installing Software on a Standard Configuration"
Install the software and make the RAID controller unit the boot device.	Table 1 "Windows NT Restrictions And Notes" starting on page 2. Call the IBM PC Help Center.
Install the software in a Cluster Server environment.	Cannot have more than 5 Emulex Fibre Channel host adapters on the same loop with the NTS310x9 driver.

Chapter 2. Installing Software on a Standard Configuration

This chapter describes how to install or upgrade the storage management software on a standard configuration (single host or independent controller configuration).

Where to Start

Are you upgrading from a previous version of the storage management software?

No	Yes
Go to "Assigning Drive Letters" on page 10.	Go to "Upgrading from a Previous Installation" on page 9.

Upgrading from a Previous Installation

If you are upgrading from a previous version of storage management software, read the following notes and use the *current* version of the storage management software to perform the tasks given in Table 3.

- **rmparms and rmscript.bat files** — During the upgrade/installation procedure, your current rmparms file will be saved as rmparms.ori and the rmscript.bat file will be saved as rmscript.ori. You can refer to these old files after installation to determine if you want to customize the new files with any changes you may have made. Do *not* copy the old files over the new; doing so may destroy new parameters or script that was installed with the new version.

Table 3: Upgrading The Storage Management Software (Standard Installation)

Task to Perform	Why Perform This Task?
<p>1 From any application, select File → Save Module Profile.</p> <p>2 Make sure All information types is selected, and select OK.</p> <p>IMPORTANT Be sure to save this information file to the <i>same</i> disk drive where the storage management software is installed (such as, c:\). However, you should place it in a different directory than the software’s installation, so that this file is not removed during the installation procedure.</p>	<p>To retain a copy of your current configuration for each RAID controller unit and the current module names. This copy can be used for reference, but cannot be used to automatically reload the configuration.</p>
<p>3 Exit the storage management software completely, making sure the previous version is not currently open or running.</p>	<p>To avoid problems with overwriting or deleting old files during installation.</p>
<p>4 Continue with "Installing the Storage Management Software" on page 11.</p>	<p>To upgrade to the new version.</p>

Assigning Drive Letters

To ensure RDAC functionality, the installation procedure loads the SymArray driver before the native NT class driver. However, this means that the system will see the RAID controller unit’s LUNs first, before it sees any local SCSI drives, and will assign drive letters accordingly. Therefore, *before* you install this software, you *must* have “sticky” drive letters assigned to your existing local drives.

IMPORTANT The storage management software can not be installed unless drive letters are assigned to existing drives.

Use the following procedure to assign “sticky” drive letters:

1. Start Disk Administrator (select Start → Programs → Administrative Tools → Disk Administrator), and view the disk configuration on your system. Check the number of partitions.

If you have 2 or more partitions:	If you have only one partition:
Go to Step 2.	Go to Step 3 on page 11.

2. If you have *at least two* partitions (the boot partition and one other partition) and *both* of the following conditions apply:
 - The last partition you created was created with Disk Administrator
 - The partition has a drive letter assigned and has a status of “Unknown” or has a file system on it (that is, it has a status other than “Unformatted”).

You are finished with this procedure; continue with "Installing the Storage Management Software" on page 11. If both conditions do not apply, proceed to Step 3 on page 11.

3. Create a new partition.

IMPORTANT If you have no room for a second partition on your local system, you can use a RAID controller unit LUN for the second partition. The RAID controller unit should have at least one LUN configured on it. You can access the RAID controller unit LUN without having installed the storage management software. Connect the RAID controller unit to the system and then restart the system. The RAID controller unit LUNs will appear in Disk Administrator, and you will be able to create a second partition on a RAID controller unit LUN using the procedure below. Note that you can delete or modify the RAID controller unit LUN later without causing the boot partition drive letter to be reassigned.

- a. Select a drive containing some free disk space.
 - b. Select Partition → Create. The partition is created (a drive letter is assigned and the partition status is “Unformatted”).
 - c. Select Partition → Commit Changes Now. The partition status changes to “Unknown,” and sticky drive letters are assigned to all your existing partitions.
4. Continue with the next section, "Installing the Storage Management Software" on page 11.

Installing the Storage Management Software

Use the following procedure to install the storage management software in a standard configuration.

IMPORTANT You must have administrator privileges to access this software. This installation procedure requires a restart of the operating system. Therefore, make sure that other users are *not* on the system when installing this software.

If you are using the independent controller configuration, you must perform this procedure on both hosts.

In the following examples, c: is designated as your boot drive and d: is designated as the CD-ROM device drive. Be sure to select the correct drives for your system.

1. Insert the Installation CD into your CD-ROM drive.
 2. To begin the installation program:
 - a. Select Start → Settings → Control Panel → Add/Remove Programs.
 - b. Select Install and follow the instructions on the screen.
 - c. When you see d:\symsm\setup.exe, select Finish.
 3. Follow the instructions on the screen to complete the installation procedure.
-

IMPORTANT During installation, you will be prompted to define the directory path where you want this software installed. If you are defining your own directory path, do *not* use special characters for the directory name (such as, #, \$, or +). The default path is \program file\symsm on your boot drive. For the purpose of providing examples of the installation requirements, this *Installation Handbook* will refer to the default directory on drive c:.

4. When installation is completed, remove the CD and restart the system.
5. Verify the storage management software is installed and the Disk Array Monitor service is running:
 - a. Select Start → Programs. SYMplicity Storage Manager should appear in the list.
 - b. Select Start → Settings → Control Panel → Services. The Disk Array Monitor should be running if this service's status is Started.
6. Continue with "Chapter 4. Initial Startup Procedures."

Chapter 3. Installing Software in a Cluster Server Environment

This chapter describes how to install or upgrade the storage management software in the Multi-Host configuration, using Cluster Server software.

Where to Start

Are you upgrading from a previous version of the storage management software?

No	Yes
Go to "Cluster Server Overview" on page 15.	Continue with "Upgrading from a Previous Installation" on page 13.

Upgrading from a Previous Installation

If you are upgrading from a previous version of storage management software, read the following note and use the *current* version of the storage management software to perform the tasks given in Table 4.

Note: During the upgrade/installation procedure, your current `rmparms` and `rmscript.bat` files will be saved as `rmparms.ori` and `rmscript.ori`. You can refer to these old files after installation to determine if you want to customize the new files with changes you may have made. Do not copy the old files over the new; doing so may destroy new parameters or script that was installed with the new version.

Table 4: Upgrading the Storage Management Software (Cluster Server)

Task to Perform	Why Perform This Task?
<p>1 From any application, select File → Save Module Profile.</p> <p>2 Make sure All information types is selected, and select OK.</p> <p>IMPORTANT Be sure to save this information file to the <i>same</i> disk drive where the storage management software is installed (such as, c:\). However, you should place it in a different directory than the software's installation, so that this file is not removed during the installation procedure.</p>	<p>To retain a copy of your current configuration for each RAID controller unit and the current module names. This copy can be used for reference, but cannot be used to automatically reload the configuration.</p>

Table 4: Upgrading the Storage Management Software (Cluster Server) (continued)

Task to Perform	Why Perform This Task?
<p>3 Exit the storage management software completely, making sure the previous version is not currently open or running.</p>	<p>To avoid problems with overwriting or deleting old files during installation.</p>
<p>4 Using Cluster Administrator, you should pause the node and move all Groups that it owns <i>before</i> upgrading the storage management software.</p>	<p>To verify that your resources are up and running.</p>
<p>5 Select node A.</p>	
<p>6 Select File → Pause Node.</p>	
<p>7 Select a Group that node A owns, and select File → Move Group. Repeat for every Group owned by node A.</p>	
<p>8 Upgrade the software on node A.</p> <ul style="list-style-type: none"> a Insert the installation CD into your CD-ROM drive on node A. b Select Start → Settings → Control Panel → Add/Remove programs c Select Install and follow the instructions on the screen. d When you see d:\native\symism\setup.exe, select Finish. e Follow the instructions on the screen to complete the installation procedure. f When the installation is complete, remove the CD and restart the system. 	<p>To upgrade to the new version of storage management software on node A.</p>
<p>9 Using Cluster Administrator again, resume service to node A <i>after</i> upgrading the storage management software.</p> <p>NOTE If the Groups are set for “preferred node,” they should revert back to node A after the Cluster Service is resumed. If they do <i>not</i> revert back, go to “Chapter 7. Troubleshooting.”</p>	<p>To return the node back to full service.</p>
<p>10Select node A.</p>	
<p>11Select File → Resume Node.</p>	
<p>12Repeat Step 4 through Step 11 for node B.</p>	<p>To upgrade to the new version of storage management software on node B.</p>
<p>13Continue with “Chapter 4. Initial Startup Procedures.”</p>	<p>To check the new software installation.</p>

Cluster Server Overview

The storage management software has been tested with Cluster Server software to support the Multi-Host RAID controller unit configuration. For details on specific server-host adapter models tested with this software, see "Cluster Server References" on page 92.

The hardware components of this configuration consist of a pair of server-host adapter systems connected to one or more high-performance RAID controller units. This configuration provides a hardware RAID implementation and features high-availability functions such as hot-swap redundant fans, power supplies, and hot-swap drives for increased data protection and reliability.

Continue with the next section, "Required Components" on page 15.

Required Components

Before installing the RAID controller unit and the storage management software in the cluster server environment, you will need the hardware/software components listed in Table 5.

Table 5: Cluster Server Required Components

Component Description	Important Notes
Two nodes with a PCI Ethernet adapter installed in each node.	<p>These nodes will be node A and node B in your cluster server environment.</p> <p>Microsoft recommends two Ethernet adapters in each node (one for intercommunication between the nodes and one for client access over the network).</p> <p>IMPORTANT You must configure both nodes (servers) to use the TCP/IP protocol over all interconnects. However, routers can be placed between the cluster and its clients. If all interconnects must run through a hub, isolate each interconnect by using separate hubs. Also, ensure that both nodes on the cluster are in the same domain (not workgroup).</p>
One interconnect (cross-over) cable installed between each PCI ethernet adapter installed in each node.	None
Microsoft Windows NT Server, Enterprise Edition 4.0 (including Service Pack 3) installed on each of your nodes.	IMPORTANT Make sure you do not install the Cluster Server Software until told to do so in this chapter.
Netfinity Fibre Channel PCI Adapters.	See "This appendix describes the configuration specifications for this software." for a list of the host adapters tested with the cluster server environment.

Table 5: Cluster Server Required Components (continued)

Component Description	Important Notes
RAID controller unit (with two RAID controllers).	You should have unpacked the RAID controller unit, connected the appropriate power cables, and placed it in the proper location for installation into the Cluster Server environment. Instructions on checking Host-Side IDs and connecting the cables are provided in the appropriate product handbook (see the documentation list on page 92).
SYMplicity Storage Manager For Windows NT (version 6.20).	This storage management software is provided on a CD-ROM and included with the RAID controller unit.
A minimum controller firmware version depending on your controller model and configuration type (single- or dual-bus).	Controller firmware is provided on the storage management software's CD-ROM. Always use the most current version of firmware available for the controller you are using (see Table on page 92).

Continue with the next section, "Quick Installation Summary" on page 16.

Quick Installation Summary

Table 6 summarizes the tasks required to install the storage management software in a cluster server environment for the first time. See the next section, "Installing The Hardware" on page 18 for the complete procedure.

Table 6: Cluster Server Environment Installation (summary)

Step	Node A	Node B	Additional Details
1	Install the nodes and network environment (ethernet adapters, interconnect cables, TCP/IP protocol).		See your hardware documentation.
2	Install Windows NT Server, Enterprise Edition 4.0 (including Microsoft Service Pack 3). IMPORTANT Do <i>not</i> install the Cluster Server Software at this time).		See your Windows NT operating system documentation.
3	Install the host adapters and drivers.		See "Installing The Host Adapters" on page 19.
4	Install the RAID controller units between nodes A and B.		"Installing the RAID Controller Units" on page 19.

Table 6: Cluster Server Environment Installation (summary) (continued)

Step	Node A	Node B	Additional Details
5		Turn on node B, but <i>do not</i> allow Windows NT to boot. NOTE To suspend the booting of Windows NT, press the spacebar at the Operating System (OS) loader screen.	See "Installing the Software on Node A" on page 21.
6	Turn on node A and boot Windows NT.		
7	Assign "sticky" drive letters to the drives on Node A.		
8	Install the storage management software.		
9	Verify the controller firmware version for the RAID controller unit and upgrade if necessary.		See "Setting Up the RAID Controller Units" on page 23.
10	Set NVSRAM values for the Cluster Server environment.		
11	Configure logical units (LUNs) using the storage management software.		
12	Use Windows NT Disk Administrator to partition RAID controller unit LUNs and assign drive letters.		
13	Shut down Windows NT but leave node A running (do <i>not</i> turn off the node).		See "Shutting Down Node A" on page 24.
14		Boot Windows NT.	See "Installing the Software on Node B" on page 24.
15		Assign "sticky" drive letters to the drives on Node B.	
16		Install the storage management software.	

Table 6: Cluster Server Environment Installation (summary) (continued)

Step	Node A	Node B	Additional Details
17		Use Windows NT Disk Administrator to verify the LUN drive letters are the same as those assigned to node A (in Step 12).	See "Verifying Drive Letters" on page 26.
18		Shut down Windows NT but leave node B running (do <i>not</i> turn off the node).	See "Shutting Down Node B" on page 26.
19	Start Windows NT and insert the CD-ROM containing the Cluster Server Software.		See "Installing the Cluster Server Software" on page 26.
20	Install the Cluster Server Software and Form A New Cluster.		
21	Keep Windows NT running on node A.		See "Installing the Cluster Server Software" on page 26.
22		Start Windows NT and insert the CD-ROM containing the Cluster Server Software.	
23		Install the Cluster Server Software and Join The Existing Cluster.	
24		Keep Windows NT running on node B.	
25	Test the Cluster Server software installation by starting Cluster Administrator.		

Continue with the next section, "Installing The Hardware" on page 18, for the complete installation procedure.

Installing The Hardware

Hardware installation involves installing host adapters and RAID controller units.

Installing The Host Adapters

See the documentation accompanying your host adapter for installation information and requirements. The following considerations apply:

- Ensure that the BIOS on each Fibre Channel host adapter is disabled.
- Install the correct driver for the IBM Fibre Channel host adapter.
- Continue with the next section, "Installing the RAID Controller Units" on page 19.

Installing the RAID Controller Units

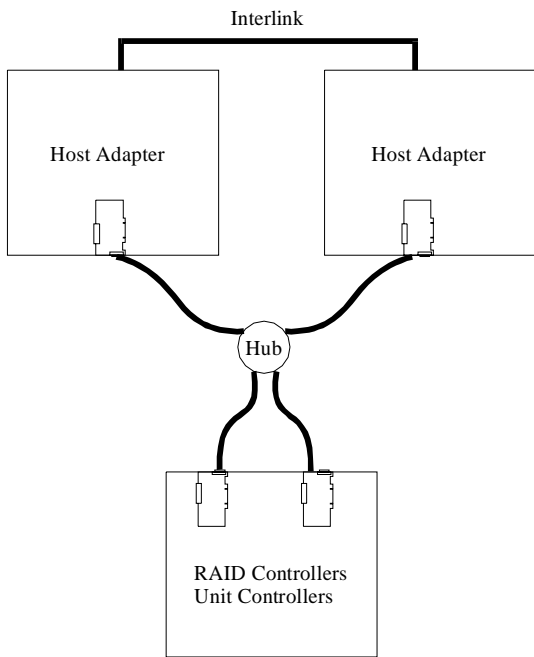
Figure 1 on page 20 shows the hardware components involved with installing the RAID controller unit (nodes, host adapters, RAID controller unit drives and controllers, and applicable cables).

Figure 1 on page 20 shows a Fibre Channel connection using either a single or dual bus configuration.

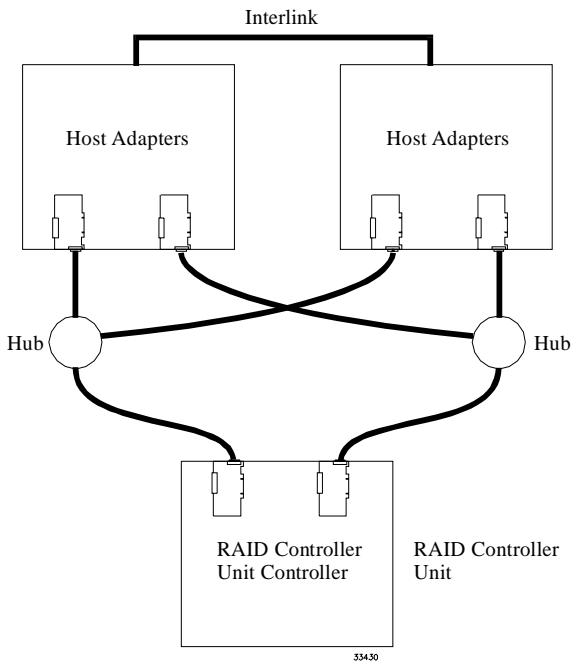
- For best results, use the dual bus configuration. It provides the fullest RDAC protection and functionality in the event there is a problem with the connection along one bus.
- Use the appropriate RAID controller unit installation documentation, making sure to check each controller on the back of the module to be sure that each controller has a unique Host-Side ID setting.

Note: RAID controller unit controllers are normally preset to IDs 4 and 5.

Note: Continue with the next section, "Installing the Storage Management Software" on page 21.



**Fibre Channel connection
(single bus)**



**Fibre Channel connection
(dual bus)**

Figure 1. Installing the RAID Controller on a Fibre Channel Loop

Installing the Storage Management Software

IMPORTANT Make sure you do not install the Cluster Server Software until told to do so in this chapter.

Installing the Software on Node A

CAUTION Once you have connected the RAID controller units to both nodes, do *not* boot Windows NT on both nodes at the same time until you have installed the Cluster Server Software on *at least* one node. To suspend the booting of Windows NT, press the spacebar at the Operating System (OS) loader screen.

Assigning Drive Letters

The installation procedure loads the SymArray driver before the native NT class driver. This is necessary to enable RDAC functionality. However, this means that the system will see the RAID controller unit's LUNs first, before it sees any local SCSI drives, and will assign drive letters accordingly. Therefore, *before* you install this software, you *must* have "sticky" drive letters assigned to your existing local drives.

IMPORTANT The storage management software *cannot* be installed unless drive letters are assigned to existing drives.

Use the following procedure to assign "sticky" drive letters:

1. Start Disk Administrator (select Start → Programs → Administrative Tools → Disk Administrator), and view the disk configuration on your system. Check the number of partitions.

If you have 2 or more partitions:	If you have only one partition:
Go to Step 2.	Go to Step 3.

2. If you have *at least two* partitions (the boot partition and one other partition) and *both* of the following conditions apply:
 - The last partition you created was created with Disk Administrator

- The partition has a drive letter assigned and has a status of “Unknown” or has a file system on it (that is, it has a status other than “Unformatted”).

You are finished with this procedure; continue with "Installing the Storage Management Software on Node A" on page 22. If both conditions do not apply, proceed to Step 3.

3. Create a new partition.

IMPORTANT If you have no room for a second partition on your local system, you can use a RAID controller unit LUN for the second partition. The RAID controller unit should have at least one LUN configured on it. You can access the RAID controller unit LUN without having installed the storage management software. Connect the RAID controller unit to the system and then restart the system. The RAID controller unit LUNs will appear in Disk Administrator, and you will be able to create a second partition on a RAID controller unit LUN using the procedure below. Note that you can delete or modify the RAID controller unit LUN later without causing the boot partition drive letter to be reassigned.

- a. Select a drive containing some free disk space.
 - b. Select Partition → Create. The partition is created (a drive letter is assigned and the partition status is “Unformatted”).
 - c. Select Partition → Commit Changes Now. The partition status changes to “Unknown,” and sticky drive letters are assigned to all your existing partitions.
4. Continue with the next section, "Installing the Storage Management Software on Node A" on page 22.

Installing the Storage Management Software on Node A

IMPORTANT You must have administrator privileges to access this software. This installation procedure requires a restart of the operating system. Therefore, make sure that other users are *not* on the system when installing this software.

In the following procedure, c:\ is designated as your boot drive and d: is designated as the CD-ROM device drive. Be sure to select the correct drives for your system.

1. From node A, insert the Installation CD into your CD-ROM drive.
2. To begin the installation program:

- a. Select Start → Settings → Control Panel → Add/Remove Programs.
 - b. Select Install and follow the instructions on the screen.
 - c. When you see d:\native\symsm\setup.exe, select Finish.
3. Follow the instructions on the screen to complete the installation procedure.

IMPORTANT During installation, you will be prompted to define the directory path where you want this software installed. If you are defining your own directory path, do *not* use special characters for the directory name (such as #, \$, or +). The default path is \program file\symsm on your boot drive. For the purpose of providing examples of the installation requirements, this *Installation Handbook* will refer to the default directory on drive c:.

4. When installation is completed, remove the CD and restart the system.
5. Verify the storage management software is installed and the Disk Array Monitor service is running:
 - a. Select Start → Programs. SYMplicity Storage Manager should appear in the list.
 - b. Select Start → Settings → Control Panel → Services. The Disk Array Monitor should be running if this service's status is Started.
6. Continue with the next section, "Setting Up the RAID Controller Units" on page 23.

Setting Up the RAID Controller Units

Go to "Chapter 4. Initial Startup Procedures," and perform the procedures given to set-up the RAID controller unit. Specifically:

- Make sure the correct version of controller firmware is installed (see "Verifying and Upgrading Controller Firmware" on page 30).
- Make the necessary changes to the NVSRAM files (see "Setting NVSRAM Values" on page 34).
- Run a health check to insure that the RAID controller unit is operating correctly (see "Running Recovery Guru/Health Check" on page 35).
- Configure your RAID controller units as much as possible, including using Disk Administrator to partition them and assign drive letters. You do not have to completely configure your RAID controller units, but remember that if you make changes in the future, you must also make them known to node B. See "Determining the Current Configuration" on page 38.

After you have completed the procedures given in "Chapter 4. Initial Startup Procedures", return here and continue with the next section, "Shutting Down Node A."

Shutting Down Node A

1. Shut down Windows NT, but leave node A running (do *not* turn off the node).
2. Continue with the next section "Installing the Software on Node B."

Installing the Software on Node B

After you have verified the software installation on node A and configured logical units, install the software on node B using the same procedure you used on node A. However, you do *not* need to configure any logical units.

Assigning Drive Letters

Before you install this software, you *must* have "sticky" drive letters assigned to your existing local drives.

IMPORTANT The storage management software *cannot* be installed unless drive letters are assigned to existing drives.

Use the following procedure to assign "sticky" drive letters:

1. Boot Windows NT on node B.
2. Start Disk Administrator (select Start → Programs → Administrative Tools → Disk Administrator), and view the disk configuration on your system. Check the number of partitions.

If you have 2 or more partitions:	If you have only one partition:
Go to Step 3.	Go to Step 4 on page 24.

3. If you have *at least two* partitions (the boot partition and one other partition) and *both* of the following conditions apply:
 - The last partition you created was created with Disk Administrator
 - The partition has a drive letter assigned and has a status of "Unknown" or has a file system on it (that is, it has a status other than "Unformatted").

You are finished with this procedure; continue with "Installing the Storage Management Software on Node B" on page 25. If both conditions do not apply, proceed to Step 4 on page 24.

4. Create a new partition.

IMPORTANT If you have no room for a second partition on your local system, you can use a RAID controller unit LUN for the second partition. The RAID controller unit should have at least one LUN configured on it. You can access the RAID controller unit LUN without having installed the storage management software. Connect the RAID controller unit to the system and then restart the system. The RAID controller unit LUNs will appear in Disk Administrator, and you will be able to create a second partition on a RAID controller unit LUN using the procedure below. Note that you can delete or modify the RAID controller unit LUN later without causing the boot partition drive letter to be reassigned.

- a. Select a drive containing some free disk space.
 - b. Select Partition → Create. The partition is created (a drive letter is assigned and the partition status is “Unformatted”).
 - c. Select Partition → Commit Changes Now. The partition status changes to “Unknown,” and sticky drive letters are assigned to all your existing partitions.
5. Continue with the next section, "Installing the Storage Management Software on Node B."

Installing the Storage Management Software on Node B

1. From node B, insert the Installation CD into your CD-ROM drive.

NOTE In the following examples, c: is designated as your boot drive and d: is designated as the CD-ROM device drive. Be sure to select the correct drives for your system.

2. To begin the installation program:
 - a. Select Start → Settings → Control Panel → Add/Remove Programs.
 - b. Select Install and follow the instructions on the screen.
 - c. When you see d:\native\symsm\setup.exe, select Finish.
3. Follow the instructions on the screen to complete the installation procedure.

IMPORTANT During installation, you will be prompted to define the directory path where you want this software installed. If you are defining your own directory path, do *not* use special characters for the directory name (such as, #, \$, or +). The default path is \program file\symsm on your boot drive.

4. When installation is completed, remove the CD and restart the system.
5. Verify the storage management software is installed and the Disk Array Monitor service is running:
 - a. Select Start → Programs. SYMlicity Storage Manager should appear in the list.
 - b. Select Start → Settings → Control Panel → Services. The Disk Array Monitor should be running if this service's status is Started.
6. Continue with the next section, "Verifying Drive Letters."

Verifying Drive Letters

1. Use the Windows NT Disk Administrator to verify that the drive letters assigned to the configured logical units are the same as those assigned to node A (in "Partitioning Logical Units And Assign Drive Letters" on page 46).
2. If the drive letters are *not* the same, go to "Chapter 7. Troubleshooting."
3. Continue with the next section, "Shutting Down Node B."

Shutting Down Node B

1. Shut down Windows NT, but leave node B running (do *not* turn off the node).
2. Continue with the next section, "Installing the Cluster Server Software" on page 26.

Installing the Cluster Server Software

1. Install the Cluster Server software on Node A
 - a. Refer to the *Microsoft Clustering For Windows NT Server Administrator's Guide* for the correct procedure to install the Cluster Server Software.

Note During installation, specify that you want to Form A New Cluster.

- b. After the system restarts, leave node A up and running.
2. Install the Cluster Server software on Node B.
 - a. Refer to the *Microsoft Clustering For Windows NT Server Administrator's Guide* for the correct procedure to install the Cluster Server Software.

NOTE During installation, specify that you want to Join The Existing Cluster.

- b. After the system restarts, leave node B up and running.

3. Verify the software installation.
 - a. On either node (A or B), select Start → Programs → Administrative Tools (Common).
 - b. Click on Cluster Administrator.
 - c. In the “Cluster or Server Name” prompt, type either the name of the cluster or the name/IP address of one of the nodes.
 - d. If the installation was successful, the computer names of both nodes appear on the left side of the Cluster Administrator window.
4. Do both node names appear?

No	Yes
Go to "Chapter 7. Troubleshooting."	Go to "Chapter 5. Customizing the Installation."

Chapter 4. Initial Startup Procedures

This chapter contains procedures to ensure that the storage management software operates properly and to determine if your system configuration meets your needs:

Starting the Software

IMPORTANT You must have administrator privileges to access this software.

1. Start Windows NT if it is not already running. Select Start → Programs → SYMplicity Storage Manager.
2. The application names appear under SYMplicity Storage Manager (Configuration, Maintenance and Tuning, Recovery, and Status). For a description of some key terms used in the applications, refer to the “Common Definitions” section in the *User’s Handbook* or the Online Help glossary.
3. Do your modules have an Independent Controller configuration?

No	Yes
Go to "Assigning Names to the Modules" on page 30.	Continue with "Setting Up Independent Controllers" on page 29.

Setting Up Independent Controllers

If your RAID controller units are using an Independent Controller configuration, you need to perform the procedure below to indicate the configuration to the storage management software.

1. Start any storage management software application.
2. When the Module Selection screen appears, highlight the module that has independent controllers, and select Edit.
3. Click the box next to “Independent Controllers?” and select OK.

You return to the main Module Selection screen, and the “Indep. Cntrls?” column now says Yes.

4. Assign names to the modules, if desired, and add any comments (you may want to add location details or other unique information to further clarify the module name).
5. Repeat this procedure for all modules using this configuration.
6. Continue with "Verifying and Upgrading Controller Firmware" on page 30.

Assigning Names to the Modules

The installation procedure assigns default names to each RAID controller unit (in the form <hostname_XXX>). You can assign other names to the modules, if desired, to aid in identifying them.

If you do not want to assign names to the modules at this time, continue with the next section, "Verifying and Upgrading Controller Firmware" on page 30. Otherwise, perform the following procedure:

1. Start any storage management software application.
2. When the Module Selection screen appears, highlight the module that has independent controllers, and select Edit.
3. Assign a name to the module and add any comments (you may want to add location details or other unique information to further clarify the module name).
4. Perform this procedure on each RAID controller unit you want to assign a name to.
5. Continue with the next section, "Verifying and Upgrading Controller Firmware" on page 30.

Verifying and Upgrading Controller Firmware

If your RAID controller units do not contain the most recent version of controller firmware, you will need to download the correct version to the RAID controller unit controllers (including any previously installed RAID controller units). Downloading new firmware almost always includes downloading a new NVSRAM file. Use the following procedures to determine the current firmware level and to download new firmware, if necessary.

Determining Controller Firmware Version Level

Note: Be sure to perform these steps from *each* host machine if your RAID controller units have an Independent Controller configuration. In addition, be sure to check the firmware level on *all* RAID controller units attached to the host system.

You can quickly see what the controller firmware version is by using Module Profile:

1. Start the Configuration application, select the RAID controller unit you want to check, then select Module Profile → Controllers.
2. Verify the firmware level is the most recent version (see Table on page 92 for a list of the firmware levels and controllers supported by this software).
3. Select OK when finished viewing.
4. Check *all* the RAID controller units on your system.
5. Do *all* the controllers on your system have the required version of firmware?

No	Yes
You <i>must</i> upgrade to the most recent version immediately. Continue with "Upgrading the Controller Firmware Version" on page 31.	Go to "Setting NVSRAM Values" on page 34.

Upgrading the Controller Firmware Version

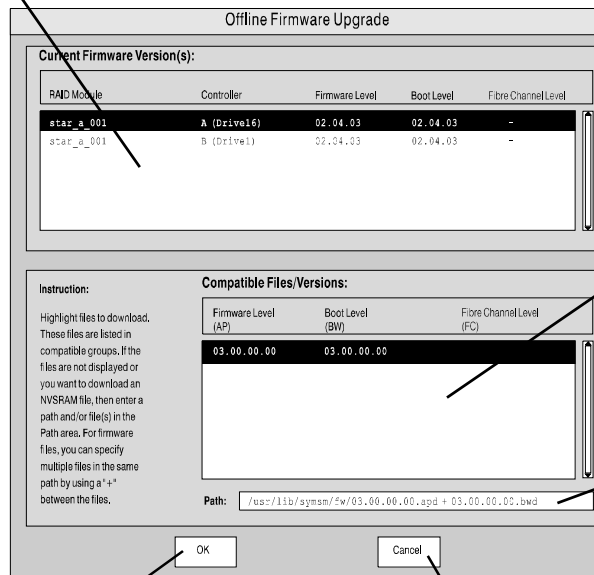
For complete details on the Firmware Upgrade option, refer to the “Upgrading Controller Firmware” procedure in the Maintenance/Tuning Chapter of the *User’s Handbook*.

Perform the following steps to download new controller firmware.

1. Copy the firmware files, the fwcompat.def file, and the NVSRAM files to the \program files\symasm\lib directory.
2. Determine whether you can upgrade the firmware using the Online or Offline method. If you must use the Offline method, make sure that you stop all I/O to the controllers you are going to upgrade. Note that if you must download an NVSRAM file, you must use the Offline method (because you will have to restart the RAID controller unit before the new settings take effect).
3. Start the Maintenance and Tuning application.
4. Select the RAID controller unit containing the controllers you want to upgrade. Select All RAID controller units to download firmware to all controllers in all RAID controller units.
5. Click on the Firmware Upgrade button or select Options → Firmware Upgrade from the drop-down menus.
6. Read the Important Notes screen, and select OK.
7. A screen appears asking you to select the online or offline procedure. Select either:

- Online to upgrade firmware while the selected RAID controller unit receives I/O.
 - Offline to upgrade firmware when the selected RAID controller unit is not receiving I/O.
8. After selecting Online or Offline, the screen displays “Verifying the controller state” while the software checks the selected RAID controller units for restrictions based on the type of firmware upgrade you selected. If there are no restrictions, a screen like Figure 2 on page 32 is displayed.

This display shows the controllers in the selected RAID controller units and their current Firmware levels. Make sure both controllers are highlighted here if you want to download firmware to both controllers. Note that for firmware levels 3.0 and higher, the fibre channel level is the same as the firmware level because the fibre channel firmware is contained in the firmware file.



This screen displays the compatible firmware files found by fwcompat.def. That program checks the default subdirectory for files. Highlight the version level you want to download.

Note that for firmware versions 3.0 or higher, the firmware (appware) file contains the fibre channel firmware, so no fibre channel file is listed here.

The path is updated to show the files currently selected in the Compatibility display. You can also enter a file name here to download that file (this is how to download an NVSRAM file).

Click here to begin the download after you have selected the firmware files to load or entered the name of the NVSRAM file in the path box.

Click here to cancel without downloading any new files.

Figure 2. Firmware Upgrade Screen

9. Depending on whether you are downloading NVSRAM files or upgrading controller firmware, do one of the following:

IMPORTANT Remember, you need to download any NVSRAM files first, *before* downloading any new firmware files.

- To download an NVSRAM file, type its complete path information in the path box and select OK. Continue with Step 11.
- To select controller firmware, highlight the version level you want to download. Continue with Step 10.

10. Select OK with the correct version level highlighted.

You either receive notification that a problem occurred, or you have a final confirmation that the upgrade process is about to begin.

IMPORTANT Once you click OK at the “Firmware is about to start” prompt in Step 11, do *not* select any other options or exit the Maintenance/ Tuning Application until the upgrade process is complete. You can, however, monitor the upgrade progress.

11. Select OK and follow the upgrade progress.

A histogram for the selected RAID controller unit indicates the download progress of the NVSRAM or firmware files. This graphic shows the amount of progress as a percentage and starts over at 0% for each file if you have more than one. If you selected All RAID controller units, the module number is updated as each module begins its upgrade process.

When the NVSRAM download or the firmware upgrade is finished, you see a summary report indicating whether the upgrade is Successful or Failed. Table 7 on page 34 shows the information this screen displays.

Note: If you selected All RAID controller units, it is possible that the upgrade was successful for some modules, but not for others. The final summary report should indicate which modules were not successful and give an appropriate cause. For more information, refer to your User’s Handbook.

Table 7: Firmware Confirmation Screen Elements

Screen Element	Description
Summary Report for Files	Lists the files used to upgrade the firmware. These are the files loaded in the Path line when you selected files at the Compatible Files/Versions screen (Figure 2 on page 32).
RAID Controller Unit	Identifies the specific RAID controller unit.
Download Status	Indicates whether the download process was completed successfully. You either see “Successful” or “Failed” with a reason why the upgrade was unsuccessful. Refer to your <i>User’s Handbook</i> if you see any Failed download statuses.

12. After the download is completed, select OK to return to the Maintenance/ Tuning screen.

13. Did you download an NVSRAM file or new firmware?

New Firmware	NVSRAM file
You are finished with this procedure. Continue with the next section, "Setting NVSRAM Values" on page 34	Continue with Step 14

14. At the command line, type:

```
nvutil -vf
```

This utility checks and corrects any settings on all controllers in your RAID controller units to ensure that certain settings in the NVSRAM are setup correctly for this software.

15. Turn the power to the RAID controller unit off and then on again to establish the new NVSRAM settings.

16. Go back to Step 9 on page 33 and download any new firmware files.

Setting NVSRAM Values

You need to change NVSRAM settings so that the RAID controller units perform correctly on your configuration if *either* of the following two conditions applies:

- Your RAID controller units are *not* connected to a network
- Your RAID controller units are being used in a *dual bus* Cluster Server environment.

If your RAID controller units do not need updating, continue with the next section, "Running Recovery Guru/Health Check" on page 35. Otherwise, perform the following procedure:

1. Determine the .def file you need to use.

The .def files are located in \program files\symsm\lib directory. At this time, you need to use one of two files. Either:

- networkoff.def — If the RAID controller unit has no network connections.
- reseton.def — If the RAID controller unit is being used with a Cluster Server on a dual bus configuration.

Note: You will see two other .def files in the directory: networkon.def and resetoff.def. These files can be used to restore the original NVSRAM settings.

2. From the command line, enter:

```
nvutil -vf <def_file_name>
```

where <def_file_name> is the name of the required .def file (determined in Step 1).

3. Turn the power to the RAID controller unit off and then on again to establish the new NVSRAM settings.
4. Perform this procedure from each host attached to an affected RAID controller unit.
5. Continue with the next section, "Running Recovery Guru/Health Check" on page 35.

Running Recovery Guru/Health Check

Use the following steps to ensure that the RAID controller units attached to your host system are all operational.

Note: Be sure to perform this step from *each* host machine if using the Independent Controller configuration.

Use the following procedure to run Recovery Guru/Health Check.

1. Start the Recovery application.
2. Select All RAID controller units to check all the modules on your system.
3. A screen like Figure 3 is displayed.

- Click on the Recovery Guru/Health Check button or select Options → Recovery Guru from the drop-down menu. The software checks all the selected modules for non-optimal statuses.



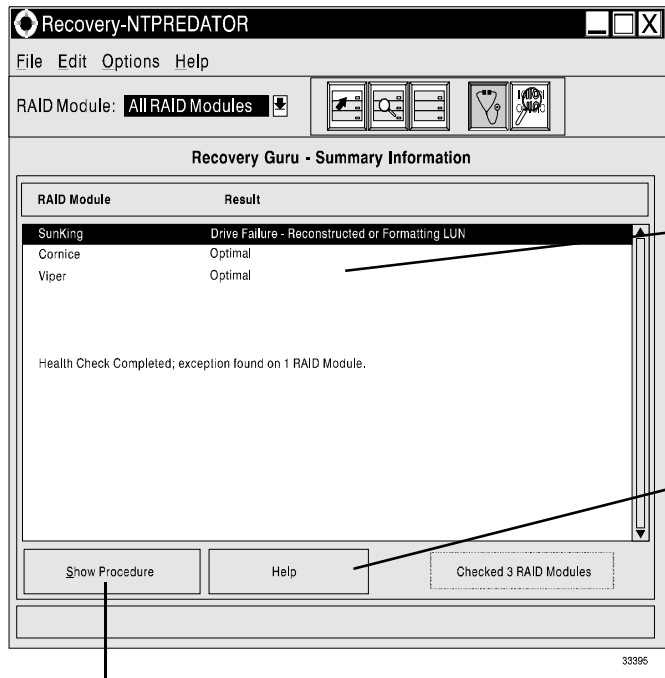
Click here to start the Recovery Guru/Health Check on the selected modules. You can also start by selecting Options → Recovery Guru.

Figure 3. Recovery Main Screen

- Were non-optimal statuses found?

No	Yes
You are finished with this procedure. Continue with the next section, "Determining the Current Configuration" on page 38.	A screen like Figure 4 is displayed. Continue with Step 6.

- If exceptions are found, highlight the exception and click on Show Procedure for recommendations on how to fix the problem (see Figure 5 on page 38).



This area displays the results of the check. If a non-optimal status is found, highlight the line and click Show Procedure for recovery information.

Click here for help.

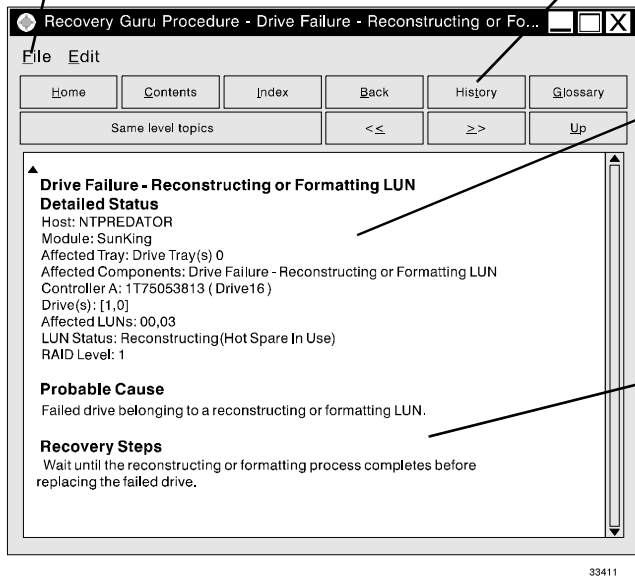
Click here to display information on the highlighted failure. This information includes recovery information. See Figure 5 on page 38 for a sample screen.

Figure 4. Recovery Screen/Exceptions Found

7. Print out the procedure, if desired.
8. Follow the procedure given to recover from the component failure.
9. After correcting any problems, reselect Recovery Guru/Health Check until all RAID controller units are Optimal.
10. Continue with the next section, "Determining the Current Configuration" on page 38.

Select File here to print the information displayed in the procedure screen, or to set up the printer before printing. Select Edit to copy text to the clipboard.

Although this looks like a standard Help screen, these buttons are grayed out.



The first part of this area gives detailed status information on the failure. In this case, the message indicates that drive [1,0] has failed. A hot spare drive has taken over for the failed drive and is currently reconstructing. LUNs 0 and 3 are affected by this failure.

The rest of this area gives information on the cause of the failure and on how to recover from it. Read the instructions carefully. If necessary, print them out by selecting File → Print Topic from the drop-down menus. In this case, there is no action to take until the reconstruction is finished. Then you should run Health Check again for information on how to replace the failed drive.

Figure 5. Recovery Procedure Screen

Determining the Current Configuration

Now that you have successfully installed the software, you need to use it to identify each RAID controller unit connected to your host system and determine the module's current configuration (for example, number of drives, number of controllers, logical units).

This software has assigned a number for each RAID controller unit connected to your host system. These designations are shown in the RAID controller unit selection list near the top of each application's screen (see Figure 6 on page 39).

Perform the following steps for each RAID controller unit to identify the module and determine its current configuration. If you need a definition of a Drive Group, RAID controller unit, or Logical Unit, refer to the "Common Definitions" section in the *User's Handbook* or the Online Help glossary.

1. Use the following steps to view the current drive groups and logical units in a RAID controller unit.
 - a. Select the Configuration Application.

The Module Selection screen appears. If you have more than one RAID controller unit connected to your host system, each RAID controller unit appears in the list.

- b. Highlight the first RAID controller unit in the list, and select OK.

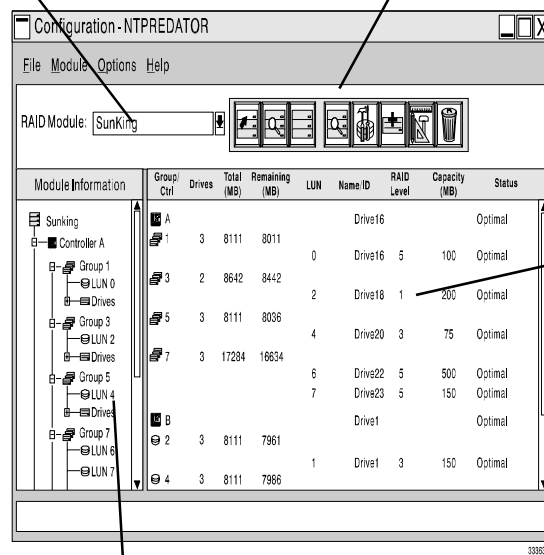
The main Configuration screen is displayed (see Figure 6 on page 39). Table 8 on page 39 describes the items in the display.

- c. View the current drive groups and logical units.

As you highlight an element in the Module Information display on the left of the screen, the display on the right changes to show those elements. You *cannot* select or highlight any item in right side of the display (it is information only).

This is the currently selected RAID controller unit.

These buttons are active or grayed out depending on what RAID controller unit structure is currently highlighted in the directory tree.



This gives information on the drive groups and logical units in the RAID controller unit. The items displayed here depend on what is highlighted in the directory tree display to the left.

The display shown here is the master display, shown when the RAID controller unit itself is selected.

See Table 8 for a description of the elements in the display.

This shows the RAID controller unit as a directory tree structure. At the top is the RAID controller unit, then the controllers, then the drive groups owned by the controller, then the logical units and drives in that drive group. Clicking on the different structures changes the display on the right of the screen.

Figure 6. Main Configuration Screen

Table 8: Configuration Display Columns

Column Heading	Explanation
Group/Ctl	The controller (A or B) or drive group.
Drives	The number of drives in the drive group.
Total (MB)	The total capacity of the drive group, after accounting for RAID level.

Table 8: Configuration Display Columns (continued)

Column Heading	Explanation
Remaining (MB)	The total capacity remaining in the drive group.
LUN	The logical units (LUNs) in the drive group.
Name/ID	The name or ID of the controller, logical unit, or drive, depending on the display. <ul style="list-style-type: none">• Controller and logical unit names are assigned by the operating system and can't be changed.• Drive IDs are the channel number and SCSI ID of the drives.
RAID Level	The RAID level of the logical unit.
Capacity (MB)	The capacity of the logical unit.
Status	The current status of the logical unit. If a status other than Optimal appears here, run Recovery Guru/Health Check to determine what the problem is, and, if necessary, what action to take.

2. Use the following steps to physically locate and label a RAID controller unit.
 - a. Click on the Locate Module button, select Module → Locate from the drop-down menus, or right-click on a module or group item in the Module tree (if in the Configuration Application).
 - b. Click Start on the Locate Module screen. The activity lights flash on the drive canisters in this module. Remember that the RAID controller unit is the *entire unit* and not a particular set of drives.
 - c. Physically locate the RAID controller unit with the flashing activity lights.
 - d. Once you have identified the RAID controller unit, place a sticker label on it for future reference.

The label should correspond to the name of the RAID controller unit (for example, <hostname>_001, <hostname>_002, etc.).
 - e. Click Stop to stop the flashing of the activity lights.

IMPORTANT It is very important that you save the profile of each RAID controller unit during initial installation and any time you change your configuration. You can use this information as a reference if you need to perform any recovery or maintenance tasks. See Step 3.

3. Use the following steps to save and print a RAID controller unit's profile information.

- a. Select the desired RAID controller unit, then select File → Save Module Profile.
A screen shows the different types of information you can save.
 - b. Make sure All is selected (all of the buttons should be depressed), and select OK to save all of the types of information.
A screen display prompts you to enter a filename.
 - c. Enter an appropriate path and filename on the Selection line, and select OK.
The information is saved to the path and filename you specified.
 - d. Print the Module Profile information you saved in Step c using your host system's printer utility.
4. Use the following steps to view a RAID controller unit's profile. (Optional)
 - a. Select the desired RAID controller unit → Module Profile.
A summary information screen appears (see Figure 7) showing information about the controllers, drives, and logical units in the RAID controller unit.
 - b. Select Controllers, Drives, or LUNs for more detailed information on these components.
 - c. Select OK to exit the profile information.

This display gives information on the selected module.

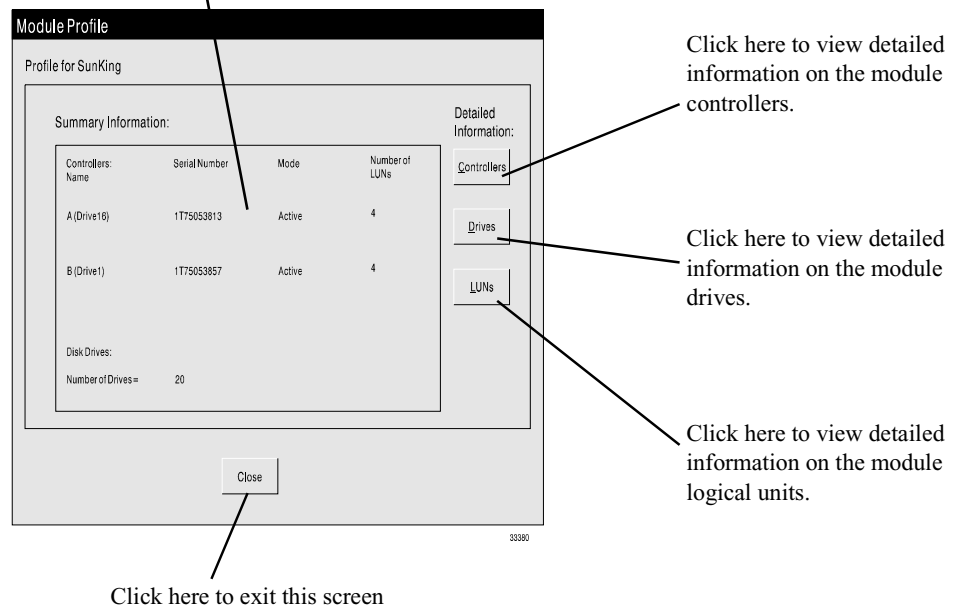


Figure 7. Main Module Profile Screen

5. Use the following steps to view details on specific drives in a drive group (optional):
 - a. Highlight the drive group or individual drives you want to locate.
 - b. Click on the List/Locate Drives button or select Options → List/Locate drives from the drop-down menus.
 - c. Use the drive location information [x,y] provided in the list to physically locate individual drives in the module.

[x,y] corresponds to a specific drive in the RAID controller unit, and indicates the channel number and SCSI ID for that drive, where the channel number is always listed first. You can also select Locate to flash the drives' activity lights in the RAID controller unit.
 - d. Select OK to exit the drive information.
6. Repeat Steps 1 through 3 (and 4- 5 if desired) for each RAID controller unit connected to your host system.

You should have enough information to understand the configuration for each RAID controller unit.
7. Continue with the next section, "Determining Whether Any Changes Are Necessary" on page 42.

Determining Whether Any Changes Are Necessary

In the previous section ("Determining the Current Configuration" on page 38) you should have performed the following tasks for each RAID controller unit connected to your host system:

Reviewed each module's current configuration (controllers, drives, and logical units/drive groups).	Step 1 on page 38.
Identified each RAID controller unit using Locate Module, and placed a sticker label on it.	Step 2 on page 40.
Saved the Module Profile information to a file using File → Save Module Profile, and printed the information.	Step 3 on page 40.

Now, you need to determine if you need to make any changes to the configuration to meet the requirements of your environment.

1. Use Table 9 and the Module Profile information you saved and printed to assist you in determining if any changes are necessary.

2. Continue with the next section, "Configuring RAID Controller Units" on page 45.

Table 9: Possible Parameters To Change

Parameter	Description	Why Change?	For More Details,
General Parameters			
Controller Mode	Applicable controller modes are single active, active/ passive, or active/ active.	If you have an active/ passive controller pair, you should consider changing it to active/ active for best performance.	<ul style="list-style-type: none"> Refer to the Maintenance/ Tuning chapter in the <i>User's Handbook</i>.
Auto Parity Check/Repair	An automatic parity check/ repair process runs each day or once a week at a specific time. Default is auto parity disabled.	If you want to enable the check/repair or change the time when it runs.	<ul style="list-style-type: none"> Use the online help for the Maintenance/ Tuning Application.
Hot Spare Drives	A hot spare drive is a drive that acts as a standby in case a drive fails in a RAID 1, 3, or 5 logical unit. The hot spare adds another level of redundancy to your RAID controller unit.	If you want to create new or additional hot spare drives for added protection.	<ul style="list-style-type: none"> Refer to the Configuration chapter in the <i>User's Handbook</i>. Use the online help for the Configuration Application.
Polling Interval	The array monitor checks the RAID controller units periodically looking for events and failures. The default is to check every 5 minutes.	If you want to increase or decrease the frequency of the polling interval. If you have a lot of modules, you may need to increase this interval because the amount of time needed to check and return results can increase.	<ul style="list-style-type: none"> Refer to the Status chapter in the <i>User's Handbook</i>. Use the online help for the Status Application.

Table 9: Possible Parameters To Change (continued)

Parameter	Description	Why Change?	For More Details,
Logical Unit Parameters			
RAID Level	Specifies how the data is striped across the drive and whether or not the drive group has redundancy.	If the current RAID Level is not appropriate for your environment, or you need to change the number of drives.	<ul style="list-style-type: none"> • Refer to the Configuration chapter in the <i>User's Handbook</i>. • Use the online help for the Configuration Application.
Segment Size	Specifies in 512-byte blocks how much data is written to one drive before data is written to another drive in the group.	If the segment size is not appropriate for your environment.	
LUN Capacity	Specifies in megabytes (MB) how much capacity is available on the logical unit.	If you want to increase the capacity of the LUN (you will have to delete the LUN and recreate it).	
Number of Drives in the Drive Group	The number of drives in the drive group. Adding drives increases the drive group's capacity, but not the capacity of the LUNs in the drive group.	<p>If you want to add drives to the drive group.</p> <p>NOTE You can not <i>reduce</i> the number of drives in the drive group, only add drives. To reduce the number of drives, you will have to delete the LUNs and recreate them.</p>	<ul style="list-style-type: none"> • Refer to the Configuration chapter in the <i>User's Handbook</i>. • Use the online help for the Configuration Application.

Table 9: Possible Parameters To Change (continued)

Parameter	Description	Why Change?	For More Details,
Caching Parameters	Specifies the caching parameters for each logical unit.	If you want to enable or disable any of these parameters.	<ul style="list-style-type: none"> • If you are creating <i>new</i> logical units, refer to the Configuration chapter in the <i>User's Handbook</i> or use the online help. • To change caching parameters on <i>existing</i> logical units, refer to the Maintenance/Tuning chapter in the <i>User's Handbook</i> or use the online help.
LUN Assignment and LUN Balancing	Determines what controller owns which logical units/drive groups.	To reassign or balance the logical units/drive groups between controllers in an active/active controller pair.	<ul style="list-style-type: none"> • If you are creating <i>new</i> logical units, refer to the Configuration chapter in the <i>User's Handbook</i> or use the online help. • To change LUN Assignments on <i>existing</i> logical units, refer to the Maintenance/Tuning chapter in the <i>User's Handbook</i> or use the online help.
Reconstruction Rate	Determines how quickly reconstruction occurs on a logical unit when a failed drive is replaced.	To increase or decrease the reconstruction performance.	<ul style="list-style-type: none"> • Refer to the Maintenance/Tuning chapter in the <i>User's Handbook</i>. • Use the online help for the Maintenance/Tuning Application.

Configuring RAID Controller Units

Perform the following procedures to change the logical unit/drive group configuration of your RAID controller units.

Configuring Logical Units On Your RAID Controller Units

Use the Configuration Application of the storage management software to view the current logical unit configuration and to make any necessary changes.

NOTE Refer to the *SYMlicity Storage Manager User's Handbook* for detailed information on using the Configuration application. Also, you can make configuration changes after completing the installation process. You don't have to make all your changes now.

1. Select Start → Programs → SYMlicity Storage Manager → Configuration.

The main Configuration screen is displayed.

2. Set up the logical units with the desired drives, RAID Levels and parameters.

IMPORTANT In Windows NT, you are limited to creating 8 LUNs. In addition, by default the software is limited to 16 RAID controllers. If you have more than 16 controllers attached to the host system, configure the controllers you can access now, then see "Controller Limits" on page 49 after you complete the installation procedure for information on how to access the additional controllers.

3. If you add, change, or delete logical units, you will need to restart your system.
4. Continue with the next section, "Partitioning Logical Units And Assign Drive Letters."

Partitioning Logical Units And Assign Drive Letters

1. Use the Windows NT Disk Administrator to partition the logical units and assign drive letters. Refer to your Windows NT online help for further details.

Note: If you are installing the software in a cluster server environment, remember that node B will need to see the same logical unit-drive letter assignment as you are setting up now for node A.

2. Continue with the next section, "What's Next?" on page 47.

What's Next?

Now that you have successfully completed the installation of the software, do one of the following:

- If you are installing the software in a Cluster Server environment, return to "Shutting Down Node A" on page 24 and continue with the installation procedure.
- Go to "Chapter 5. Customizing the Installation," if you want to set up SNMP notification or make other changes to support the software.
- Refer to the *User's Handbook* for detailed information on how to use each application. Note that "Chapter 6. Operating System Support," in this book gives information specific to the NT operating system.
- Go to "Chapter 7. Troubleshooting," for troubleshooting tips on common problems you may encounter as you use this software with the Windows NT operating environment.

Chapter 5. Customizing the Installation

This chapter describes how to customize your software installation.

Controller Limits

NOTE In order to change the number of available controllers, you must edit the `\program files\symasm\rmparams` file. Read this section and the "Disabling the Module Selection Screen" and "Setting Up SNMP Notification" sections before modifying the `rmparams` file so that you can make all your `rmparams` changes at the same time).

At installation, the storage management software is limited to 16 RAID controllers. This limit is determined by the `System_MaxControllers` parameter setting in the `rmparams` file. If your system has more than 16 RAID controllers, change the parameter in the `rmparams` file to reflect the actual value (see "Changing the `rmparams` File" on page 52).

Disabling the Module Selection Screen

NOTE In order to disable the Module Selection screen, you must edit the `\program files\symasm\rmparams` file. Read this section and the "Controller Limits" and "Setting Up SNMP Notification" sections before modifying the `rmparams` file so that you can make all your `rmparams` changes at the same time).

By default, the Module Selection screen is displayed every time you start a storage management application. Refer to the "Selecting A Module" section in the *User's Guide* for information on this screen.

If you want to disable this screen, you must change the `System_DefaultModuleSelect` parameter in the `rmparams` file (see "Changing the `rmparams` File" on page 52).

Setting Up SNMP Notification

The following sections describe the SNMP notification setup process.

NOTE In order to enable or disable the SNMP notification option, you must edit the \program files\symasm\rmparams file. Read this section and the "Controller Limits" and "Disabling the Module Selection Screen" sections before modifying the rmparams file so that you can make all your rmparams changes at the same time).

Enabling SNMP Notification

This software can provide remote notification of RAID events to a designated Network Management Station (NMS) using Simple Network Management Protocol (SNMP) traps.

Use the following procedure to set up the NMS, to enable or disable this notification option for each host, and to understand the contents of an SNMP trap message.

1. Set up the NMS. You only need to set up your designated NMS *once*. Use the following procedure to compile this software's Management Information Base (MIB) into your NMS.

NOTE The MIB was written to standard version 1 SNMP syntax. It was designed specifically for the storage management software. It is *not* applicable to other companies' RAID products.

- a. Copy the \program files\symasm\rm6traps.mib file to the network management station.
- b. Follow the steps required by your specific network management station to compile the MIB.

NOTE For details on the required steps, consult your network administrator or the documentation specific to the NMS product you are using.

2. Make sure the host system is connected to the network with the NMS station.
3. Enable this notification on your host. You must edit three parameters in the \program files\symasm\rmparams file so that the software will know where to direct the SNMP trap messages when a RAID Event occurs. Go to "Changing the rmparams File" on page 52.

Contents of an SNMP Trap Message

Refer to Table 10 on page 51 for a description of the contents of an SNMP trap message.

IMPORTANT If the trap type is anything other than informational, you should use the Status or Recovery Applications to get more information or specific instructions on how to remedy the problem. Do *not* remove the SNMP message until the problem has been corrected since most trap notifications associated with this software are not persistent.

Table 10: Contents of an SNMP Trap Message

Item	Description
Host IP Address	The standard IP address dot notation for the host where the RAID controller unit is attached.
Host Name	The text name assigned to the host.
Trap Type	<p>There are four trap types:</p> <ul style="list-style-type: none"> • Informational — No failure has occurred. Information is provided that an event, such as a logical unit creation, has occurred. • Degraded Array — A subsystem component failure has occurred. The module is still operational but now lacks redundancy in some area. (For example, a drive failure resulting in a degraded logical unit, a power supply failure, or a failure of one controller in a controller pair.) • Failed Array — A failure has occurred that leaves a module or logical unit unable to communicate. (For example, a failure of the controller in a single-controller RAID controller unit or a multiple drive failure resulting in a dead logical unit.) • Critical — This is a small category of failures that may require timely intervention to correct. (For example, the two-minute warning from an uninterruptible power supply or a warning that write-back cache has been disabled due to a low battery.)
Affected RAID Controller Unit	Indicates which RAID controller unit had the event (for example, sonne_001).
Condition Description	A brief description of the event.

Disabling SNMP

Perform the following steps to disable this notification on your host and stop this software from sending SNMP traps:

1. In the `\program files\symasm\rmparams` file, change the value of the `SNMP_Action_Number` line to 0 (see "Changing the `rmparams` File" on page 52).

2. Save the `rmparms` file and copy it to the backup directory. It is critical that you have a backup copy of this file.

Changing the *rmparms* File

The `\program files\symasm\rmparms` file is used to store several configurable options available through this software. Table 11 on page 53 shows a list of the parameters in the file that you may need to change during initial installation.

IMPORTANT Before you edit the `rmparms` file, make sure you read "Controller Limits" on page 49, "Disabling the Module Selection Screen" on page 49, and "Setting Up SNMP Notification" on page 49. Decide which of these parameters you want to change and make all the changes at the same time.

If you installed an upgrade of the storage management software, you may want to refer to the `rmparms.ori` file to determine if you want to make additional customized changes to the new file. Remember, the new file contains new parameters for this version, so do *not* replace it with the old file.

Most of the options in the `rmparms` file (other than the ones shown in Table 11 on page 53) should *not* be changed except through the graphical user interface (GUI).

For more information about the `rmparms` file, read the text file about `rmparms`. From the installation directory, type:

```
help rmparms
```

Because of the critical nature of the `rmparms` file, you should make a backup copy of the file in a directory other than the installation directory before you modify the current file. If this file becomes corrupted or missing, you should copy the backup `rmparms` file to the installation directory to resume normal operation. Furthermore, if you make any changes to this file directly or use the options in the GUI that write to this file (such as log settings), always copy the new version of the file to the backup directory once you are sure the changes work.

-
1. *Before* making any changes to the `rmparms` file for the first time, save the original file and copy it to the backup directory.
 2. Make any necessary changes to the `rmparms` file using Table 11 on page 53.
 3. Save the `rmparms` file, and copy it to the backup directory.

Table 11: Changeable Parameters in the *rmparms* File

Description	When To Change	How To Change
SNMP_Target_IP_Address=xxx.xx.xx.xx		
Provides the SNMP IP Address for remote notification.	If you want to enable SNMP.	Change this value to the dotted notation IP address of the network management system where the MIB has been compiled. On most systems, this IP address can also be a dotted notation multicast address or broadcast address.
SNMP_Community_Name=NONE		
Provides the community name to be used for SNMP remote notification.	If you want to enable SNMP.	Add the community name. The most commonly used community name is public; however, your network environment may require another name.
SNMP_Action_Number=0		
Indicates the SNMP trap notification option you want to use.	If you want to enable SNMP.	Change this value to either 1 or 2. 1 will send SNMP traps to the designated NMS station. 2 means that all the relevant data is written to the file <i>trap.dat</i> . IMPORTANT Setting this parameter to 0 will completely disable the SNMP option.
System_DefaultModuleSelect=TRUE		
Determines whether or not the Module Selection screen is displayed each time you open an application.	If you want to disable the Module Selection screen (see "Disabling the Module Selection Screen" on page 49).	Change TRUE to FALSE.
System_MaxControllers=16		
Determines the maximum number of RAID Controllers supported by this software.	If you have more than 16 RAID Controllers (see "Controller Limits" on page 49).	Change the 16 to the appropriate number.

Setting Up Scriptable Notification Options

The `rmscript.bat` file is accessed by the status monitor and automatic parity check whenever these utilities find an exception. By default, no action is taken. You can edit this file to specify a set of actions to take when an error is found.

For example, if you want to install third-party notification software to perform various events (such as, faxing or paging), you would add the appropriate script for each event near the end of this file (making sure the `del %1` remains the last line in the file). Consult the third-party's software documentation for specific details.

NOTE If you installed an upgrade of the storage management software, you may want to refer to the `rmscript.ori` file to determine if you want to make additional customized changes to the new file. Remember, the new file contains new script for this version, so you must *not* replace it with the old file.

For more information, read the text file about `rmscript.bat`. From this software's installation directory, type:

```
help rmscript
```


Chapter 6. Operating System Support

This section contains information related to operating this software with the Windows NT operating environment. See "Understanding the Restrictions" on page 1 for other important notes about using this software in an NT environment.

Number of LUNs

There are two limits on the number of logical units you can have.

- Windows NT limits the maximum number of logical units (LUNs) per RAID controller unit to eight (8) (whether the module has a single controller or redundant controllers). Therefore, if you have a RAID controller unit with two active controllers, the total number of LUNs between them *cannot* be more than eight.
- Your host adapter has a maximum number of LUNs it can support. Consult your host adapter documentation for more information.

Module Names

By default, module names are assigned in the order in which the system detects the module. The default name displayed is derived from the name of the host machine where the storage management software is installed. For example, you see <hostname>_001, <hostname>_002, and so on.

The controllers and logical units in the module have unique device names. See the next section, "Controller/LUN Names" on page 55 for more information.

Controller/LUN Names

The storage management software uses device names in the form Drive#, where # is a device number, to identify controllers and logical units (LUNs). These device names appear in various screen displays, usually related to a controller's identification.

NOTE These names do *not* match the disk# used in the Disk Administrator utility which represent configured logical units and corresponding filesystems.

The device numbers are assigned on a controller basis, eight to a controller, representing the maximum number of LUNs allowed on a RAID controller unit in Windows NT. The device numbers assigned to a controller depend (in descending order) on the port, path, and ID of the controller.

EXAMPLE Assume RAID controller unit 1 has only one controller. RAID controller unit 2 has two active controllers on different ports. Device numbers are assigned to these controllers in groups of eight in the order they are detected on the system:

- RAID controller unit 1, controller A (port 0, path 1, HOST ID 5) uses device names Drive8 through Drive15. The controller is Drive8.
- RAID controller unit 2, controller A (port 0, path 1, HOST ID 3) uses device names Drive0 through Drive7. The controller is Drive0.
- RAID controller unit 2, controller B (port 1, path 0, HOST ID 2) uses device names Drive16 through Drive23. The controller is Drive16.

Within the numbers assigned to a controller, the controller itself always uses the lowest assigned number. The lowest numbered logical unit also uses this number. After that, logical units are assigned device names sequentially, even if the logical unit doesn't exist. For example, if a controller is assigned device names Drive8 through Drive15, and contains logical units 0, 3, 4, and 6, the following device names are used:

Module Element	Device Name
Controller	Drive8
LUN 0	Drive8
LUN 3	Drive11
LUN 4	Drive12
LUN 6	Drive14

Note that in a redundant controller configuration, a maximum of 8 LUNs can exist between the two controllers, even though 16 numbers are available.

Redundant Controller Support

The storage management software supports redundant controllers on a Windows NT system using the Redundant Disk Array Controller (RDAC) driver. The RDAC driver is part of the storage management software package and is installed automatically.

For RAID controller units with redundant controllers, this host-based driver manages the I/O data paths. If a component fails on the data path (cable, controller, host adapter, and so on) and the host loses communication with a controller, the RDAC driver automatically reroutes all I/O operations to the other controller.

Figure 8 on page 57 illustrates how RDAC provides this redundancy when the host application generates a request for I/O to Controller A, but Controller A fails. Use the information at the bottom of the figure to follow the I/O data path.

For more information on how to use the redundant controller feature, refer to the *User's Handbook*.

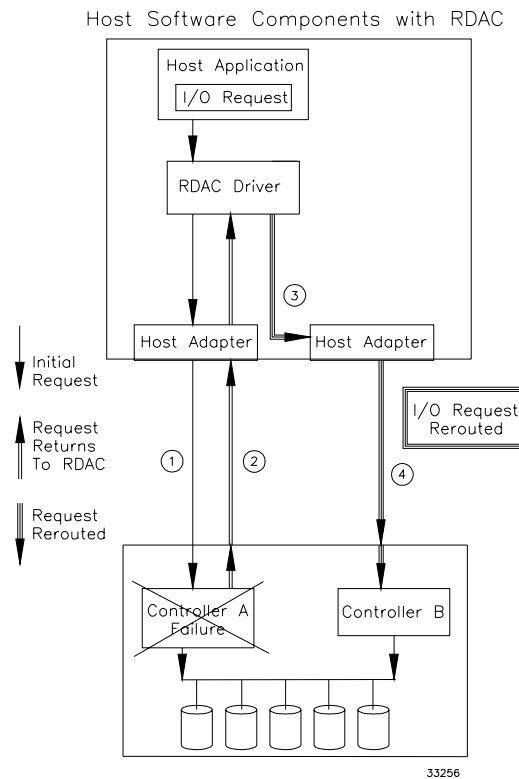


Figure 8. Example Of RDAC I/O Data Path Redundancy

Creating Logical Units

After creating logical units (LUNs) using the Configuration Application, you have to add them to the operating system. See your Windows NT documentation for details on adding a drive. Remember each logical unit (not a drive group) is seen by the operating system as *one* drive.

NOTE Windows NT will *not* recognize any configuration changes (such as, creations/deletions) until you restart it. Therefore, after creating LUNs with this software, restart the operating system.

Deleting Logical Units

CAUTION If you are using the RAID controller unit as a boot device, do *not* delete LUN 0 or use File → Reset Configuration or you will lose your boot device.

Before deleting LUNs with this software or using File → Reset Configuration, stop I/Os to the affected RAID controller unit. Then use the Disk Administrator utility to delete any partitions and to deassign drive letters associated with those LUNs. If you do *not* use this utility first, registry information will be corrupted.

NOTE Windows NT will *not* recognize any configuration changes (such as, creations or deletions) until you restart it. Therefore, after deleting LUNs with this software, restart the operating system.

Accessing Raw Partitions

Many database applications address raw partitions for their data. In the Disk Administrator utility, the partition information is shown as “unknown.” The order of these partitions could be rearranged whenever a dead LUN is present and the system is booted without restoring the LUN (which to Windows NT is the same as removing a physical drive and booting), possibly causing data corruption.

Data corruption occurs because the raw partition's namespace in the registry that the application is addressing has now been changed or moved. The application, however, will continue to write to that partition or device as though it were the correct one. The work-around for this is to be sure that all LUNs are Optimal and fully reconstructed before running any utilities which re-address the raw partition namespaces (rearrange their ordering in Disk Administrator.)

The Background Monitor

The storage management software has a background monitor that automatically polls all RAID controller units and checks for problems or events at a specified interval. If any problems or events are detected, the information is written to the default log file. This becomes an historical record of past component failures, general status changes, and configuration changes.

The polling interval can be changed from the default of every five minutes. For best results, use the default value or smaller to ensure that you are notified about problems or events as close as possible to when they occur.

CAUTION Setting this value too small (with Status → Options → Log Settings) could cause the check to affect system I/O performance. However, setting this value too large could cause delay notification of serious problems.

Stopping the Disk Array Monitor Service

CAUTION You should *only* stop this monitoring service if you are specifically instructed to do so by Recovery Guru, the troubleshooting documentation, or your Customer Services Representative. However, doing so means that *none* of the RAID controller units connected to the host will be checked during this time. Be sure to restart the monitor when instructed.

1. Select Start → Settings → Control Panel → Services.
2. Highlight the Disk Array Monitor Service
3. Select Stop. When the status changes to Stopped, close the Services Application.

Starting the Disk Array Monitor Service

This background monitor automatically starts when you run the storage management software. However, it will be necessary to manually start this process if you have stopped it for some reason.

1. Select Start → Settings → Control Panel → Services.
2. Highlight the Disk Array Monitor Service.
3. Select Start. When the status changes to Started, close the Services Application.

When you have manually stopped the background monitor, you have not been monitoring for some period of time. We recommend that you run Recovery Guru/Health Check to make sure that no problems have occurred while you had the disk array monitor stopped.

Command Line Utilities

Although you can perform most necessary storage management tasks through the storage management software, there are command line utilities which allow you to perform these tasks through the DOS command line. For a list of these files and a description, see the "Command Line Interface" chapter in the *User's Handbook*.

To access the help files for these utilities, type (from the installation directory) `help <filename>` from the command line. For example, to read the file on the `drivutil` program, from the installation directory, type:

```
help drivutil
```

Adding New RAID Controller Units to Your Configuration

If you need to add new RAID controller units to your system after installing the storage management software, use the following procedure to be sure this software recognizes the new module and that its configuration meets your needs.

1. Physically connect the RAID controller unit to your system. Consult the appropriate hardware documentation for this procedure.
2. Close all open applications and restart Windows NT.
3. Go to "Chapter 4. Initial Startup Procedures," to perform the following steps:
 - "Verifying and Upgrading Controller Firmware" on page 30.
 - "Running Recovery Guru/Health Check" on page 35.
 - "Determining the Current Configuration" on page 38.
 - "Determining Whether Any Changes Are Necessary" on page 42.
 - "Configuring RAID Controller Units" on page 45.

Uninstalling the Storage Management Software

If you are upgrading the storage management software, you do *not* need to use this procedure first. The previous version's files are removed or overwritten as needed.

Use the following procedure *only* if you want to remove the storage management software from your system.

IMPORTANT This procedure requires that you shutdown and restart the operating system. Therefore, close all other applications and make sure that other users are *not* on the system when uninstalling this software.

1. If you do not intend to reinstall this software and are *not* removing your RAID controller unit from the system, you may need to download your original NVSRAM file to restore your controllers' configuration.
 - a. Obtain a copy of the correct NVSRAM values from your Customer Services Representative (it will be part of the controller firmware's release media).
 - b. Download the new NVSRAM values to the controllers in your RAID controller units using the fwutil command line utility.
 - c. If you set NVSRAM parameters during installation with the reseton.def or networkoff.def files (see "Setting NVSRAM Values" on page 34), you may want to run restoff.def or networkon.def to restore these settings to their original values.

CAUTION Do not restart the storage management software again after performing Step 1, or the software will reset the NVSRAM values it needs to operate.

2. Select Start → Settings → Control Panel → Add/Remove Programs, and scroll the list to find SYMplicity Storage Manager.
3. With SYMplicity Storage Manager highlighted, select Add/Remove.
4. At the "Uninstall software" screen, select OK.

You will see screens indicating that this program is removing the appropriate service, registry information, and files.
5. At the "Uninstall Complete" screen, select YES to shutdown and restart the Windows NT system.

Chapter 7. Troubleshooting

This chapter describes the restrictions that apply when using this software and gives information to help you solve problems that may occur. The last section gives important information you may need when replacing failed controllers.

Troubleshooting

The troubleshooting tables that follow provide probable cause and action to take for specific problems you might have as you use the storage management software with the Windows NT operating system.

IMPORTANT If you cannot find the problem you are looking for, consult the Online Help for additional troubleshooting information. Also, see "Understanding the Restrictions" on page 1 for additional information.

Locating Solutions

To quickly find the problem-solution you are looking for, use the following tables to locate the problem you are having. It is possible for an entry to appear in more than one table:

- **Category** — organizes problems into general use or specific option groups (page 64).
- **Component** — organizes problems by hardware components, such as controllers, drives, modules, and so on. (page 64).
- **Application** — organizes problems for each storage management application, including a group for options common to all applications (page 66).
- **Software** — organizes problems by operating system, storage management software, or command line utility (page 67).

Category

Groups problems into sections for general use or specific options.

Table 12: Troubleshooting Entries By Category

Category	See Page
"Configuration Application"	68
"Firmware Upgrade"	70
"General"	71
"Recovery Guru/Health Check"	75

Component Search

Organizes individual problems by hardware components, such as controllers, drives, LUNs, RAID controller units, and so on.

Table 13: Troubleshooting Entries Organized By Component

Component	Problem	See Page
Controllers	Failed during alternate replacement	71
	Firmware upgrade failed	70
	LUN creation error after deleting all LUNs or using Reset configuration	69
	Not visible to storage management software	72
	Not visible to either operating system or storage management software	72
	Passive, no LUNs owned after replacement	77
Fans	Failure detected after replacement	75
Drives (continued on next page)	Activity lights don't flash (Configuration → List/Locate Drives)	69
	All drives failed in a drive group	77
	Failed status, but LUN is Optimal	76

Table 13: Troubleshooting Entries Organized By Component (continued)

Component	Problem	See Page
Drives (continued from previous page)	Fault light comes on after replacing failed drive	76
	Fault lights lit (drives continue to fail)	76
	Missing information in Manual Recovery → Drives screen	77
	Number of drives incomplete or wrong during LUN creation	68
	Removed drive; no failure reported	75
	Status other than Optimal	76
LUNs	Error message during LUN creation after deleting all LUNs or using Reset Configuration	69
	Less capacity shows than selected during configuration	68
	Missing information in Manual Recovery → LUNs screen	78
	Not visible to storage management software	72
	Number of drives incomplete or wrong during LUN creation	68
	Optimal LUN status with failed drives	76
	Reconstructing status appears, but no drives replaced	76
	Status other than Optimal	76
	Status remains Reconstructing	77
RAID controller units	Failure detected after replacing fan or power supply	75
	Listed after being removed	73
	Not visible to either operating system or storage management software	72
	Status other than Optimal	74
	Status doesn't update after a recovery procedure	78
Power Supplies	Failure detected after replacement	75

Application Search

Organizes individual problems for each storage management application, including a group for options common to all applications.

Table 14: Troubleshooting Entries Organized By Application

Application	Problem	See Page
Common To Any Application	Cannot select some options	73
	“Cannot secure access to LUNs” message	74
	Select Module lists a RAID controller unit removed from the system	73
	Status doesn’t update after a recovery procedure	78
Configuration	Less capacity shows than selected during configuration	68
	List/Locate Drives doesn’t work	69
	LUN creation error after deleting all LUNs or using Reset Configuration	69
	Number of drives incomplete or wrong during LUN creation	68
	Reset Configuration doesn’t work	69
Status	Reconstructing status appears, but no drives replaced	76
	Status remains Reconstructing	77
Recovery (continued on next page)	All drives failed in a drive group	77
	Controller mode is Passive, no LUNs owned after replacement	77
	Drive fault lights lit (drives continue to fail)	76
	Drive status other than Optimal	75
	Failed status, but LUN is Optimal	76
	Fault light comes on after replacing failed drive	76
	Failure detected after replacing fan or power supply	75
LUN status other than Optimal	76	

Table 14: Troubleshooting Entries Organized By Application (continued)

Application	Problem	See Page
Recovery (continued from previous page)	Missing information in Manual Recovery → Drives screen	77
	Missing information in Manual Recovery → Logical Units screen	78
	Reconstructing status appears, but no drives replaced	76
	Recovery Guru takes a long time	75
	Removed drive; but Recovery Guru doesn't report a failure	75
	Status doesn't update after a recovery procedure	78
	Status other than Optimal	74
	Status remains Reconstructing	77
Maintenance/Tuning	Controller mode is Passive, no LUNs owned after replacement	77
	Firmware upgrade failed	70

Software Search

Organizes individual problems by operating system, storage management software, and command line utility.

Table 15: Troubleshooting Entries Organized By Software

Software	Problem	See Details On
Storage Management	“Cannot secure access to LUNs” message	74
	Can’t select some options	73
	Can’t start the software	71
	Controllers/LUNs not visible	72
	Controllers/RAID controller units not visible	72
	Failure detected after replacing fan or power supply	75
	“Not all files removed” message when uninstalling the software	71
	RAID controller unit listed after being removed	73
Windows NT	Controllers/RAID controller units not visible	72
Command Line	Batch file commands fail	71

Configuration Application

Includes problems you may have as you use options in the Configuration Application.

Table 16: Configuration Changes Troubleshooting

Number of Drives field (in the main Create LUN screen) show less than the number of drives in the unassigned drive group.

CAUSE There are two main reasons this number could be different than expected:

- This list shows *only* the maximum number allowed, which is a maximum of 30 drives in a drive group.
 - There could be failed or unresponsive drives in the unassigned drive group. Failed drives are not available for configuration; therefore, they are not displayed in this list.
-

Less capacity shows than I selected during configuration.

When using 5+ drives to create a LUN, you could see a capacity slightly less than you selected during configuration; for example, you see 1.97 GB instead of 2 GB on a RAID 5, 9-drive LUN. This can occur because the capacity you select is based on stripe size which depends on segment size times the number of drives.

Table 16: Configuration Changes Troubleshooting (continued)

List/Locate Drives → Locate does not work.

ACTION It is not possible to flash the drive activity lights for a particular drive group if any of the drives has a status other than Optimal. For an explanation of possible drive statuses and recommended action to take, see the Online help.

CAUSE Use Module Profile to verify that all drives are Optimal and try again. If any of the drives are not Optimal, select Recovery Guru\Health Check (in the Recovery Application) to correct the problem.

Reset Configuration does not work.

CAUSE If this software detects any drives as removed or unresponsive, Reset Configuration will not work. Also, if the selected RAID controller unit has an Independent Controller configuration, this option is grayed out.

ACTION Use Module Profile to verify that all drives are Optimal and that the controller is not in an Independent Controller configuration (neither controller is marked Inaccessible). Try File → Reset Configuration again.

CAUTION Any time you use Reset Configuration, you will lose all data on your drives. *Only select this option as a last resort* if your configuration is inaccessible or you want to start over. You will need to use Create LUN to re-configure your drive groups/LUNs.

LUN Creation error message is displayed after deleting all LUNs or using File → Reset Configuration.

CAUSE Most likely the controller has 256 MB cache and requires a reset after deleting all LUNs/drive groups before re-creating new LUNs/drive groups.

ACTION Turn off power to the affected RAID controller unit. Turn power back on and try the LUN creation procedure again.

Firmware Upgrade

Problems you may have in upgrading firmware.

Table 17: Controller Firmware Upgrade Troubleshooting

Firmware upgrade does not complete successfully

CAUSE This should *not* happen unless you try to perform some other activity on the module while upgrading controller firmware. If you are upgrading firmware to a redundant controller pair, the progress bar reaches 50% very quickly after downloading a file to the first controller. However, it may take another couple of minutes to reach 100% if it is downloading to a second controller in the module. Do *not* assume the controller has hung unless the firmware upgrade has not completed after ten minutes or so.

ACTION

- To avoid this problem, *wait* for the controller firmware upgrade to be completed before selecting any other option or exiting Maintenance/Tuning.
- If it occurs, turn off power to the RAID controller unit and turn it back on; then, immediately try to upgrade the firmware again.

IMPORTANT If you are not upgrading the firmware again immediately, check the firmware version of the module's controllers using Module Profile. The controller firmware could be in an unusable state if some files completed the download process before the controller hung. In this case, your module will not perform properly until the firmware is upgraded.

General

General problems you could have in all applications.

Table 18: Troubleshooting Generally Applicable to All Applications

Cannot start the software.

CAUSE If the software does not load when you try to start it, the rmparms file may be corrupted or missing from the installation directory (\program files\symism).

ACTION

You may want to view the Windows NT Event Log (“Applications” log). This log might contain specific information about missing files and/or executables.

- 1 Start Windows NT and try to start the software again. (See "Starting the Software" on page 29 if you need more information on starting this software.)
- 2 If you had previously saved a backup rmparms file, copy it to the installation directory (default is \program files\symism – be sure to select the appropriate directory on your system) and try to start the software again.

IMPORTANT The rmparms file is required for normal operation of this software’s applications. Therefore, it is strongly advised that if you make any changes to this file, you should make a backup by copying the edited file to another directory.

- 3 If you still cannot start the software, run the clean.bat -all script to delete certain files that could be hiding information from this software.
 - 4 If you still cannot start the software, reinstall the software.
-

Controller failed while bringing its alternate Online.

CAUSE You have a RAID controller unit with two controllers, one is Offline and the other is Online (Optimal). When you bring the offline controller online, you could see the alternate controller Fail or go Offline.

ACTION Bring the newly failed controller Online using the same procedure.

While uninstalling this software, “not all files were removed” message is displayed.

CAUSE If you see this message after performing the uninstall procedure (page 60), the auto parity check/repair service was probably running. The software has been successfully uninstalled; however, there may be some files that were not removed from the installation directory.

ACTION Delete any remaining files from the installation directory, then delete the directory.

Commands run in a batch file fail unexpectedly.

CAUSE Utility commands such as fwutil or rdacutil -u that require a controller reboot may return before the controller is ready to accept commands. If the next command is executed before the controller is ready to accept commands, the controller will return an error status.

ACTION Include a delay command in the batch file to allow enough time for the controller to finish its action.

Table 18: Troubleshooting Generally Applicable to All Applications (continued)

Some controllers/logical units are not visible to storage management software, but are visible to the host

CAUSE It is possible that controllers or logical units might *not* be visible to the storage management software, but will remain visible to Windows NT. Any time an operation is being performed that requires exclusive access to the logical units (LUNs), these LUNs may not appear on the screen *except* in the application where the operation was initiated. The software uses a file (\program files\symasm\lunlocks) to hide these LUNs from the other applications, so that no other operations can be performed on them until the current operation is complete.

IMPORTANT For example, if you started a format in the Recovery Application, these LUNs show a “Formatting” status in Recovery, but may not appear in any other application. Operations that require exclusive access include Delete for LUNs and Reset Configuration (Configuration); formatting a LUN with Options → Manual Recovery → Logical Units (Recovery); and Firmware Upgrade → Offline method (Maintenance/Tuning).

Should the utility/application holding the LUN lock come to an abnormal termination, these LUNs may remain hidden from the other applications.

ACTION

- 1 Wait for the operation to be completed, or perform operations on a different RAID controller unit.
- 2 If you still do *not* see controllers or LUNs that you know exist, do the following:
 - a Close all your applications and exit the storage management software completely.
 - b Run the clean.bat script to delete certain files that could be hiding information from this software.
- 3 Restart the application where you had the problem and verify that the controller/LUNs are now visible.

Some controllers/RAID controller units are not visible at all

CAUSE If controllers or RAID controller units are not displayed and you know they exist, there could be some faulty connection between the RAID controller unit and the host adapter/network card. It is also possible that the storage management software or your operating system doesn't recognize the devices yet. Less likely, the NVSRAM settings for the module's controllers may not be set properly to run this software. Normally, these settings are changed automatically during installation and any incorrect settings are detected and corrected by the software.

ACTION

- 1 Verify there is no problem on the data path:
 - Check the interface cables and Host-side IDs of the controllers. If they appear OK, turn off power to the module, and turn it back on.
 - Check the I/O connection cables for bent pins in the connectors, for connectors that are not on straight, or for cables that are kinked or crimped. Select Recovery Guru/Health Check and follow the recovery procedures for any component problem detected.
 - 2 If you have replaced or added controllers/RAID controller units after installing this software, be sure to follow the procedures for your operating system to recognize the new devices (see your operating system documentation).
 - 3 If you see a message (on the console) that incorrect NVSRAM settings have been fixed, immediately restart the RAID controller unit so the new settings can take effect. If you suspect that the NVSRAM settings for the module's controllers may not be set properly to run this software, use RAID Manager For DOS™ to verify your NVSRAM settings or call your Customer Services Representative.
-

Table 18: Troubleshooting Generally Applicable to All Applications (continued)

A RAID controller unit is listed that I have removed from my system.

CAUSE The storage management software does *not* automatically remove modules from configuration; thus, a module you remove will continue to be listed in the RAID controller unit Selection box and the Module Selection screen.

ACTION If you wish to remove a RAID controller unit, do the following:

- 1 Physically remove the module from your host system.
 - 2 Choose Select Module.
 - 3 Highlight the module you wish to remove.
 - 4 Select Remove. The RAID controller unit no longer appears in the Module Selection screen or the RAID controller unit Selection Box.
-

I cannot select some options.

CAUSE Some options are grayed out or are unavailable because:

- The selected RAID controller unit does not support that option.
- The option cannot be performed for the item you selected.
- The option is not active until you select some item.
- The option is no longer applicable because a maximum has been reached.

ACTION Recheck your selection and try again.

For more specific information, refer to the Procedures section in the *User's Handbook* that describes the particular option, or consult Online Help, "Why Are Some Options Grayed Out?"

Table 18: Troubleshooting Generally Applicable to All Applications (continued)

“Cannot secure access to the LUNs” message is displayed (operations won’t run for a selected RAID controller unit).

CAUSE Most likely a second application has requested exclusive access to the selected RAID controller unit when some other application has already secured access. Many operations require exclusive access to the affected drive group/LUNs until its operation is completed (this software “locks” these components to secure this access). Also, if the affected LUNs are under some other software’s control, the storage management software cannot gain exclusive access. Either this message is displayed, or the second request is denied and you see an error message indicating that the module has I/Os occurring or filesystems are present.

Operations requiring exclusive access include: Delete for LUNs and File → Reset Configuration (Configuration); formatting a LUN with Options → Manual Recovery → Logical Units (Recovery); and Firmware Upgrade → Offline method (Maintenance/Tuning).

CAUTION If you are using a multi-host configuration, you must use caution when performing the tasks that need exclusive access to ensure that the two hosts do not send conflicting commands to the controllers in the RAID controller units.

ACTION

- 1 Wait for any operation that has secured exclusive access to the LUNs to be completed before performing another operation on the same RAID controller unit.
- 2 If no other storage management software operations are running, and you think another application may be running (from your operating system or third-party software), close the other application, then reselect the storage management software and try again.

Component/module status other than Optimal.

CAUSE Statuses other than Optimal can indicate many things and usually warrant attention because the module is *not* operating in a normal condition.

The most common causes are:

- At least one drive has failed.
- A drive has been replaced and is reconstructing.
- A logical unit is formatting.
- A controller has been placed offline or has failed.
- A module component had failed, such as a power supply or fan.

ACTION For Failed or Offline drives, Dead or Degraded logical units, or Dead controllers (or Offline controllers that you did not place offline), select Recovery Guru/Health Check and follow the step-by-step procedure it provides. For an explanation of the possible drive, LUN, or controller statuses and any recommended action to take, see the online help.

IMPORTANT Do not rely only on logical unit (LUN) status information to determine if a recovery procedure is necessary. For example, if you have hot spares configured for a RAID controller unit and a drive fails, the hot spare takes over for the failed drive. Therefore, you have an Optimal LUN with a failed drive. Depending on how many hot spares you have configured for the module, you can have multiple failed drives and still have an Optimal LUN or only a Degraded LUN.

Recovery Guru/Health Check

This table describes problems you may have in running Recovery Guru/Health Check or the Manual Recovery Options in the Recovery application.

Table 19: Recovery Guru/Health Check Troubleshooting

Recovery Guru/Health Check results take a long time to display.
<p>CAUSE Normally you see Recovery Guru/Health Check's results in a few seconds. However, if you have selected All RAID controller units or there are I/O operations running, you might notice a delay. Also, there could be instances where an unresponsive component or other status change affects the controller's ability to provide a result in Recovery Guru/Health Check, although such occurrences are rare.</p> <p>ACTION If you experience long delays in performing Recovery Guru/Health Check, you might try checking one RAID controller unit at a time or selecting Recovery Guru/Health Check at a time of low system I/O.</p> <p>NOTE A background check occurs at regular intervals for all RAID controller units (results are logged to Message Log); the default setting is five minutes. You can change the frequency of this check by using Options → Log Settings.</p>
Recovery Guru/Health Check doesn't report a drive failure when I remove a drive.
<p>If there is no I/O occurring for that drive, Recovery Guru/Health Check reports an Unresponsive Drive. If there is I/O occurring, the controller will fail the drive (and Recovery Guru/Health Check reports this, too).</p> <p>CAUTION You should <i>never</i> remove drives from a module unless the controller has marked them as failed. Doing so could result in data loss for the affected logical unit/drive group. If you suspect problems with a drive, it is best to select Recovery Guru/Health Check and follow the instructions provided.</p>
Software detects a failure even <i>after</i> I replaced a fan or power supply (recover from a Module Component Failure).
<p>CAUSE The software continues to report the condition as a failure for approximately ten minutes after replacing a fan or power supply due to the controller's polling interval.</p> <p>ACTION Wait for the controller to poll the module (default is ten minutes) after performing this recovery procedure before re-selecting Recovery Guru.</p>
Drive status other than Optimal.
<p>CAUSE You have a Failed, Offline, or Replaced drive (which is reconstructing), or a logical unit is being formatted. For an explanation of possible drive statuses and any recommended action to take, see the Online help.</p> <p>ACTION For Failed or Offline drives, select Recovery Guru/Health Check and follow the step-by-step procedures provided. No action is required if the drives are Replaced or the LUN is Reconstructing or Formatting. However, if the drives remain Replaced and the LUN status was Dead, Recovery Guru/Health Check may report the RAID controller unit as Optimal. If this occurs, you need to manually begin the format process for the LUN/drive group (Options → Manual Recovery → LUNs → Format).</p>

Table 19: Recovery Guru/Health Check Troubleshooting (continued)

Drives continue to fail (fault lights lit).

CAUTION It is possible that a drive channel has failed. A drive channel failure is indicated when all the drives on the same channel are Failed and/or Unresponsive. Depending how the logical units have been configured across these drives, the status of the logical units may be Dead, Degraded, or Optimal (if hot spare drives are in use).

ACTION Select Recovery Guru/Health Check and follow the step-by-step procedure given.

Drive fault light came on *after* I replaced a failed drive.

CAUSE This light may come on momentarily when a drive in a RAID 1, 3, or 5 LUN begins reconstruction.

ACTION Wait a few minutes for the fault light to go off and the drive activity lights to begin flashing steadily. This indicates that reconstruction is occurring. The drive's status changes to Replaced and the logical unit's status changes to Reconstructing.

However, if the fault remains on, select Recovery Guru/Health Check and follow the procedure provided.

Failed Drive status appears, but logical unit status is still Optimal.

CAUSE A drive on the logical unit has failed and a hot spare has taken over for it.

NOTE To see if a hot spare is being used, use List/Locate Drives in the Configuration Application. The hot spare's drive status is either In Use or Standby (not being used).

ACTION Select Recovery Guru/Health Check and follow the procedure provided.

Logical unit status other than Optimal.

CAUSE You have a Failed drive or a Replaced drive which is reconstructing, a logical unit is being formatted, or the LUN is Inaccessible because it is owned by the other controller (possible if the RAID controller unit has an Independent Controller configuration). For an explanation of possible logical unit statuses and any recommended action to take, see the Online Help.

ACTION For Dead or Degraded logical units, select Recovery Guru/Health Check and follow the step-by-step procedures it provides for restoring the logical units. However, if the drives remain Replaced and the LUN status was Dead, Recovery Guru may report the RAID controller unit as Optimal. If this occurs, you need to manually begin the format process for the LUN/drive group (Options → Manual Recovery → LUNs → Format).

LUN status changed to Reconstructing, but no drives have been replaced.

CAUSE A hot spare has taken over for a failed drive and the data is being reconstructed on it. The logical unit's status returns to Optimal as soon as reconstruction is completed.

Table 19: Recovery Guru/Health Check Troubleshooting (continued)

LUN status doesn't change from Reconstructing.

CAUTION This could occur after a Manual Recovery task is completed, especially LUN Reconstruction, or because data was reconstructed on a hot spare (the hot spare drive becomes In Use, the LUN status changes to Reconstructing, but may not return to Optimal when reconstruction is completed).

IMPORTANT If reconstruction was interrupted on a hot spare drive because another drive failed in the same drive group/LUN, the LUN is probably Dead (with two Failed drives) and you have lost data. You should select Recovery Guru\Health Check and follow the procedure provided to replace the newly failed drive.

ACTION Wait for the background monitor to run (default is five minutes) and to update the status, *or* to update immediately, do *one* of the following:

- Re-select the RAID controller unit.
 - Exit and re-enter the application.
-

All Drives in a Drive Group fail.

CAUSE If *all* the drives in a configured drive group fail and are then physically replaced, Recovery Guru/Health check will still show the replaced drives as failed. Their status is not upgraded to Replaced, although the LUN status will show Dead LUN.

ACTION In this case, follow the Recovery Guru\Health Check procedure to reformat the LUNs in the drive group.

IMPORTANT If you turn the power to the RAID controller unit off and then on again, the LUNs in the drive group are deleted, and the replaced drives are returned to the unassigned drive group, still failed. Follow the procedure given in Health Check to recreate the deleted LUNs.

Controller mode is Passive and it doesn't own any LUNs after replacing a Failed controller.

CAUSE After using Recovery Guru to replace the failed controller and Options → Manual Recovery → Controller Pairs to place it back Online, the controller is Optimal but in the Passive mode rather than Active. This is most likely to occur for controller B.

ACTION With the newly replaced controller Optimal, use Controller Mode → Change To Active/Active (Maintenance/Tuning application) to make the controller Active. You can either redistribute drive groups/LUNs during this mode change, or later you can use LUN Balancing (Maintenance/Tuning Application) to assign specific drive group/LUNs to each active controller.

Information is missing in the Options → Manual Recovery → Drives screen.

CAUSE The drives for the selected RAID controller unit are unassigned (that is, they are not part of a configured drive group). For these drives, there is no LUN, RAID Level, or logical unit status to report. However, you should still see information for the drives' location and status.

ACTION Select another module, or use the Configuration application to create logical units using those unassigned drives.

Table 19: Recovery Guru/Health Check Troubleshooting (continued)

No LUN information appears in the Options → Manual Recovery → Logical Units screen.

CAUSE There are no configured logical units for the selected RAID controller unit (that is, all the drives are unassigned). There is no LUN, drive group, RAID Level, or logical unit status to report.

ACTION Select another module, or use the Configuration application to create logical units using those unassigned drives.

Component status isn't updated after a recovery procedure has been performed.

CAUSE A configuration change may not be detected yet. For example, a drive is failed, then replaced and its status becomes Replaced, but does not return to Optimal after reconstruction is completed.

ACTION Try selecting a different RAID controller unit, then switching back and re-selecting Options → Manual Recovery, or exit, then reselect the Recovery application.

Replacing Controllers

Use Recovery Guru/Health Check (Recovery Application) to diagnose and correct problems with your RAID controller unit components. If you are replacing a failed controller and experience problems, use the following procedures as recommended.

Problems Bringing the New Controller Online

You have replaced a controller and saw a message while trying to bring the new controller Online that told you to check your controller connections and if still having problems to consult this section.

Problem Summary

One of the problems that could be preventing you from bringing the controller back online is that the new replacement controller has 2.5.X firmware (or earlier) while the remaining operational controller in your RAID controller unit has 3.X firmware. If this is the problem, you will see a new entry for a RAID controller unit using the Select Module option because the controller with 2.5.X firmware is being recognized as a single-controller RAID controller unit instead of being coupled with the controller with 3.X firmware. If you suspect this is the problem, use the following steps.

1. Exit all storage management applications, except the Recovery Application.

IMPORTANT You need to stop the storage management's background monitor from running during this procedure in Step 2 on page 79. However, doing so means that *none* of the RAID controller units connected to the host will be checked during this time. Be sure to restart the monitor when instructed.

2. Stop the Disk Array Monitor from running.
 - a. Select Control Panel → Services.
 - b. Highlight the Disk Array Monitor service.
 - c. Select Stop.
3. Using the Recovery Application, choose Select Module. Scan the list of RAID controller units displayed. You should see your original RAID controller unit. Do you also see a new entry with the default name of <hostname>_XXX?

No	Yes
Something else is causing the controller not to be brought back online. Consult your Customer Services Representative.	You have the 2.X/3.X problem mentioned above. Go to Step 4.

4. Highlight the new RAID controller unit entry with the default name of <hostname>_XXX and select Remove.
5. Exit ALL storage management applications.
6. Restart the Recovery Application and make sure that the affected RAID controller unit is selected.
7. Select Manual Recovery → Controller Pairs, highlight the controller that is Offline, and select Place Online.

Once the controller is placed Online you see an incompatible firmware detected message. Refer to the next section, "Incompatible Firmware Detected" on page 79.

Incompatible Firmware Detected

You have replaced a controller and saw a message after the new controller was brought Online telling you that incompatible firmware has been detected and to consult this section.

Problem Summary

The correct procedure for upgrading the controller firmware depends on the controller firmware versions of both controllers and the controller slot location of the replaced controller. Use the following steps to determine the correct procedure.

1. Using the Recovery Application, select Module Profile → Controllers and determine the following:

- Record the controller name/ID for both controllers. Be sure to note which is currently controller A and which is controller B. You will need this information to identify the controllers during this procedure.
 - Record the firmware version of both controllers. Be sure to note which version applies to the old controller and which to the new, replaced controller. You will need this information to determine the correct procedure to follow for upgrading the controller firmware.
2. If necessary, restart the Disk Array Monitor Service.
 - a. Select Control Panel → Services.
 - b. Highlight the Disk Array Monitor service.
 - c. Select Start.
 3. Select *only* the replaced controller to upgrade the 3.X firmware using the normal procedure (Maintenance/Tuning → Firmware Upgrade → Offline method).

Consult the *User's Handbook* or online help for further details.

Chapter 8. Getting Help, Service, and Information

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

For example, IBM maintains pages on the World Wide Web where you can get information about IBM products and services, find the latest technical information, and download device drivers and updates. Some of these pages are:

http://www.ibm.com	Main IBM home page
http://www.pc.ibm.com	IBM Personal Computing
http://www.pc.ibm.com/support	IBM Personal Computing Support
http://www.pc.ibm.com/us/desktop/	IBM Commercial Desktop (U.S.)
http://www.pc.ibm.com/us/intellistation/	IBM IntelliStation (U.S.)
http://www.pc.ibm.com/us/netfinity/	IBM Netfinity and PC Servers (U.S.)
http://www.pc.ibm.com/us/options/	IBM Options (U.S.)

You can select a country-specific Web site from these pages.

Help is also available from bulletin boards and online services, as well as by fax and telephone. This section provides information about these sources.

Services available and telephone numbers listed are subject to change without notice.

Service Support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Personal Computer HelpCenter (1-800-772-2227 in the U.S.) for hardware product assistance covered under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- Problem Determination - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.

- IBM Hardware Repair - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- Engineering Change Management - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your computer when you call.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts
- All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXXX.
- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to the IBM Statement of Limited Warranty for a full explanation of IBM's warranty terms.

Before You Call for Service

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your computer also contains information about the diagnostic tests you can perform.

If you receive a POST error code when you turn on your computer, refer to the POST error-message charts in your hardware documentation. If you do not receive a POST error code, but suspect a hardware problem, refer to the troubleshooting information in your hardware documentation or run the diagnostic tests.

If you suspect a software problem, consult the documentation (including README files) for the operating system or application program.

Getting Customer Support and Service

Purchasing an IBM PC hardware product entitles you to standard help and support during the warranty period. If you need additional support and services, a wide variety of extended services are available for purchase that address almost any need.

Using Electronic Support Services

If you have a modem, you can get help from several popular services. Bulletin boards and online information services provide assistance through question-and-answer message areas, live chat rooms, searchable databases, and more.

Technical information is available on a wide range of topics, such as:

- Hardware setup and configuration
- Preinstalled software
- OS/2, DOS, and Windows
- Networking
- Communications
- Multimedia

In addition, the latest device driver updates are available.

The IBM Bulletin Board System (BBS) can be reached 24 hours a day, 7 days a week. Modem speeds of up to 14,400 baud are supported. Long distance telephone charges might apply. To access the IBM BBS:

- In the U.S., call 1-919-517-0001.
- In Canada:

- In Montreal, call 514-938-3022.
- In Toronto, call 905-316-4255 or 416-956-7877.
- In Vancouver, call 604-664-6464.

- In the U.K., call 01256 336655.

Commercial online services that contain information about IBM products include:

- CompuServe

Use the following GO words: APTIVA, IBMPS2, ThinkPad, PowerPC, ValuePoint, IBMSVR, or IBMObI.

- PRODIGY

Use the Jump command; type **IBM** and select **PC Product Support**.

- America Online

Use the “Go to” keyword **IBM Connect**.

Using the World Wide Web

On the World Wide Web, the IBM Personal Computing Web site has up-to-date information about IBM Personal Computer products and support. The address for the IBM Personal Computing home page is:

<http://www.pc.ibm.com>

You can find support information for your IBM products, including supported options, on the IBM Personal Computing Support page at:

<http://www.pc.ibm.com/support>

If you select Profile from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. You will have the information you need, all in one place.

In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products. You also can access online support forums, which are community sites monitored by IBM support staff.

For information about specific Personal Computer products, visit the following pages:

<http://www.pc.ibm.com/us/intellistation/>

<http://www.pc.ibm.com/us/desktop/>

<http://www.pc.ibm.com/us/netfinity/>

<http://www.pc.ibm.com/us/thinkpad/>

<http://www.pc.ibm.com/us/options/>

<http://www.pc.ibm.com/us/aptiva/>

You can select a country-specific Web site from these pages.

Getting Information by Fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada you can receive by fax marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs). You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine.

To access the IBM Automated Fax System, do the following:

- In the U.S., call 1-800-426-3395.
- In Canada, call 1-800-465-3299.

Getting Help Online

Online Housecall is a remote communication tool that allows an IBM technical-support representative to access your PC by modem. Many problems can be remotely diagnosed and corrected quickly and easily. In addition to a modem, a remote-access application program is required. This service is not available for servers. There might be a charge for this service, depending on the request.

For more information about configuring your PC for Online Housecall:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-565-3344.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Getting Help by Telephone

During the warranty period, you can get help and information by telephone through the IBM PC HelpCenter. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your computer and IBM monitor

- Installing and setting up IBM options purchased from IBM or an IBM reseller
- 30-day, preinstalled-operating-system support
- Arranging for service (on-site or carry-in)
- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased an IBM PC Server or IBM Netfinity Server, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface cards
- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine Type and Model
- Serial numbers of your computer, monitor, and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

If possible, be at your computer when you call.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.¹

Country	Telephone number
Austria	1-546 585 075
Belgium - Dutch	02-717-2504
Belgium - French	02-717-2503
Canada	1-800-565-3344
Denmark	3-525-6905

1. Response time will vary depending on the number and complexity of incoming calls

Finland	9-22-931805
France	01-69-32-40-03
Germany	069-6654-9003
Ireland	01-815-9207
Italy	02-4827-5003
Luxembourg	298-977-5060
Netherlands	020-504-0531
Norway	2-305-3203
Portugal	01-791-5147
Spain	091-662-4270
Sweden	08-632-0063
Switzerland - German	01-212-1810
Switzerland - French	022-310-0418
Switzerland - Italian	091-971-0523
United Kingdom	01475-555555
U.S.A. and Puerto Rico	1-800-772-2227

In all other countries, contact your IBM reseller or IBM marketing representative.

Getting Help Around the World

If you travel with your computer or need to move it to another country, you can register for International Warranty Service. When you register with the International Warranty Service Office, you will receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM PC products.

For more information or to register for International Warranty Service:

- In the U.S. or Canada, call 1-800-497-7426.
- In Europe, call 44-1475-893638 (Greenock, U.K.).
- In Australia and New Zealand, call 61-2-9354-4171.

In all other countries, contact your IBM reseller or IBM marketing representative.

Purchasing Additional Services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and name might vary by country.

Enhanced PC Support Line

Enhanced PC Support is available for desktop and mobile IBM computers that are not connected to a network. Technical support is provided for IBM computers and IBM or non-IBM options, operating systems, and application programs on the Supported Products list.

This service includes technical support for:

- Installing and configuring your out-of-warranty IBM computer
- Installing and configuring non-IBM options in IBM computers
- Using IBM operating systems in IBM and non-IBM computers
- Using application programs and games
- Tuning performance
- Installing device drivers remotely
- Setting up and using multimedia devices
- Identifying system problems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Enhanced PC Support, see "900-Number Operating System and Hardware Support".

900-Number Operating System and Hardware Support

In the U.S., if you prefer to obtain technical support on a pay-as-you go basis, you can use the 900-number support line. The 900-number support line provides support for IBM PC products that are out of the warranty period.

To access this support, call 1-900-555-CLUB (2582). You will be notified of the charge per minute.

Network and Server Support Line

Network and Server Support is available for simple or complex networks made up of IBM servers and workstations using major network operating systems. In addition, many popular non-IBM adapters and network interface cards are supported.

This service includes all of the features of the Enhanced PC Support Line, plus:

- Installing and configuring client workstations and servers
- Identifying system problems and correcting problems on the client or the server
- Using IBM and non-IBM network operating systems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit.

Ordering Support Line Services

Enhanced PC Support Line and Network and Server Support Line services are available for products on the Supported Products list. To receive a Supported Products list:

In the U.S.:

1. Call 1-800-426-3395.
2. Select document number 11683 for Network and Server support.
3. Select document number 11682 for Enhanced PC support.

In Canada, contact IBM Direct at 1-800-465-7999, or:

1. Call 1-800-465-3299.
2. Select the HelpWare catalog.
3. In all other countries, contact your IBM reseller or IBM marketing representative.

For more information or to purchase these services:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your HelpCenter.

Warranty and Repair Services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- Carry-in service to on-site service

If your warranty provides carry-in repair service, you can upgrade to on-site repair service, either standard or premium. The standard upgrade provides a trained servicer within the next business day (9 a.m. to 5 p.m., local time, Monday through Friday). The premium upgrade provides 4-hour average response, 24 hours a day, 7 days a week.

- On-site service to premium on-site service

If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. Warranty and Repair Services offers a variety of post-warranty maintenance options, including ThinkPad EasyServ Maintenance Agreements. Availability of the services varies by product.

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4968.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Ordering Publications

Additional publications are available for purchase from IBM. For a list of publications available in your country:

- In the U.S., Canada, and Puerto Rico, call 1-800-879-2755.
- In other countries, contact your IBM reseller or IBM marketing representative.

Appendix A. Specifications

This appendix describes the configuration specifications for this software.

Hardware Specifications

The following Host-RAID controller unit configurations are supported.

- **Single-Host Configuration** — one host machine is connected by two fibre channel loops to each controller in a RAID controller unit.
- **Independent Controller Configuration** — two host machines are connected to a dual-controller RAID controller unit. One host machine is connected by a Fibre Channel loop to one controller, and a second host machine is connected by another Fibre Channel loop to the other controller.
- **Multi-Host Configuration** — A pair of servers each with host adapters connected to one or more RAID controller units. Windows NT requires a Cluster Server environment.

NOTE For an explanation of a RAID controller unit, see the “Common Definitions” section in the *User’s Handbook* or the Online Help glossary. For more information on the types of Host-RAID controller unit configurations supported by the storage management software, see the “Module Configurations” section in the *User’s Handbook*.

Host Adapter Information

Currently the only Fibre Channel host adapter that has been tested is the IBM Netfinity Fibre Channel PCI adapter.

For the latest information on supported host adapters, drivers, installation procedures, and so on, consult the IBM Web site. (See "Chapter 8. Getting Help, Service, and Information")

Fibre Channel Hubs

The storage management software was tested with the IBM Netfinity Fibre Channel Hub.

Firmware Specifications

The 4766 Controller requires firmware version 3.0 or later.

Cluster Server References

Depending on the number of host adapters in each server, the Cluster Server may use either a single- or dual-bus configuration.

The following references are provided for component-specific documentation if needed:

- *Microsoft Clustering For Windows NT Server Administrator's Guide*
- *IBM Netfinity Server documentation for your server*

Appendix B. Notices

Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

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