



RAID Array 7000 Fibre Channel Cluster Solutions for Windows NT

Installation Guide

EK-NTC7K-IG. A01

Digital Equipment Corporation
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Revision Record

This Revision Record provides a concise publication history of this manual. It lists the manual revision levels, release dates, and reasons for the revisions.

The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the Revision Level column, with the last entry denoting the latest revision.

This publication supports the StorageWorks RA7000 subsystem configured with a StorageWorks, 9-port, unmanaged, fibre channel hub (DHGGA-CA), to two host servers running the Windows NT operating system, and each containing a StorageWorks KGPSA fibre channel host adapter. NT Cluster software is supported by this publication.

Revision Level	Date	Summary of Changes
EK-NTC7K-IG. A01	July 1998	Original release

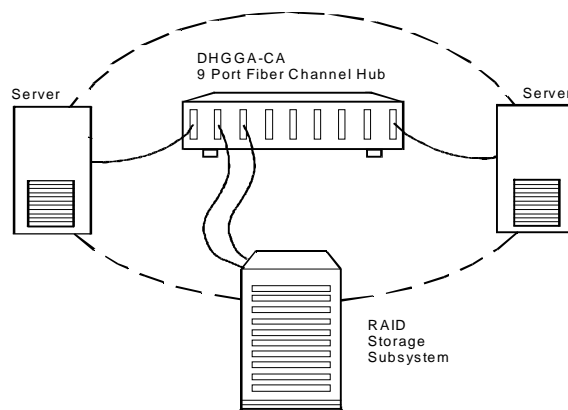
About This Guide

This section provides an overview of the RA7000 fibre channel cluster concept for Windows NT, and defines the scope and conventions of this guide. It also identifies the associated reference documentation, and the StorageWorks sales, service, and technical support contacts worldwide.

An Overview of RA7000 Fibre Channel Cluster Solutions for Windows NT

A RAID fibre channel (FC) cluster enables two host servers running the Windows NT operating system, to share an RA7000 FC storage subsystem through an FC arbitrated loop, via a 9-port FC hub, with Windows NT Cluster software. Should a failure on a server occur, the failure is detected and the storage I/O is re-routed through to the functioning server. This process, called failover, requires no resource downtime - ensuring the high availability of data. The failed component(s) can be warm-swapped or serviced while functioning components remain active.

Figure 1 RA7000 Fibre Channel Cluster Concept



SHR-1127

Audience

This guide is intended for administrators and system integrators of NT-based host servers and StorageWorks RA7000 FC subsystem equipment. Setting up a fibre channel cluster requires a general understanding of server networks, RAID storage concepts, Windows NT Cluster software and fibre channel hardware configurations. Or, contact your service representative for installation assistance.

Supported Configurations:

The fibre channel cluster configurations supported by this guide are as follows:

- 1 StorageWorks RA7000 FC subsystem (with a single or dual-controllers)
- 1 StorageWorks fibre channel hub, 9-port, unmanaged (DHGGA-CA)
- 2 Windows NT host servers
- 1 StorageWorks KGPSA fibre channel adapter, per host server
- For a *single controller* configuration - use host port 1 as the active port, with units D0 through D7 available.
- For a *dual controller* configuration - use host port 1 on the top controller as the active port, with units D0 through D7 available. Use host port 1 on the bottom controller as the standby port. This is the port that will take over in the event the active controller fails.
- Maximum cable lengths: 10M from the host to the fibre hub.
5M from the hub to the RAID array.
- FC Arbitrated Loop Physical Address hard mode only

Document Structure

This guide contains the following chapters:

Getting Started

This section provides a roadmap to serve as the master procedural guide for establishing a fibre channel cluster.

Chapter 1: Installing Hardware for a Fibre Channel Cluster

This chapter provides the procedures for installing the hardware components of the RA7000 fibre channel cluster, including the two NT host servers and a shared StorageWorks RA7000 subsystem through a 9-port fibre channel hub.

Chapter 2: Installing Software for a Fibre Channel Cluster

This chapter identifies the software setups, in sequence, required to prepare the StorageWorks RA7000 subsystem and two NT host servers for a fibre channel cluster environment.

Appendix A: Troubleshooting

This appendix describes how to troubleshoot the RA7000 fibre channel cluster.

Appendix B: Valid ALPA Settings

This appendix provides a table of the valid arbitrated loop physical addresses (ALPA) available for hard addressing the fibre channel arbitrated loop (FC-AL).

Associated Documents

In addition to this guide, the following documentation is useful to the reader:

Table 1 Associated Documents

Document Title	Order Number
<i>Getting Started - RAID Array 7000 Fibre Channel for Windows NT Server, Intel</i>	AA-RDY8A-TE
<i>DIGITAL StorageWorks HSG80 Array Controller ACS Version 8.2 User's Guide</i>	EK-HSG80-UG. B01
<i>DIGITAL StorageWorks UltraSCSI RAID Enclosure (BA370-Series) User's Guide</i>	EK-BA370-UG
<i>The RAIDBOOK—A Source for RAID Technology</i>	RAID Advisory Board
<i>Fibre Channel Arbitrated Loop Hub (DS-DHGGA-CA)</i>	EK-DHGGA-UG
<i>KGPSA PCI-to-Fibre Channel Host Adapter User's Guide</i>	EK-KGPSA-UG

Conventions

In this guide, references to RAID, RAID subsystem, *StorageWorks RAID Array*, *HSG80*, *controller*, or *subsystem* pertain to the following:

- RAID Array 7000 fibre channel subsystem

Fibre Channel is abbreviated as FC in this guide.

This guide uses the following documentation conventions:

Table 2 Style Conventions

Style	Meaning
boldface monospace type	To be input by the user.
<i>italic type</i>	For emphasis, manual titles, utilities, menus, screens, and filenames.
plain monospace type	Screen text.

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Support and Services

Who to contact in the Americas

Information and Product Questions:	Local Sales Office / StorageWorks Hotline 1-800-786-7967
Installation Support:	Contact the DIGITAL Distributor where the Storage Solution was Purchased / Local Digital Sales Office.
<u>DIGITAL Multivendor Customer Service (MCS)</u>	
Installation	Contact the DIGITAL Customer Support Center (CSC).
Warranty	Contact the DIGITAL Customer Support Center (CSC) for warranty service after solution is installed and operating.
Remedial	Contact the DIGITAL Customer Support Center (CSC)
	Note: A Service Contract is recommended when the equipment is out of warranty. Contact the local DIGITAL Sales Office.
Customer Support Center (CSC)	1- 800-354-9000

Who to contact in Europe

Information and Product Questions, Installation Support, and Installation:	Contact the DIGITAL Distributor or reseller from whom the Storage Solution was purchased.
For Warranty Service	See the Warranty Card packaged with the product.
For Remedial Service	Contact the DIGITAL Distributor or reseller from whom the Storage Solution was purchased.
	Note: A Service Contract is recommended when the equipment is out of warranty.

Who to contact in Asia Pacific

For all services, contact the DIGITAL Distributor or reseller from whom the equipment was purchased.

Getting Started

This section contains a roadmap to serve as your master guide for establishing a fibre channel cluster between two NT host servers and a shared RAID Array 7000 (RA7000) storage subsystem. This roadmap presides over all other documentation supplied with your equipment, and refers to those resources as more technical depth is required.

NOTE: Depending on your current system environment, you may not need to perform all tasks on this roadmap.

RA7000 Fibre Channel Clusters for Windows NT

- - - - - RoadMap - - - - -

STEP	PERFORM THIS PROCEDURE...	DESCRIBED IN...
□ 1	Unpack and Setup the RAID Subsystem	<i>Getting Started - RAID Array Fibre Channel for Windows NT Server (Intel), – Chapter 1</i>
□ 2	Cable the RAID Subsystem Fibre Channel Cluster Components	<i>RAID Array 7000 Fibre Channel Cluster Solutions for Windows NT – Chapter 1</i>
□ 3	Install RAID Manager (SWCC) Software and Create the RAID StorageSets	<i>Getting Started - RAID Array Fibre Channel for Windows NT Server (Intel), – Chapter 4</i>
□ 4	Perform Software Setups Required for a Cluster, Including... <ul style="list-style-type: none">◇ Prepare the RA7000 for a Cluster◇ Prepare Host A for a Cluster◇ Prepare Host B for a Cluster◇ Install and Configure Cluster Software	<i>RAID Array 7000 Fibre Channel Cluster Solutions for Windows NT – Chapter 2</i>

After these steps have been successfully completed in sequence, your RA7000 fibre channel cluster for Windows NT will be operational.

1

Installing Hardware for a Fibre Channel Cluster

This chapter provides the procedures for installing the hardware components of the RA7000 fibre channel cluster, including the two NT host servers and a shared StorageWorks RA7000 subsystem through a DHGGA fibre channel hub.

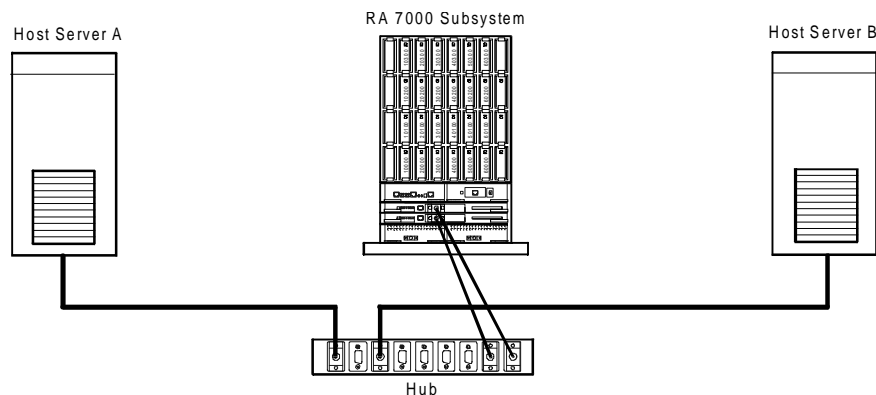
1.1 Summary

A Windows NT Cluster configuration, using fibre channel as the I/O interconnect, consists of two Windows NT servers, one RA7000 Fibre Channel RAID subsystem and one DHGGA fibre channel hub.

Each Windows NT server is limited to one KGPSA PCI-to-Fibre Channel adapter. Only one host fibre channel port, per HSG80 controller, can be connected to the fibre channel hub.

The fibre channel media that is supported with Windows NT Clusters is a copper serial cable. Each copper cable configured in a Windows NT Cluster must connect to the same fibre channel hub. Reference Figure 1-1.

Figure 1-1 Overview of Fibre Channel Cluster Cabling



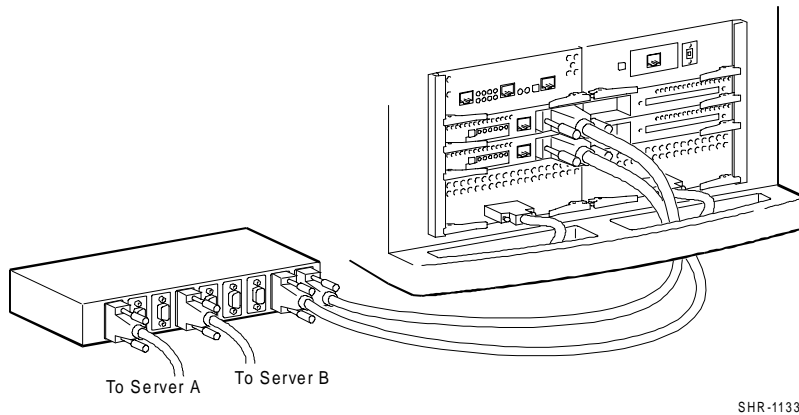
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1.2 Connecting the Cluster Components

The Windows NT Cluster fibre channel configuration imposes a maximum cable length of 10 meters from the server to the hub. The length of each cable connecting the hub to the RA7000 FC subsystem can be a maximum of 5 meters.

Only fibre channel host port 1 on the RA7000 FC subsystem can be used in a Windows NT cluster configuration. The same port number must be used in a dual redundant HSG80 controller configuration. Refer to Figure 1-2.

Figure 1-2 Detail of Fibre Channel Cluster Cabling



NOTE

Additional NT cluster configurations will be supported in a future release of the RA7000 Fibre Channel ACS software.

1.3 Fibre Channel Physical (Hard) Addressing

Windows NT Clusters requires **hard addressing** for all FC Arbitrated Loop (FC-AL) ports. In a Windows NT cluster configuration, an FC-AL port consists of the FC host adapter in a Windows NT server and the host port in the RA7000 FC subsystem. Each port must have a unique arbitrated loop physical address, known as an ALPA. StorageWorks recommends using the following FC-AL addresses:

FC-AL Component	ALPA Setting
FC Host Adapters	1 and 2
RA7000 Host Port	EF

Refer to Appendix B for a complete list of all ALPA settings.

2

Installing Software for a Fibre Channel Cluster

This chapter identifies the software setups, in sequence, required to prepare the StorageWorks RA7000 subsystem and two NT host servers for a fibre channel cluster environment.

2.1 Designating Servers as Host A and Host B

A cluster environment requires sets of software procedures to be performed one host server at a time. Therefore, the servers must be clearly designated in your mind as Host A and Host B prior to the setup process. If both servers are new, either one can be designated as Host A, and the other, Host B.

However, if you are adding a second server (only) to an existing RAID subsystem environment, this documentation assumes it will be designated as Host B, and the existing server as Host A.

Server designation must remain constant through the configuration process.

2.2 Software Setup Summary for a Fibre Channel Cluster

The software setup procedures required for a cluster are presented in this section in the order that they must occur, which is as follows:

- Prepare the Fibre Channel RAID Subsystem for a Cluster
- Prepare Host A for a Cluster
- Prepare Host B for a Cluster
- Install and Configure Windows NT Cluster Software on *both* host servers.

After completing these four main procedures in sequence, as described in Sections 2.3 through 2.4, you will have successfully established a fibre channel cluster between the shared RA7000 subsystem and the two host servers.

2.3 Checklist for Preparing the RA7000, Host A and Host B for a FC Cluster

The procedures for preparing the FC RAID Array 7000, and each host server for a cluster are provided in checklist format, below. Detailed procedures follow.

RA7000 :

- Change the RA7000 Port Topology to LOOP_HARD
- Assign an Arbitrated Loop Physical Address (ALPA) to the RA7000 Host Port
- Reboot the RA7000 Subsystem

Host A:

On HOST A (with Host B powered down):

- Install the KGPSA Fibre Channel Host Adapter Device Driver
- Prepare for the HszInstall FC Utility Installation (only if NTFS partition drive letters have been previously assigned for your subsystem)
- Run the HszInstall FC Utility (See NOTE below)
- Reboot the server (Host A)
- Reassign Previous NTFS Partition Drive Letters **or** Create New NTFS Partition Drive Letters

Host B:

On HOST B (Host A can remain powered up)

- Install the KGPSA Fibre Channel Host Adapter Device Driver
- Prepare for the HszInstall FC Utility Installation (temporarily de-assign NTFS partition drive letters)
- Run the HszInstall FC Utility (See NOTE below)
- Reboot the server (Host B)
- Reassign NTFS Partition Drive Letters

NOTE

NOTE: You must run the HszInstall Utility even if you have previously installed the HszDisk driver. This utility will correctly set the ALPA and registry parameters for the KGPSA.

2.3.1 Procedures for Preparing the RA7000 for a FC Cluster

This section describes how to perform the following steps required to prepare the RA7000 to operate in a Fibre Channel Arbitrated Loop:

1. Change the RA7000 Port Topology
2. Assign an Arbitrated Loop Physical Address (ALPA) to the Host Port

NOTE

As described in this section, both steps involve issuing CLI commands specific to your single-controller or dual-controller configured RA7000 subsystem. Refer to your *Getting Started - RAID Array 7000 Fibre Channel for Windows NT Server* (Intel) Installation Guide for additional information on CLI commands.

2.3.1.1 Changing the RA7000 Port Topology

The RA7000 in a FC Arbitrated Loop requires that the default port topology be changed from LOOP_SOFT to LOOP_HARD for port 1. The default port topology for port 2 must be changed to OFFLINE. Change the RA7000 port topologies by issuing the following configuration-specific commands at the CLI prompt:

Single-Controller RA7000 subsystem-

To change the default port topology of a single-controller RA7000 controller, issue the following set of CLI commands:

```
SET THIS_CONTROLLER PORT_1_TOPOLOGY = LOOP_HARD  
SET THIS_CONTROLLER PORT_2_TOPOLOGY = OFFLINE
```

Two-Controller, Dual Redundant RA7000 subsystem-

To change the default port topology of a dual-controller RA7000 subsystem (which must be in dual-redundant mode), issue the following set of CLI commands:

```
SET OTHER_CONTROLLER PORT_1_TOPOLOGY = LOOP_HARD  
SET OTHER_CONTROLLER PORT_2_TOPOLOGY = OFFLINE
```

2.3.1.2 Assigning an ALPA to the RA7000 Host Port

The RA7000 in an FC Arbitrated Loop requires that an Arbitrated Loop Physical Address (ALPA) setting be assigned to its host port. StorageWorks recommends that ALPA setting *EF* be assigned to the RA7000 host port, as follows:

Single-Controller RA7000 subsystem-

Set the host port ALPA of a single controller RA7000 by issuing the following command at the CLI prompt:

```
SET THIS_CONTROLLER PORT_1_AL_PA=EF
```

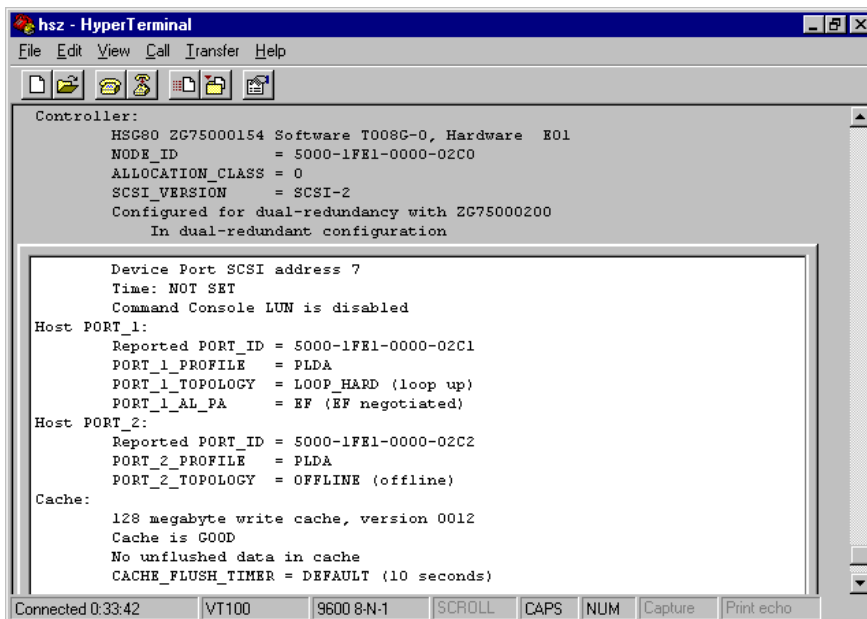
Two-Controller, Dual Redundant RA7000 subsystem-

Set the host port ALPA of a dual-redundant RA7000 by issuing the following command at the CLI prompt:

```
SET OTHER_CONTROLLER PORT_1_AL_PA=EF
```

You will need to reboot your RA7000 controllers after completing the above steps. Figure 2-1 illustrates the RA7000 FC subsystem controller information after implementing the above commands.

Figure 2-1 RAID Controller Port Topology Changed



2.3.2 Procedures for Preparing Both Host Servers for a FC Cluster

Perform all of the steps in this section on Host A, while Host B is powered down. When finished, power up Host B and repeat all of the steps on Host B.

NOTE

Follow normal procedures to **power down Host B** before preparing Host A for a cluster.

2.3.2.1 Installing the Fibre Channel Host Adapter Device Driver

The fibre channel host adapter device driver (software module) is provided with your newly installed fibre channel host adapter. Install the fibre channel host adapter device driver for your Intel server platform as described in Chapter 3 of your *Getting Started - RAID Array Fibre Channel for Windows NT Server* guide.

2.3.2.2 Preparing for the HszInstall FC Utility Installation

NOTE

This procedure is required *only if NTFS drive letter assignments have already been created* for the RAID subsystem. If NTFS drive letters have **not** yet been created, please ignore this step and proceed to Section 2.3.2.3, “*Running the HszInstall Utility*”.

Installing the HszInstall FC utility automatically installs the HszDisk class driver, checks the event log for SCSI miniport and class driver errors, checks the FC adapter driver version, and sets Windows NT registry device driver parameters.

Running the HszDisk class driver when NTFS partitions exist on the RAID subsystem causes Windows NT to reassign the drive letters. (HszDisk inserts all RAID array-based partitions ahead of any local (non-shared bus) partitions. Windows NT would, for example, reassign drive letter C from your system disk to the first NTFS formatted storage set partition, Disk 0).

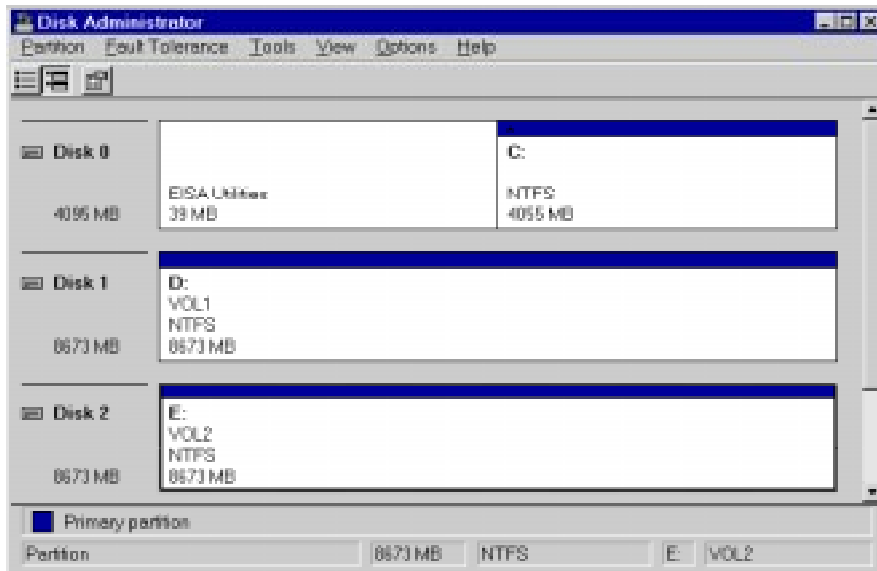
Since drive letter reassignments by the HszDisk class driver could invalidate your drive mappings, **you must temporarily remove NTFS drive letter assignments** for all partitions on the RAID Array prior to installing the HszDisk driver.

DO NOT REMOVE THE DRIVE LETTERS FOR LOCAL DRIVES OR THE BOOT PARTITION.

To remove drive letter assignments temporarily, follow these steps:

1. Start Disk Administrator. Figure 2–2 shows the Disk Administrator window displaying current partitions.

Figure 2–2 Current Partitions



2. Label your partitions, if they are not already labeled, so that you can distinguish each one.
3. Record the drive letters currently associated with each of the partition labels.
4. Click on a (RAID Array-based) partition.
5. From the *Tools* menu select *Assign Drive Letter*.

The Assign Drive Letter dialog box appears, similar to Figure 2–3.

Figure 2-3 Assign Drive Letter



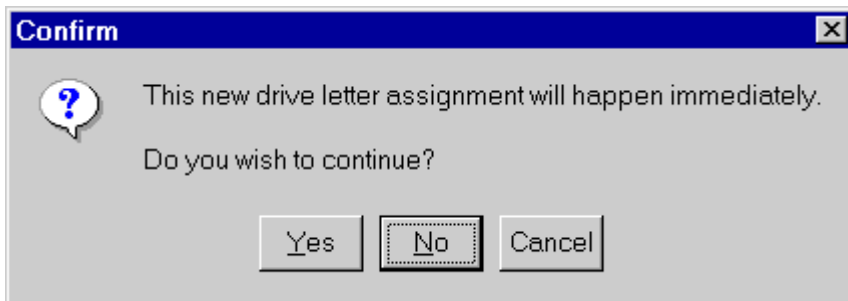
6. Click the *Do not assign a drive letter* button (as shown in Figure 2-4) and then click OK.

Figure 2-4 Do Not Assign a Drive Letter



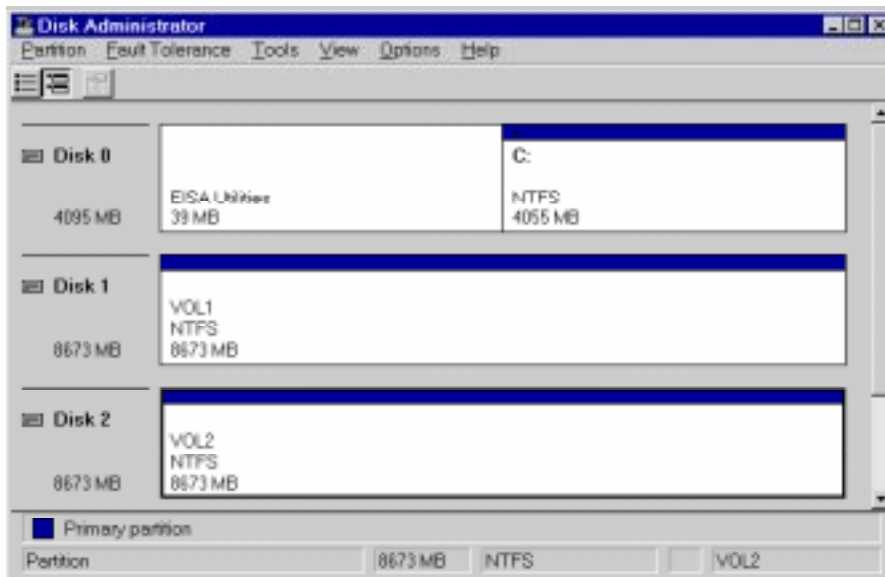
A confirmation dialog box appears as shown in Figure 2-5.

Figure 2-5 Drive Letter Confirmation



7. Click Yes. The partition now appears without a drive letter designator similar to the screen shown in Figure 2-6.

Figure 2-6 No Drive Letter Assignments



8. Repeat Steps 4 - 7 for each of your partitions except the local and boot partitions.

2.3.2.3 Running the HszInstall FC Utility

NOTE

You must run the HszInstall FC Utility even if you have previously installed the HszDisk driver. This utility will install the version of the KGPSA driver (lpnds35.sys) required for Windows NT clusters and set the ALPA and registry parameters.

Locate the CD-ROM disk labeled *HSG80 Solution SW V8.0B for Windows NT (Intel)*, which contains the HszDisk driver (HszDisk.sys).

Perform the following steps:

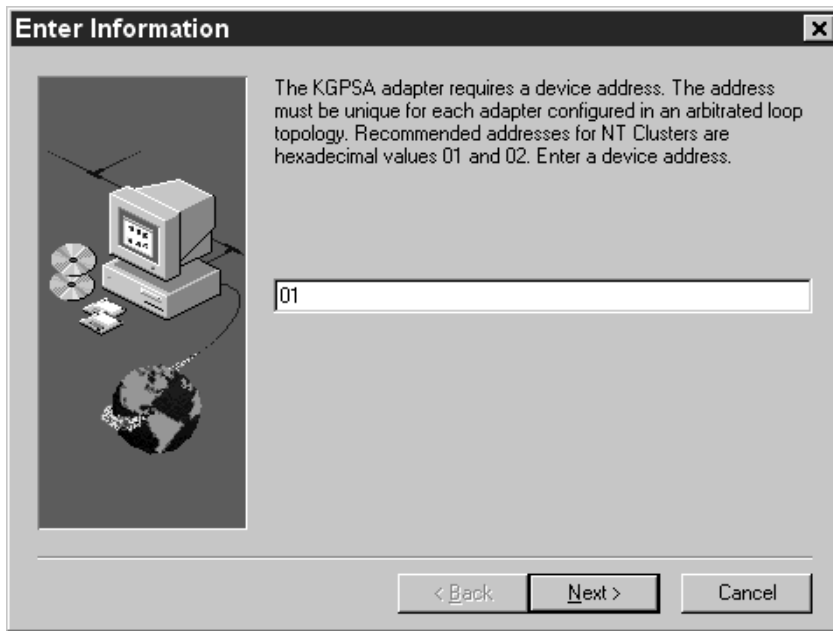
1. Insert the CD-ROM into your CD-ROM drive.
2. Run *File Manager* or *Windows Explorer*.
3. Navigate to the folder: CD\drivers\HZINSTAL\
4. Double click on *Setup*.
5. Follow the instructions in the *Setup* program to complete the installation. The installation process copies the driver into the proper subdirectory and creates the necessary Registry entries.
6. Set the Fibre Channel Host Adapter Address

NOTE:

The KGPSA host adapter and device driver must be installed on your server as described in your adapter guide before setting the ALPA.

The HszInstall FC Utility will set up the required NT driver registry parameters and prompt you to select an arbitrated loop physical address (ALPA) for each of your FC host adapters. StorageWorks recommends using ALPA 1 for host A and ALPA 2 for Host B for the FC host adapters. Refer to Figure 2-7 for an example of selecting an ALPA address. Reference Appendix B for a list of valid ALPA addresses.

Figure 2-7 Selecting an FC Arbitrated Loop Physical Address



7. Reboot the system.

2.3.2.4 Verifying Successful HszDisk Class Driver Installation

Once the host server is rebooted, verify that the HszDisk class driver installed successfully. To verify the HszDisk installation, follow these steps:

1. Open the *Event Viewer* from the *Administrative Tools* group.
2. Locate an information icon in the *Event Viewer* window with HszDisk for the *Source*.
3. Double click on the HszDisk entry and an entry detail screen appears.

The message in the detail screen indicates whether the HszDisk class driver was successfully installed.

Upon successful HszDisk class driver installation, proceed to section 2.3.2.5 to reassign NTFS partition drive letters or create new drive letters if none have yet been created.

2.3.2.5 NTFS Partition Drive Letter Reassignment *or* Creation

IF PREPARING HOST A

If you have not yet created any NTFS partitions on the RAID subsystem, create them now by running the Disk Administrator utility on Host A. After so doing, you will have successfully prepared Host A for a cluster, and must return to Section 2.3.2, "*Procedures for Preparing Both Host Servers for a Cluster*", to repeat the preceding software setups on Host B.

IF PREPARING HOST B

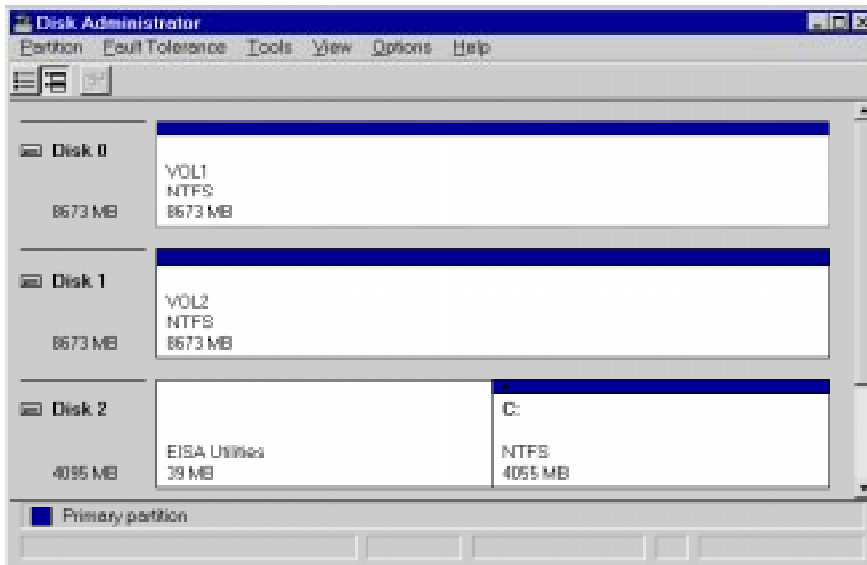
THE SHARED DRIVE LETTERS MUST BE IDENTICAL ON BOTH HOST SERVERS IN A CLUSTER ENVIRONMENT. Reassign the same drive letters to HOST B that you assigned to HOST A, using the following the procedures.

This section describes how to reassign drive letters to NTFS partitions on a host if they were temporarily de-assigned as described in Section 2.3.2.2, “*Preparing for the HszDisk Class Driver Installation*”.

To reassign drive letters, follow these steps:

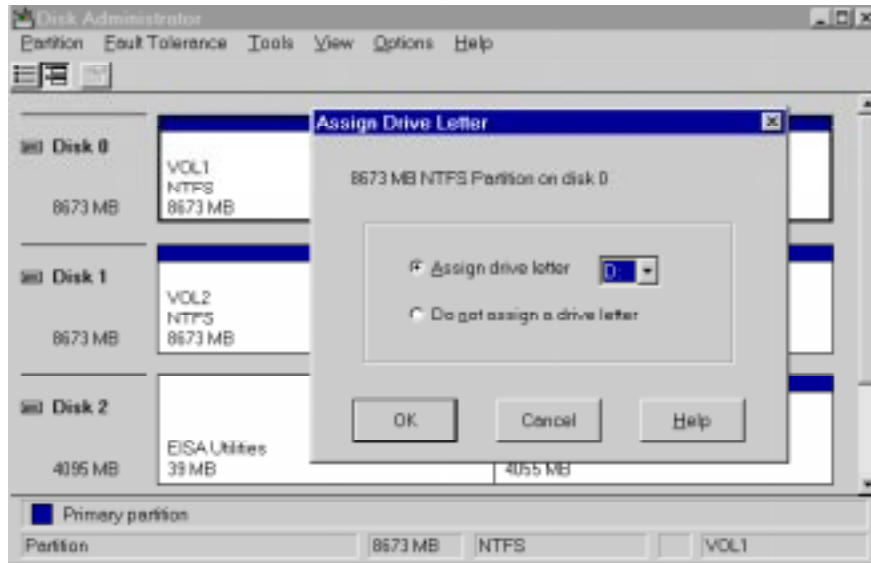
1. Start Disk Administrator. The disk administrator displays all the existing partitions, similar to the window shown in Figure 2-8. (The only partitions with drive letters are the boot partition and any non-disk devices, such as a CD-ROM drive).

Figure 2-8 Partition Appearance - (post HszDisk driver installation)



2. Highlight a (RAID Array storageset) partition and from the *Tools* menu select *Assign Drive Letter*. The Assign Drive Letter window appears displaying the next available drive letter, similar to the window shown in Figure 2-9.

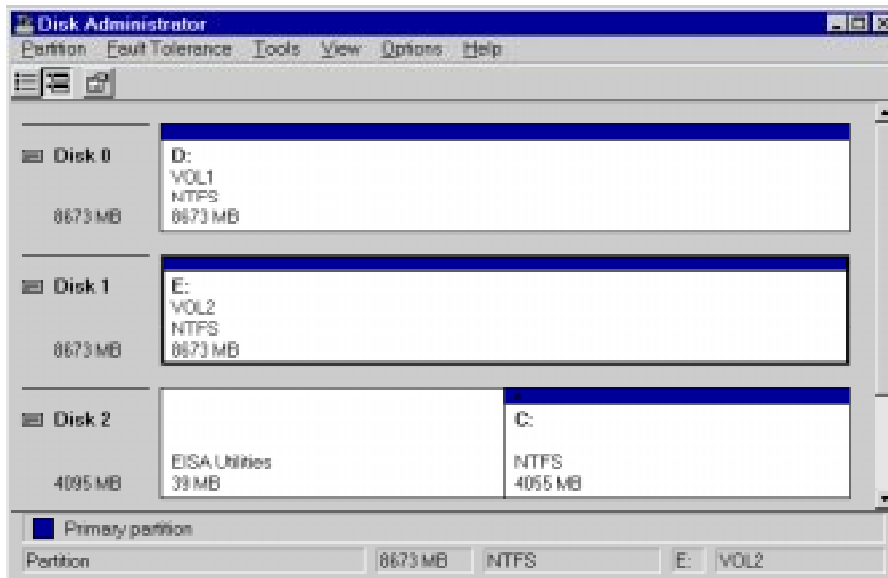
Figure 2-9 Driver Letter Availability



3. Click OK if you want to assign the selected drive letter. Otherwise, click the *Assign drive letter* radio button. Select another drive letter from the pick list and click OK. If the letter you want to assign doesn't appear in the list, Windows NT may have already assigned that letter to the CD-ROM drive. You can de-assign that letter from the CD-ROM to free it for use.
4. At the confirmation dialog box, Click "Yes". The partition now appears with the specified drive letter designator .

5. Repeat Steps 2 through 4 until you have assigned drive letters to all of the partitions that need one, similar to the window shown in Figure 2-10.

Figure 2-10 All the Drive Letters Reassigned



IF PREPARING HOST A

With the NTFS partition drive letters successfully reassigned, or newly created, as applicable, Host A is prepared for a cluster. To prepare Host B, return to Section 2.3.3, “*Procedures for Preparing Both Host Servers for a Cluster*” and repeat all of the preceding steps on Host B.

IF PREPARING HOST B

With the NTFS partition drive letters successfully reassigned, Host B is prepared for a cluster. Proceed to Section 2.4.

2.4 Installing and Configuring NT Cluster Software on Both Host Servers

NOTE

The RA7000, Host A and Host B must be prepared for an FC cluster (see Section 2.3.3) before installing NT Cluster software.

You are now ready to install and configure NT Cluster software on both of your host servers, as described in the manual provided with your cluster software.



Troubleshooting

This appendix describes how to troubleshoot the RA7000 fibre channel cluster.

A.1 Summary

As described in the following sections, troubleshooting the RA7000 Fibre Channel Cluster involves verifying the following characteristics:

- Device Driver Initialization for the FC Host Adapters
- Windows NT Registry Device Driver Parameter Settings
- Connectivity of Cluster Components to the FC Arbitrated Loop

A.1.1 Verifying Device Driver Initialization

A problem with Windows NT's HAL (Hardware Abstraction Layer) may prevent the KGPSA device driver (LP6NDS35.SYS) from initializing during system boot. The consequence of this problem is that none of your devices connected to your FC adapter will be available and the event log entry, depicted in Figure A-1, will be entered in the system event log.

The problem is caused by the Windows NT HAL re-configuring the PCI adapter with conflicting resources. A workaround is available that causes the HAL to use the BIOS assigned defaults, and not to reassign PCI resources. The workaround (from Microsoft) involves editing the BOOT.INI file (use Notepad or edit – you may need to remove the read-only file attribute, (e.g. `attrib -r -h -s c:\boot.ini`), and adding the /PCILOCK option to the system boot entry, and rebooting. (Reference the following example).

Example boot.ini

[boot loader]

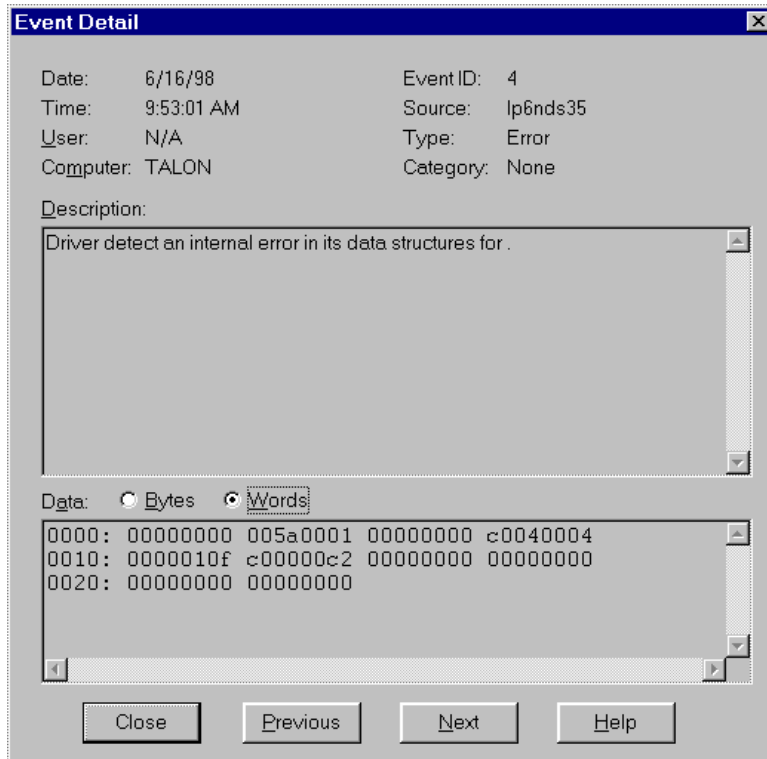
timeout=30

default=multi(0)disk(0)rdisk(0)partition(2)\WINNT

[operating systems]

multi(0)disk(0)rdisk(0)partition(2)\WINNT="Windows NT Server, Enterprise Edition Version 4.00" /**pcilock**

Figure A-1 Event Log Entry



A.1.2 Verify the Windows NT Registry Device Driver Parameters

For proper operation of your RA7000 FC subsystem configured in a Windows NT cluster, the driver parameters in the Windows NT registry must be set correctly. To verify your Windows NT registry settings, locate the registry key in your system (as depicted in Figure A-2) to review the registry setting values and compare them with the correct values that are listed in Table A-1 (where values are *decimal* unless noted). If discrepancies are found, run the HszInstall FC utility and select the *Custom* button. Click on the *KGPSA Adapter Driver Setup* option. This will automatically correct the registry settings configured in your system. Reboot your system after completing the KGPSA Setup.

WARNING

StorageWorks does not recommend using the Registry Editor to adjust registry settings. Fatal system errors may result. Please use the HSZInstall FC Utility. This utility will properly set the registry settings for the KGPSA adapter.

Figure A-2 Windows NT Registry Key

```
HKEY_LOCAL_MACHINE -
  - SYSTEM
    - CurrentControlSet
      - Services
        - Lp6nds35
          - Parameters
            Number of Requests = 50 (decimal)
            Maximum SGList = 33 (decimal)
          - Devices [See Table A-1]
```

Table A-1 Device Driver Parameter Settings

Driver Parameter	Correct Value
QueueTarget	1
QueueDepth	25
HardAIpa*	See Appendix B
RATOV	10
RetryloTimeOut	1
RetryInterval	52
EnableDPC	1
ScanDown	1
ResetFF	0
ResetTPRLO	1

NOTE

*StorageWorks recommends using Hard ALPA values 1 and 2 for the host adapters in a fibre channel Windows NT cluster, when prompted by the HszInstall FC utility.

A.1.3 Verifying Connectivity to the Fibre Channel Arbitrated Loop

Verify that the RA7000 subsystem and the host servers are properly connected to the Fibre Channel Arbitrated Loop as described in this section.

RA7000 Connectivity to the Loop –

Issue the CLI command **show this_controller**, (refer to Figure A-3), to ensure that your RA7000 HSG80 controller is connected to the loop. If the port 1 topology is in an *Offline* state, then refer to the troubleshooting section in your ACS HSG80 User's guide for troubleshooting recommendations.

The port 1 topology should be LOOP_HARD and indicate the port state is *Loop Up* or *Standby*. If one HSG80 controller indicates a Loop Up state then the other controller will be in a Standby state.

NOTE

The port 2 topology should be in an offline state since port 2 is not supported with Windows NT cluster software.

Host Server Connectivity to the Loop –

To verify that your Windows NT servers are connected to the loop, issue the CLI command **show connection**. As shown in Figure A-4, the output of this command shows status information about present and previous connections to the loop. The Unit Address column refers to your Arbitrated Loop Physical Address. The Status Column indicates the port is *On-Line* to the other HSG80 controller.

It is recommended to **rename** the connection-name field to the computer name of your server. This will facilitate your ability to discern loop connections.

Figure A-3 Verifying FC-AL Connectivity of the RA7000 Subsystem

```
HSG80> show this_controller
Controller:
    HSG80 ZG75000154 Software 82W-0, Hardware E01
    NODE_ID           = 5000-1FE1-0000-02C0
    ALLOCATION_CLASS   = 0
    SCSI_VERSION      = SCSI-2
    Configured for dual-redundancy with ZG75000200
        In dual-redundant configuration
    Device Port SCSI address 7
    Time: NOT SET
    Command Console LUN is disabled

Host PORT_1:
    Reported PORT_ID = 5000-1FE1-0000-02C1
    PORT_1_PROFILE   = PLDA
    PORT_1_TOPOLOGY  = LOOP_HARD (loop up)
    PORT_1_AL_PA     = EF (EF negotiated)

Host PORT_2:
    Reported PORT_ID = 5000-1FE1-0000-02C2
    PORT_2_PROFILE   = PLDA
    PORT_2_TOPOLOGY  = OFFLINE (offline)

Cache:
    128 megabyte write cache, version 0012
    Cache is GOOD
    No unflushed data in cache
    CACHE_FLUSH_TIMER = DEFAULT (10 seconds)

Mirrored Cache:
    Not enabled

Battery:
    FULLY CHARGED
    Expires:           WARNING: UNKNOWN EXPIRATION DATE!
    NOCACHE_UPS

Previous controller operation terminated by power failure.
```

Figure A-4 Verifying FC-AL Connectivity of the Host Servers

```
HSG80> show connection
Connection
  Name      Operating system  Controller  Port  Address  Status  Offset
SERVER_A    WINNT             THIS        1     000001   OL other  0
  HOST_ID=1000-0000-C920-3C2B      ADAPTER_ID=1000-0000-C920-3C2B

SERVER_B    WINNT             THIS        1     000002   OL other  0
  HOST_ID=1000-0000-C920-3C20      ADAPTER_ID=1000-0000-C920-3C20
```

B

Valid ALPA Settings

This appendix provides a table of the valid arbitrated loop physical addresses available for hard addressing the fibre channel arbitrated loop.

B.1 Valid ALPA Settings

Table B-1 lists the valid ALPA settings for hard addressing the fibre channel arbitrated loop.

Table B-1 Valid Arbitrated Loop Physical Address (ALPA) Settings

0x01	0x02	0x04	0x08	0x0F	0x10	0x17	0x18	0x1B
0x1D	0x1E	0x1F	0x23	0x25	0x26	0x27	0x29	0x2A
0x2B	0x2C	0x2D	0x2E	0x31	0x32	0x33	0x34	0x35
0x36	0x39	0x3A	0x3C	0x43	0x45	0x46	0x47	0x49
0x4A	0x4B	0x4C	0x4D	0x4E	0x51	0x52	0x53	0x54
0x55	0x56	0x59	0x5A	0x5C	0x63	0x65	0x66	0x67
0x69	0x6A	0x6B	0x6C	0x6D	0x6E	0x71	0x72	0x73
0x74	0x75	0x76	0x79	0x7A	0x7C	0x80	0x81	0x82
0x84	0x88	0x8F	0x90	0x97	0x98	0x9B	0x9D	0x9E
0x9F	0xA3	0xA5	0xA6	0xA7	0xA9	0xAA	0xAB	0xAC
0xAD	0xAE	0xB1	0xB2	0xB3	0xB4	0xB5	0xB6	0xB9
0xBA	0xBC	0xC3	0xC5	0xC6	0xC7	0xC9	0xCA	0xCB
0xCC	0xCD	0xCE	0xD1	0xD2	0xD3	0xD4	0xD5	0xD6
0xD9	0xDA	0xDC	0xE0	0xE1	0xE2	0xE4	0xE8	0xEF

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