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Hitachi TagmaStore®
Adaptable Modular Storage
and Workgroup Modular Storage

NAS Backup Restore User's Guide

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Document Revision Level

Revision	Date	Description
MK-95DF759-00	October 2005	Initial Release
MK-95DF759-01	April 2006	Revision 1, supersedes and replaces MK-95DF759-00.
MK-95DF759-02	May 2006	Revision 2, supersedes and replaces MK-95DF759-01.
MK-95DF759-03	July 2006	Revision 3, supersedes and replaces MK-95DF759-02.

Source Documents for this Revision

- RSD-95DF759-Ed.3(06.30.06)(V4.2)(qcode) including DFNAS_Backup_changes_062906, DFNAS_Backup_062906_body, and DFNAS_Backup_062906_appendix.

Changes in this Revision

- You can now operate the NAS Backup Restore GUI by using Mozilla 1.7 on Solaris 9.
- The formula for estimating the backup media capacity has been changed. See Figure 3.4.
- Quotas set for directories (subtree quotas) can now be backed up. See sections 3.13.5.1, 3.13.5.2, 3.13.9, 3.13.10 and figures Figure 3.13 and Figure 3.15.
- Added new sections including, 3.1.4, 3.7, 3.9.1, 3.13.5, 3.13.5.1, 3.13.5.2, 3.13.5.3, 3.13.9, 3.13.10, 3.15, 4.4, 5.9, 5.10, 5.11, 6.1.3.1, 6.2.2.1, 6.2.2.2, 6.3.2.
- Added new figures including, Figure 3.7, Figure 3.8, Figure 3.9, Figure 3.10, Figure 3.12, Figure 3.13, Figure 3.14, Figure 3.15.
- Added new tables including, Table 3.2, Table 3.3, Table 3.9, Table 5.12, Table 5.14, Table 5.16, Table 5.17, Table B.1 Quota Information Backed Up to , and Table B.2 Quota Info Directory File Attributes and NAS Backup Restore Revised Version.
- Added and updated Quota information in the following sections: 3.2, 3.12, 3.13.2, 3.13.5, 3.13.5.1, 3.13.5.2, 3.13.5.3, 3.13.7.

- Added and updated information about NetBackUp to sections: 3.1.4, 3.7, 3.9, 3.13, 3.13.6, 4.4.3, 6.3.2.
- Added and updated information about tapeadd, tapedel, and tapelist commands to sections: 5.9, 5.10, and 5.11.
- Added information about robot devices to section: 3.1.4.
- Added information about using commands to control tape devices in sections: 4.4, 4.4.1, 4.4.2, and 4.4.3.
- Updated figures including: Figure 3.4, Figure 3.16, Figure 3.20.
- Updated tables including: Table 1.2, Table 4.1.
- Updated command syntax in the following sections: 5.6, 5.7, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.24.
- Updated the command arguments and options in the following sections: 5.6, 5.7, 5.8, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23, 5.24. This includes changes in the following tables: Table 5.3, Table 5.6, Table 5.11,Table 5.13,Table 5.15,Table 5.19,Table 5.21, Table 5.24, Table 5.26, Table 5.28, Table 5.31, Table 5.35, Table 5.37, Table 5.39, Table 5.41, Table 5.43, Table 5.45.
- Yellow highlighting used when text from RSD source was not updated, but also was not in HDS draft.

Preface

This document describes and provides information about using the NAS Backup and Restore functionality to protect shared data within a NAS Manager Modular system. This document is for those who have installed the NAS Backup Restore product and who manage disk subsystem data.

This manual is intended for the following users:

- Account administrators who manage a NAS system.
- Others who operate and manage a NAS Manager system.
- End users of the AMS/WMS NAS Manager system.

This document assumes the following:

- The user is familiar with the operating system and Web browser software on the system hosting the NAS Manager software.
- The user is familiar with the Hitachi TagmaStore® AMS and/or WMS subsystem and has read and understands the appropriate *Storage Navigator Modular Users Guide* listed in the referenced documents on the next page.
- The user is familiar with CIFS, network-attached storage (NAS), NFS®, UNIX® and LINUX®. The user should also understand disk arrays and co-operating backup management software.

Notes:

- In this document the term "Adaptable Modular Storage (AMS)" refers to all models of the TagmaStore AMS subsystem, unless otherwise noted.
- In this document the term "Workgroup Modular Storage (WMS)" refers to all models of the TagmaStore WMS subsystem, unless otherwise noted.
- The NAS Manager screens shown in this document were captured on a Windows® system with the Internet Explorer Web browser. The NAS Manager screens may display differently on other operating systems and browsers.
- The first occurrence of a word in the glossary is italicized.

Note: The use of NAS Manager and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Software Version

This document revision applies to NAS Manager Version 4.2 and higher.

Release Notes

The Release Notes for this product (located on the installation CD) contain requirements and/or restrictions that may not be fully described in this document. The Release Notes may also contain updates and/or corrections to this document. Make sure to read the Release Notes before installation and use of the product.

Convention for Storage Capacity Values

This document uses the following convention for storage capacity values:

1 KB (kilobyte) = 1,024 bytes
1 MB (megabyte) = $1,024^2$ bytes
1 GB (gigabyte) = $1,024^3$ bytes
1 TB (terabyte) = $1,024^4$ bytes

Storage capacity values for hard disk drives (HDDs) on the AMS/WMS are calculated based on the following values:

1 KB (kilobyte) = 1,000 bytes
1 MB (megabyte) = $1,000^2$ bytes
1 GB (gigabyte) = $1,000^3$ bytes
1 TB (terabyte) = $1,000^4$ bytes

Referenced Documents

- **Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage**
  - *Command Control Interface (CCI) User and Reference Guide* (MK-95DF701).
  - *ShadowImage™ In-System Replication Software User's Guide* (MK-95DF709).
  - *Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712).
  - *Storage Navigator Modular for Web User's Guide* (MK-95DF719).
  - *Storage Navigator Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711).
  - *NAS Error Codes* (MK-95DF760).
  - *NAS Manager Modular User's Guide* (MK-95DF757).
  - *NAS Sync Image Modular User's Guide,* (MK-95DF758).

Formats of the NAS Backup Restore manuals

NAS Backup Restore provides the following manuals in two formats: the format for the manuals that come with the product, and in HTML format:

- *NAS Backup Restore Modular User's Guide* (MK-95DF759-01).
- *NAS Modular Error Codes* (MK-95DF760).

The HTML manuals contain the same information as the corresponding standard-format manuals. To view an HTML manual, click **Help** in the GUI windows.

Comments

Please send us your comments on this document. Make sure to include the document title, number, and revision. Please refer to specific section(s) and paragraph(s) whenever possible.

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Chapter 1 NAS Backup Restore

Network Attached Storage (NAS) Backup Restore is a program used to protect data that is shared in a NAS Modular system environment. *NAS Backup Restore* enables data to be backed up and restored over a local area network (LAN). NAS Backup Restore provides the functionality to protect data using Backup/Restore and Remote copy program products.

1.1 Introduction

NAS Backup Restore consists of at least one disk array, two NAS Units, a console computer, backup and *media server*(s), and a tape device.

NAS Manager Modular and Unit

NAS Manager Modular (afterwards expressed as NAS Manager) consists of two NAS servers, a primary and secondary server that are installed in a TagmaStore® disk array. The hardware for each server, called a *NAS Unit*, is a replaceable server processor control board.

The primary server handles all NAS file-server operations, allowing multiple users to access files at the same time. If the primary server fails, the secondary server assumes control. This server-server linking, or clustering, helps ensure continuous operation. Each server is a *node* that connects directly to the network.

Console Computer

The console computer can be any network-connected computer from which you can manage the *Hitachi TagmaStore™ AMS/WMS NAS Manager Modular* and use NAS Backup Restore.

Backup Server, Media Server, and Tape Device

A *backup server*, media server, and tape device are required to backup and restore data to and from tape.

- The backup server (with backup management software installed) sends backup and restore requests to NAS Blade for processing by NAS Backup Restore. You can connect up to five backup servers to a NAS Blade. A backup server can also function as a media server.
- The media server, with an NDMP-compliant tape device connected, manages the tape device. You can connect up to five media servers to a NAS Blade. Figure 1.1 illustrates the NAS Backup Restore operating environment. For information about tape devices, please refer to the appropriate VERITAS Corporation documentation.

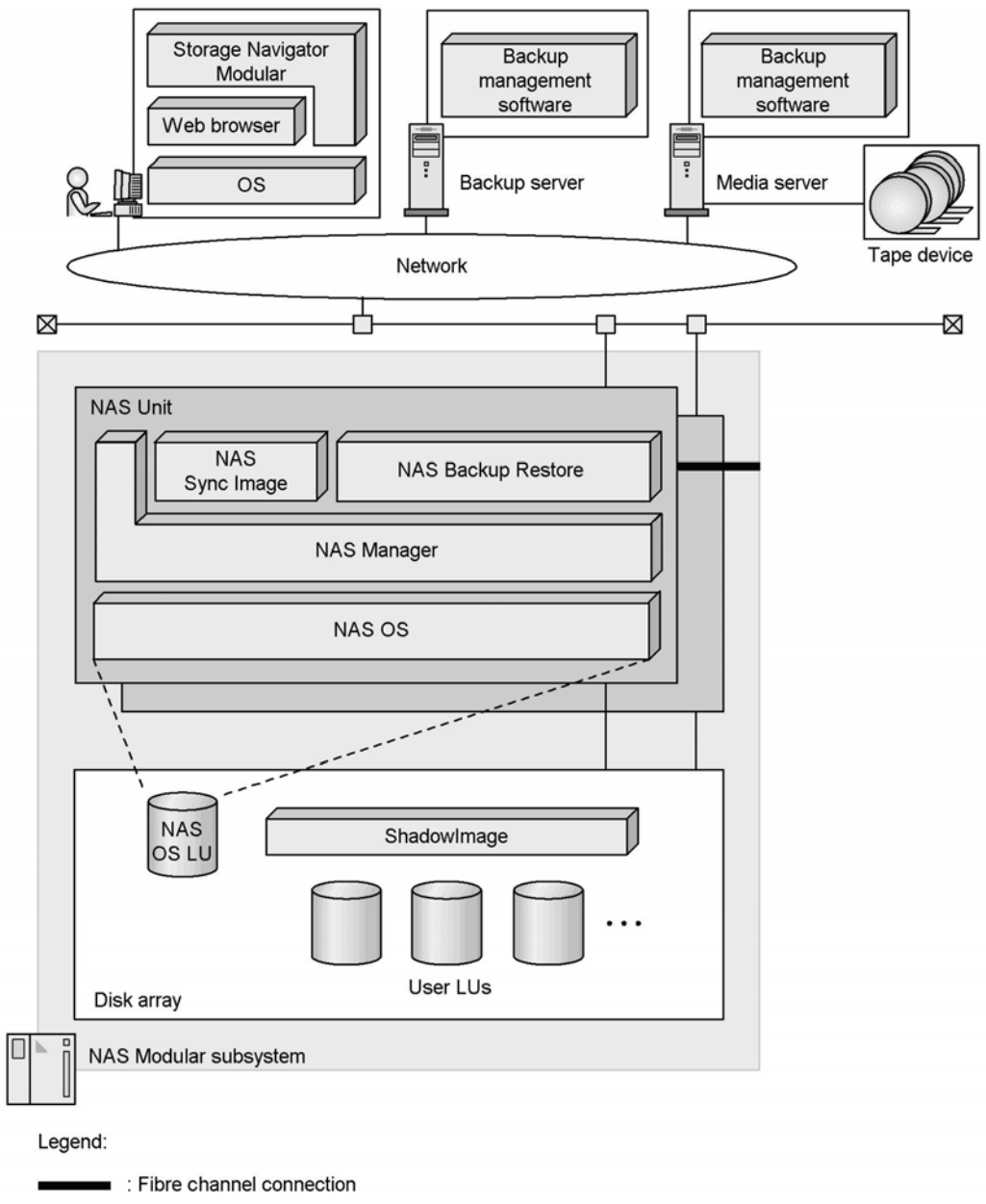


Figure 1.1 NAS Backup Restore Operating Environment

1.2 NAS Backup Restore Data Protection Functions

The basic protection functions of NAS Backup Restore include Backup Restore, Backup Restore with a NDMP server and tape device, offline or online data backup, *ShadowImage* and *NAS Sync Image* Modular differential-data snapshot, restore operations, and remote copy operations. Each of these functions is described this section.

1.2.1 Backup Restore with a NDMP Server and Tape Device

NAS Backup Restore uses a tape device and Network Data Management Protocol (NDMP)-compliant backup management software to backup and restore network data. NDMP defines a common architecture for backing up data on a network.

- NAS Backup Restore runs from an NDMP server on which NAS Backup Restore is installed. The NDMP server accepts backup and restore requests from the backup management software running on the backup server and controls the functionality required for backup and restore operations.
- When backup or restore is executed, the NDMP server is automatically connected to the backup server and the media server, and data copying begins. When data copying finishes, the NDMP server is automatically disconnected.

1.3 Backup/Restore and Tape Devices

The backup/restore functionality consists of functions to back up file system data to media and to restore a file system from media. NAS Backup Restore features the backup/restore functionality in conjunction with NDMP-compliant backup management software and tape devices. Backup/restore functionality can use a tape device connected to a media server external to a NAS Modular subsystem.

The backup/restore functionality uses an NDMP server on which NAS Backup Restore is installed. The NDMP server accepts backup and restore requests from backup management software running on a backup server, and controls the functionality required for backup or restoration.

When backup/restore is executed, the NDMP server automatically connects to the necessary server, and processing begins. When using a tape device connected to a media server external to the NAS Modular subsystem, the NDMP server connects to the backup server and media server.

When data copying is complete, the connections between servers are automatically disconnected.

Figure 1.2 illustrates operation of the offline backup functionality. Figure 1.3 illustrates operation of the online backup functionality using differential-data snapshot.

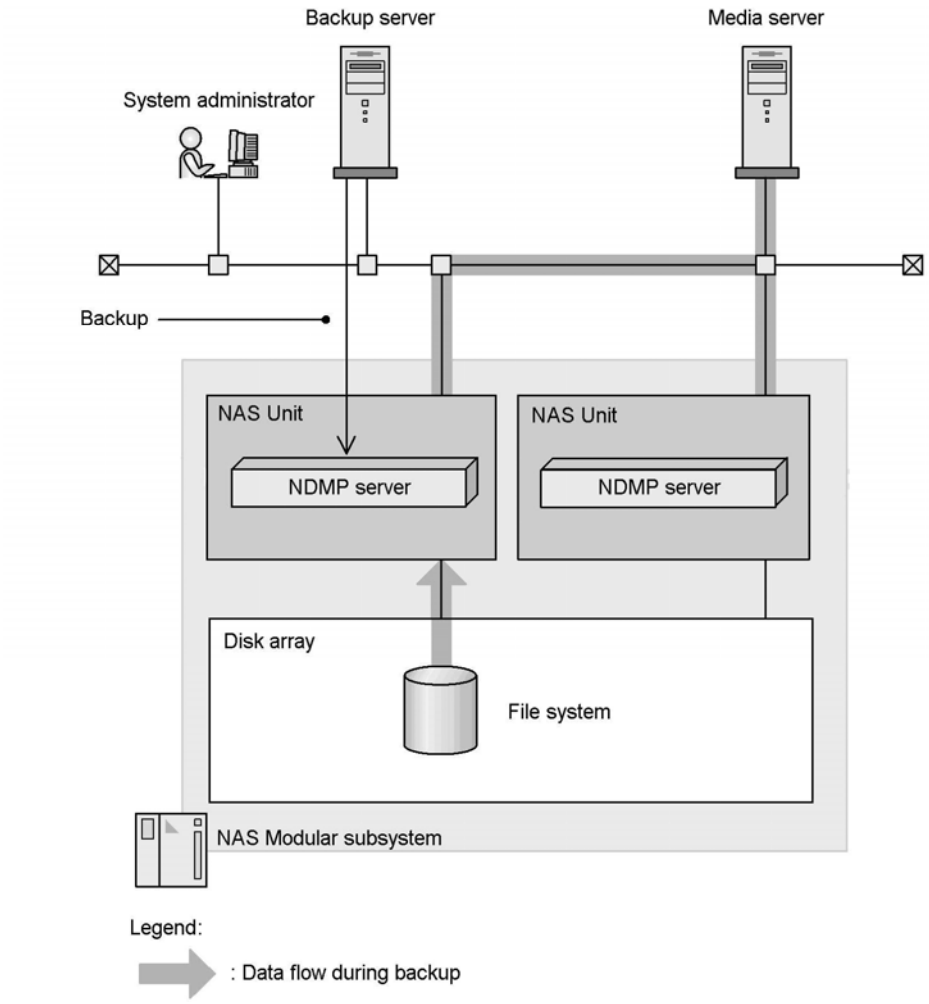


Figure 1.2 Operation of the Offline Backup Functionality

In an offline backup, only the data to be backed up is copied from the file system to a media. The next figure (Figure 1.3) shows the use, in an online backup, of differential-data snapshot.

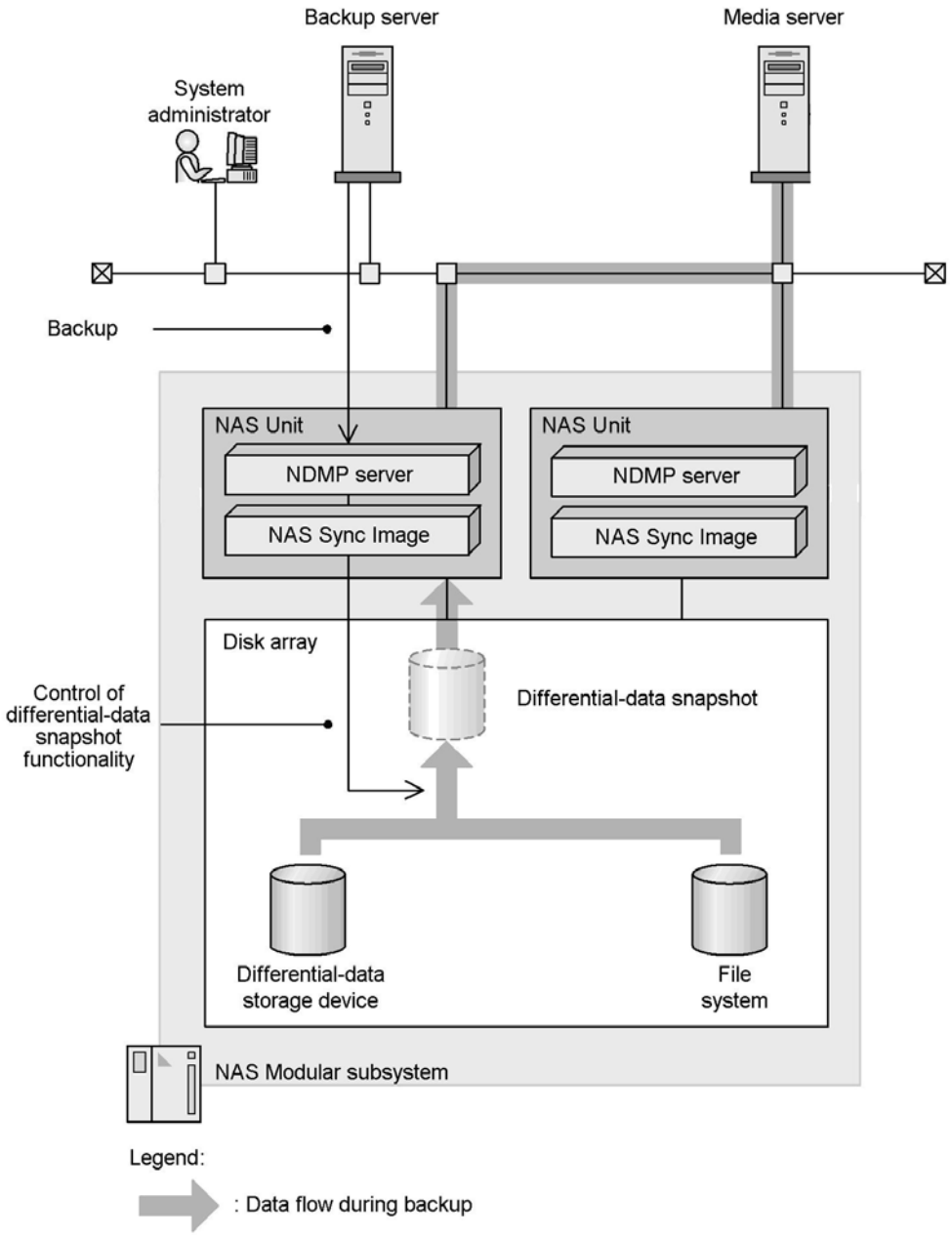


Figure 1.3 Operation of Online Backup Functionality Using Differential-data Snapshot

In an online backup using differential-data snapshot, the NDMP server controls the NAS Sync Image differential-data snapshot functionality, and (from the data contained in the file system and the differential-data storage device) automatically creates and mounts a differential-data snapshot. Then, only the data to be backed up is copied from the differential-data snapshot to media. When data copying finishes, the NDMP server automatically un-mounts and deletes the differential-data snapshot.

The next illustration (Figure 1.4) shows the operation of the restore functionality.

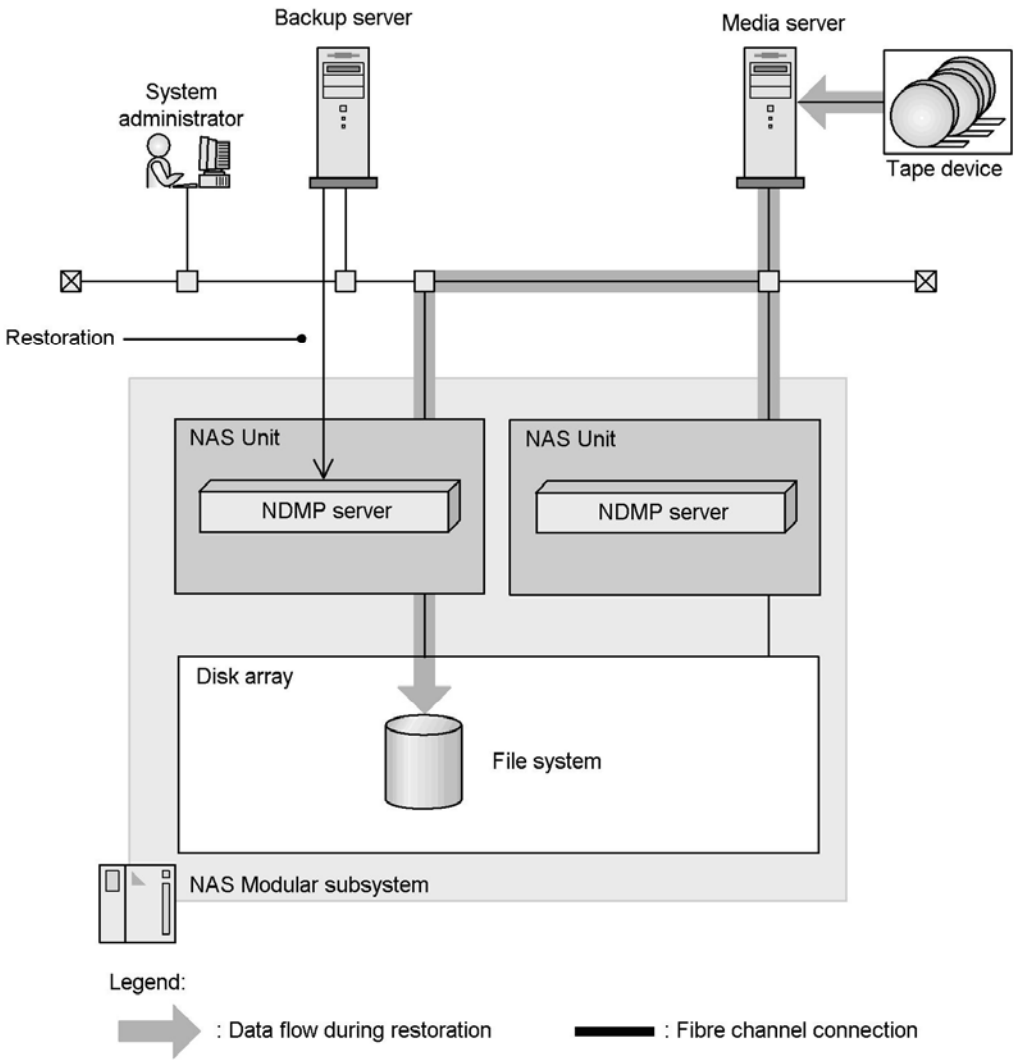


Figure 1.4 Operation of the restore functionality

In a restore operation, the data stored on the media is copied back to a file system in the disk array.

1.4 Requirements and Settings Tables

The tables provided next and in section 1.5.2 provide additional information about supported NAS Backup Restore functions, software configuration requirements, and font and cache browser settings. NetBackup functions, available using NAS Backup Restore, are shown in Table 1.1 does not support some functionalities provided by backup management software. The following describes the limitations and restrictions on functionalities when backup management software is linked with NAS Backup Restore. The following table shows the functionalities provided by NetBackup that are available to NAS Backup Restore.

See section 1.5.2 under Table 1.4 for more information about NetBackup.

Table 1.1 NetBackup functionalities Supported by NAS Backup Restore

Functionality		Supported
Backup execution	Manual	Yes
	Automatic (scheduled)	Yes
Backup type	Full backup	Yes
	Cumulative incremental	Yes[#1]
	Differential incremental	Yes[#1]
Backup and restore by[#2]	Volume	Yes
	Directory	Yes
	File	Yes
	Path-based history[#3]	Yes
Direct Access Recovery (DAR)		Yes
Restore destination	The node that has the volume to be backed up	Yes
	The node for the failover destination	Yes
	Redirected Restore to a different client (a node in another cluster)	--

Legend: Yes: Supported. --: Not supported.

[#1] In the NAS Modular system, the incremental backup only backs up the directories and files whose contents are modified.

[#2] The length of the path for the directory or file, to be specified for backup or restoration, must not exceed 1,023 bytes.

[#3] *Path-based history* is a functionality used for sending file history information from an NDMP server to NetBackup during a backup operation. This file history information consists of path names for backed-up directories and files.

Depending on the file history information, you can restore in either directory or file units.

Using the functionality listed in Table 1.1, you can copy data at the file system level regardless of the operating status of an application. Using this functionality while the data is being used by an application can cause data integrity issues during operations.

NAS Backup Restore does not support some functionalities provided by backup management software. The following describes the limitations and restrictions on functionalities when backup management software is linked with NAS Backup Restore. The following table shows the functionalities provided by NetBackup that are available to NAS Backup Restore.

1.5 System Requirements

The next sections detail the hardware and software prerequisites for using the NAS Backup Restore system.

1.5.1 Hardware

The NAS Modular system, that NAS Manager manages, uses the TagmaStore Adaptable Modular Storage (AMS) or Workgroup Modular Storage (WMS) as midrange disk storage systems with scalable capacity. WMS is an all serial advanced technology attachment (SATA) system while the AMS supports both fibre channel (FC) and SATA disk drives. The hardware prerequisites for a disk array to be used in a NAS Modular system are described next:

- Applicable disk array (AMS or WMS).

  The NAS Modular system that NAS Manager manages uses the TagmaStore AMS/WMS series as a disk array.

  To use the NAS Modular system, you must connect the following device to a disk array:

- NAS Unit.

  The NAS Unit is a device for implementing a NAS environment. A gigabit Ethernet adapter, a CPU, and other hardware are mounted on this device.

On the disk array, the required *command devices* for communication between the NAS Unit and disk array must be set up using Storage Navigator Modular.

The following summarizes the external devices required for the disk array when using the backup/restore functionality.

- Backup server.

  A backup server is a server that has backup management software installed. A backup server can also function as a media server.

- Media server.

  A media server manages tape devices.

- Tape device.

  For details on backup media that can be connected to a media server external to the NAS Modular subsystem, see the appropriate VERITAS Software Corp. documentation.

For details on how to backup medias, see the appropriate vendor's documentation.

1.5.2 Software Requirements

This section describes the software configuration required for using backup/restore functionality in the NAS Modular system. Software requirements for NAS Backup Restore are shown next in Table 1.2. Except for the Web browser, these are programs required in the disk array.

Table 1.2 Software Requirements

Component	Description
NAS OS	Operating system that runs on the NAS Unit and provides the NAS functionality. It consists of NAS Data Control Modular and NAS File Sharing Modular.

Component	Description
NAS Manager (installed on the console computer)	Used to set up and manage the NAS Modular system and to install NAS Backup Restore.
NAS Sync Image Modular (installed on NAS Modular)	This program provides differential-data snapshot functionality that protects data of file systems managed by a NAS Modular system. NAS Sync Image Modular creates data-differential snapshots. This program is required for online backup operations that use a differential data snapshot. For details on the NAS Sync Image functionality, see the manual *NAS Sync Image Modular User's Guide* (MK-95DF758). For details on how to install NAS Sync Image, see *NAS Manager Modular User's Guide* (MK-95DF757). For details on NAS Sync Image license setup, see *Storage Navigator Modular User's Guide* (MK-94RD206).
Web browser (installed on the console computer)	▪ Windows 2000 Professional Operating System SP2 or later: Internet Explorer 6, SP2 or later. ▪ Window Server 2003 SP1 or later. ▪ Windows XP Professional Edition operating system SP2 or earlier, Internet Explorer 6. ▪ Solaris 8 Operating System for SPARC Platforms, Netscape 6.2.3 or Netscape 7.0. ▪ Solaris 9 Operating System for SPARC Platforms, Mozilla 1.4 or Mozilla 1.7.
Storage Navigator Modular	A program used to perform operations such as restarting the NAS OS, setting up a license, and setting up command devices.
NAS Backup Restore (installed on the backup and media servers) To install, specify the following file contained in the installation CD-ROM: NAS_Backup_Restore_Modular_version-number.deb For details on how to install NAS Backup Restore, see the Storage Navigator Modular manuals.	NAS Backup Restore supports NetBackup (versions 5.0, and 5.1) backup management software. This program is used to protect data shared in the NAS Modular system. Use the NAS Manager GUI to install NAS Backup Restore. Required for backup servers: NetBackup installed with the NetBackup for NDMP option enabled. Required for media servers: ▪ NetBackup installed with the NetBackup for NDMP option enabled. ▪ NDMP Mover Agent must be set in advance because the media server uses the NDMP remote functionality. After NAS Backup Restore is installed, you must set up a license in Storage Navigator Modular. For details on license setup, the Storage Navigator Modular manuals.

Use a Web browser on any machine outside the disk array to display the NAS Backup Restore windows. NAS Backup Restore uses cookies, so cookies must be enabled in the Web browser. Also, set the screen resolution to at least 800 x 600 pixels and the color depth to at least 65,000 colors (high color and 16 bit) for the monitor displaying the Web browser.

The next table (Table 1.3) shows the recommended font settings for Web browsers in a NAS Modular system when displaying the NAS Backup Restore GUI.

Table 1.3 Font Settings for the Web Browser

Web Browser	Font Settings
Internet Explorer	Language script: Latin based Web page font: Times New Roman Plain text font: Courier New Text size: Smallest

Web Browser	Font Settings
Netscape or Mozilla	Fonts for: Western Proportional: Serif Size (pixels): 12 Serif: adobe-times-iso8859-1 Sans-serif: adobe-helvetica-iso8859-1 Cursive: -courier-iso8859-1 Fantasy: -courier-iso8859-1 Monospace: adobe-courier-iso8859-1 Size (pixels): 12

If the browser user sets a text size or font to something other than those indicated above, the NAS Backup Restore GUI may not be displayed properly.

Cache settings to use with your Web browser are shown next in Table 1.4. If the cache settings are not set, the Web page may not be displayed properly.

Table 1.4 Cache Settings for the Web Browser

Web Browser	Cache Settings
Internet Explorer	Check for newer versions of stored pages: Every visit to the page
Netscape or Mozilla	Compare the page in the cache to the page on the network each time the page is viewed.

If the backup/restore functionality is used, backup servers and media servers outside the disk array will require backup management software.

NAS Backup Restore supports NetBackup 5.0 and NetBackup 5.1. NetBackup is required on backup servers and media servers. Backup servers and media servers also require that NetBackup for NDMP, which is available as an option, be operable. Additionally, media servers require NDMP Mover Agent to be set in advance because media servers use Remote NDMP. See section 1.4 and Table 1.1 for more information about NetBackup.

Using NetBackup requires several licenses. For information about how to install NetBackup, how to set licenses, and how to use NetBackup for NDMP, see the appropriate VERITAS Corporation documentation.

This concludes the overview and introduction of the NAS Backup and Restore software.

1.5.3 Software Installation

For details on software installation and license setup, refer to the *Storage Navigator Modular User's Guide* (MK-94RD206).

Chapter 2 Using NAS Backup Restore

This chapter describes the NAS Backup Restore using illustrations of the main screens/windows found in its graphical user interface (GUI). Descriptions are provided of most of the screen objects, fields, and buttons seen in the GUI. The command line interface is not described in this chapter.

2.1 Navigating Through a NAS Unit

The NAS Unit provides functionality, such as backup/restore functionality, which protects the data of file systems managed by NAS. (See Figure 1.1 for graphical view of NAS Unit components.) For details on installation and license setup, see *NAS Appliance Manager User's Guide* (MK-95DF757).

To use NAS Backup Restore, log on to a NAS Unit that is defined in a *cluster*. Connect to the NAS Unit using your Web browser, specifying the fixed IP address used for `mng1` of the NAS Unit that you are connecting to. In your Web browser, the URL is specified as follows:

https://fixed-IP-address-of-mng1-of-the-NAS-Unit/admin.cgi

When performing Backup Restore operations from the NAS Backup Restore GUI, there are several windows that appear frequently. Familiarize yourself with the contents of these windows before you begin using NAS Backup Restore.

Important: In order to perform operations on a NAS Unit, the NAS Unit must be defined in a cluster.

1. Open your Web browser and connect to a NAS Unit. The NAS login window opens as illustrated by Figure 2.1.

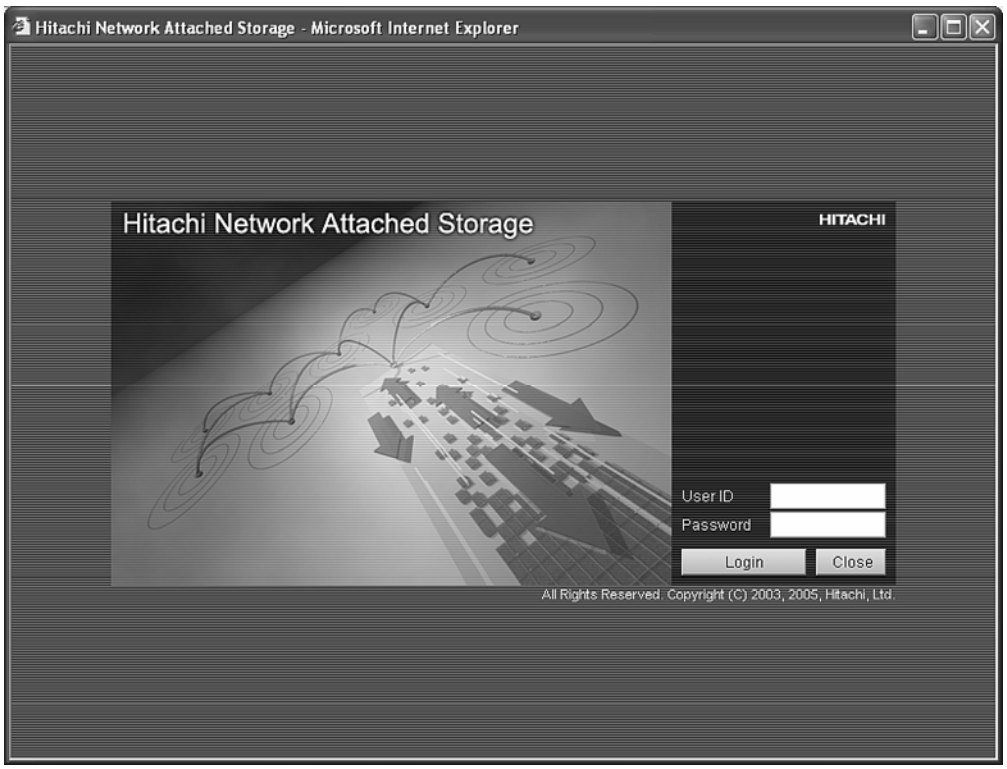


Figure 2.1 NAS Login Window

2. In the NAS login window, type your User ID and Password and click **Login**. **The NAS Manager Main Menu** window opens as shown in Figure 2.2.

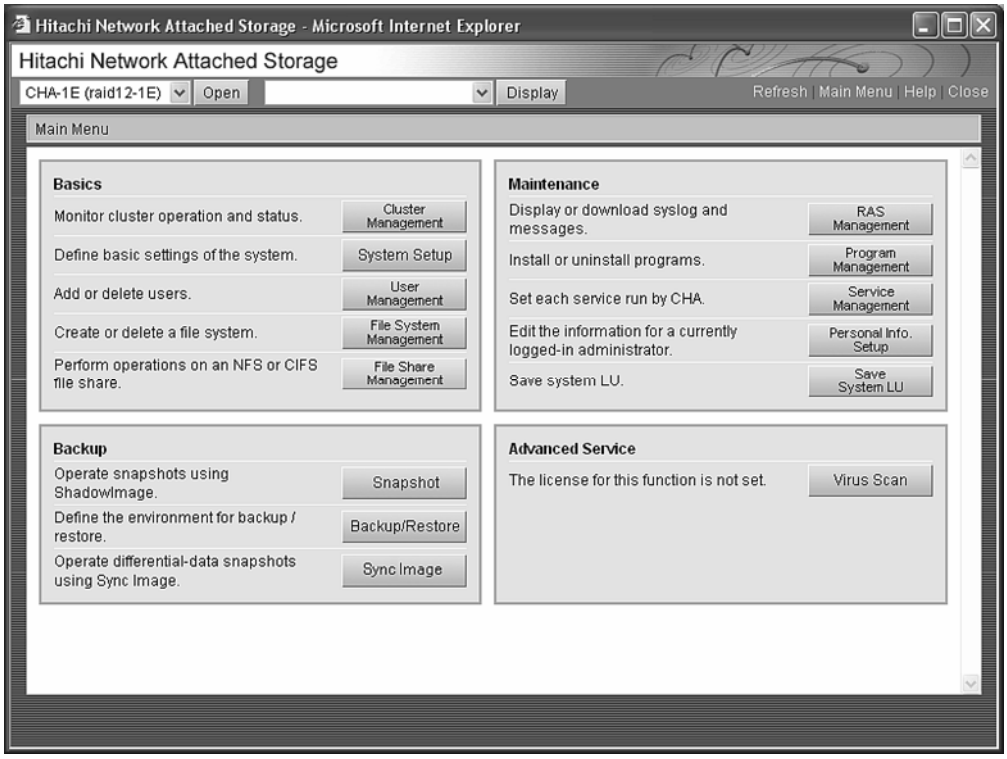


Figure 2.2 NAS Manager Main Menu Window

The **Main Menu** is divided into four (4) panels or groups: **Basics**, **Maintenance**, **Backup**, and **Advanced Service**.

Additional information about the NAS Manager Main window and its subordinate windows will be provided in a future revision of this document.

Chapter 3 Backup Restore Operations

NAS Backup Restore supports backup and restore operations over a LAN using NDMP-compliant backup management software. Network Data Management Protocol (NDMP) defines a common architecture for backing up data on a network. By working with a tape device and NDMP-compliant backup management software, NAS Backup Restore enables network data to be backed up and restored. An overview of the operations for performing a backup or restore from the backup management software is also provided. This chapter describes how to run backup and restore operations.

3.1 Introduction

This chapter describes how to run and manage NDMP servers using the NAS Backup Restore GUI.

3.1.1 Requirements/Restrictions

There are a number of prerequisites and precautions you should be aware of before performing backup and restore operations. While backup or restore operations are running, do not perform any of the following operations from the NAS Manager, as shown in Table 3.1.

Table 3.1 Backup Restore Requirements/Restrictions

Operation	Requirement/Restriction
All backup and restore operations	Do not perform any of the following operations on the NAS Manager at the same time you are performing backup or restore operations: ▪ Start or stop a cluster. ▪ Perform a forced stop for a cluster. ▪ Change a cluster configuration. ▪ Start or stop a node. ▪ Perform a forced stop for a node. ▪ Start or stop a resource group. ▪ Perform a forced stop for a resource group. ▪ Disable or restart resource group monitoring. ▪ Change the execution node of a resource group. ▪ Un-mount the file system on which operations are to be performed.
NNC name of a NAS unit is set or changed.	Restart NDMP server.
Fixed IP address, *service IP address*, or subnet mask of a NAS unit is changed.	Restart NDMP server.
IP address or host name of the gateway is changed.	Restart NDMP server.
The backup server information is	Restart NDMP server.

Operation	Requirement/Restriction
added or changed in the `/etc/hosts file`	
License setting for NAS Backup Restore are changed.	Restart NDMP server.

- Backup and Restore Recommendations.

  Because backup and restore operations routinely stop services and consume many processing resources, perform backup and restores when the whole NAS system has a light load. When one of the following operations is performed, it may take some time before the processing completes:

  - Performing backups and restores using an Access Processing List (*ACL*) to handle multiple directories and files can increase total processing time.
  - When performing a backup or a restoration, while the client frequently accesses the volume in the disk array (such as file systems and differential-data snapshot).
  - When performing a backup or a restoration, and NAS Sync Image operations at the same time.

- Concurrent Use of the GUI and Commands.

  Do not use commands while the GUI is being used to perform operations on the NAS Modular system. Also, do not use the GUI when commands are being used to perform operations on the file system.

3.1.2 Required Operations if Environment Modified

If your environment is modified due to any of the following reasons, restart the NDMP server before performing any backup restore operations. The following operations are required if the environment has been modified:

- The NAS Node Controller (NNC) name of the NAS Unit is set or changed.
- The fixed IP address, service IP address, or subnet mask of the NAS Unit is changed.
- The IP address or host name of the gateway is changed.
- The backup server information is added or changed in the `/etc/hosts` file.
- The license settings for NAS Backup Restore are changed.

If the NDMP server is not restarted, backup and restore might not end discretely. For details on how to restart the NDMP server, see section 3.14.4.

3.1.3 Backup/Restore after Failover

When you back up or restore the *failover*-destination node after failover, set the identical values for the following items on both nodes in the cluster:

- NDMP server password.
- NDMP server timeout value.

Different passwords and different timeout values for the nodes in a cluster can cause recognition or timeout errors on a failover-destination node. If communication to the backup server or data transmission to the media server (tape device) is interrupted, backups can end prematurely.

In addition, if different timeout values are set for each node, a timeout will occur based on the timeout value set for the failover-destination node. Therefore, if communication between a backup server and the NDMP server, or data transmission from the media server to the NDMP server stops for a certain period of time, the backup might end with an error before data transmission to the backup target has completed. For details on setting the timeout value for the NDMP server, see section 3.14.10.

For details on changing the NDMP server password, see section 3.14.8. For details on setting the timeout value for the NDMP server, see section 3.14.10.

3.1.4 Using a Tape Device Connected Over a Fibre Channel to a NAS Unit

When performing a backup or a restoration, if you use a tape device connected over a Fibre Channel to a NAS Unit, note the following points:

- If you perform a backup or a restoration by using a tape device connected over a Fibre Channel to a NAS Unit during degenerated operation, the backup or restoration might end abnormally.
- If failover occurs during a backup/restore operation, see section 6.3.1 to recover from the problem. Then, after failback, restart the backup/restore operation. During degenerated operation, temporarily stop the periodic backup as necessary.
- If a failover occurs when the NAS Unit is being used, and backup or restore operations are in progress, the NetBackup job might remain in progress or the backup media might remain in the tape device drive. If either of these problems occurs, after failback, execute the procedure indicated in section 6.3.2, and then perform the operation again.
- Before setting the tape device as a NDMP storage device, connect the tape device to the NAS Unit and execute the `tapeadd` command to register the information for the tape device. Then, perform the following operation on the backup server. For details on the syntax for the `tapeadd` command, see section 5.9 (registers tape device information) in Chapter 4.

Perform the following procedure on the backup server:

1. Use the set_ndmp_attr command with the `-probe` option specified to check the tape devices that can be used as NDMP Storage Devices.

   Execute the command in the following format:

   ```
   set_ndmp_attr -probe NDMP-server-host-name
   ```

   Specify the service IP address as NDMP-server-host-name.

2. Use the set_ndmp_attr command with the `-robot` option specified to register the tape changer.

   Execute the command in the following format:

```
set_ndmp_attr -robot NDMP-server-host-name device-file-path-for-tape-changer
```

Specify the service IP address as NDMP-server-host-name. Also, for the device file path of the tape changer, specify the device file path displayed by the `tapelist` command. For details on the syntax of this command, see section 5.11 (displays tape device information) in Chapter 4.

3. Use the set_ndmp_attr command with the `-verify` option specified to check whether the tape changer is registered correctly.

   Execute the command in the following format:

   ```
   set_ndmp_attr -verify NDMP-server-host-name
   ```

   Specify the service IP address as NDMP-server-host-name.

   The information on the tape changer is displayed as the command execution results.

4. Set the target tape device as an NDMP storage device.

   Select **Media and Device Management**, **Devices**, and then **Robots**, and specify the desired information. Device hosts and robot devices must be specified in the formats shown below.

Table 3.2 NetBackup for Tape Changer Connected by Fibre Channel to NAS Unit

Item	Description
Device host	Specify the host name for the backup server on which the drive or robot will be registered.
Robot device file	Execute the tapelist command without options as the device file for the tape changer (robot), and specify the path for the device file of the tape changer that shows A for the right-hand item (tape device registration conditions) for the items displayed in Status.

Note: For details on the syntax of the tapelist command, see section 5.11 (displays tape device information) in 0.

To set or add an individual tape drive, select **Media and Device Management**, **Devices**, and then **Drives**, and specify the information to be specified. Device hosts and tape drive devices must be specified in the formats shown in the next table.

Table 3.3 NetBackup for Tape Drive Connected over Fibre Channel to NAS Unit

Item	Description
Device host	Specify the host name for the backup server on which the drive or robot will be registered.
Device file for a tape drive	Specify the device file for the tape drive in the following format: `NDMP-server-host-name:device-file-path-for-tape-drive` ▪ NDMP-server-host-name Specifies the service IP address. ▪ device-file-path-for-tape-drive Execute the tapelist command without options, and specify the path for the device file of the tape changer that shows `A` for the right-hand item (tape device registration conditions) for the items displayed in `Status`.

Note: For details on the syntax of the tapelist command, see section 5.11 (displays tape device information) in Chapter 4.

Select **Media and Device Management** and then **Configure Storage Devices**. With this operation, you can specify the tape device settings all at once. If you specify the tape device settings all at once, make sure that the details shown in Table 3.2 and Table 3.3 have been set.

3.2 Performing an Incremental Backup

In the NAS Modular system, the incremental backup only backs up the directories and files that have been modified since the last backup. Even if you perform the following operations on the directories and files that have not been modified, incremental backup will not back up directories and files that have not been modified, even if the following operations were performed:

- Changing a path (moving directories and files).
- Changing a name.
- Deleting.

There are two types of incremental backup: differential-data snapshot backup, which backs up all data that has been changed since the previous full backup, and incremental-data backup, which backs up data that has been changed since the previous differential-data snapshot backup, incremental-data backup, or full backup.

- Perform a full backup when the file system configuration has changed, even if the data in the directories or files has not changed. If an error occurs that requires a restore to fix, only a full backup ensures all the data will be available to restore the files.
- You cannot perform an incremental backup by specifying copy destination file systems, which have been created by using the Remote Copy function.
- If a file system or directory in which quota information has been set is specified as a backup source, an incremental backup backs up all quota information.

NAS Backup Restore manages the incremental backup history information by using the .backupdates file for each file system. When a differential-data snapshot is specified as the backup source, NAS Backup Restore writes history information to the `.backupdates` file in the file system, assuming that the paired file system was backed up at the time the differential-data snapshot was taken. This file is included in the target file system and NAS Backup Restore writes history information to this file.

For example, assume an offline backup was performed at 06:00 for the two file systems listed in the following table.

Table 3.4 Example of Offline Backup Operations

File System	Volume Specified as the Backup Source
filesystem01	File system
filesystem02	Differential-data snapshot previously taken at 5:30

In this case, history information is recorded as illustrated in Figure 3.1 shown next.

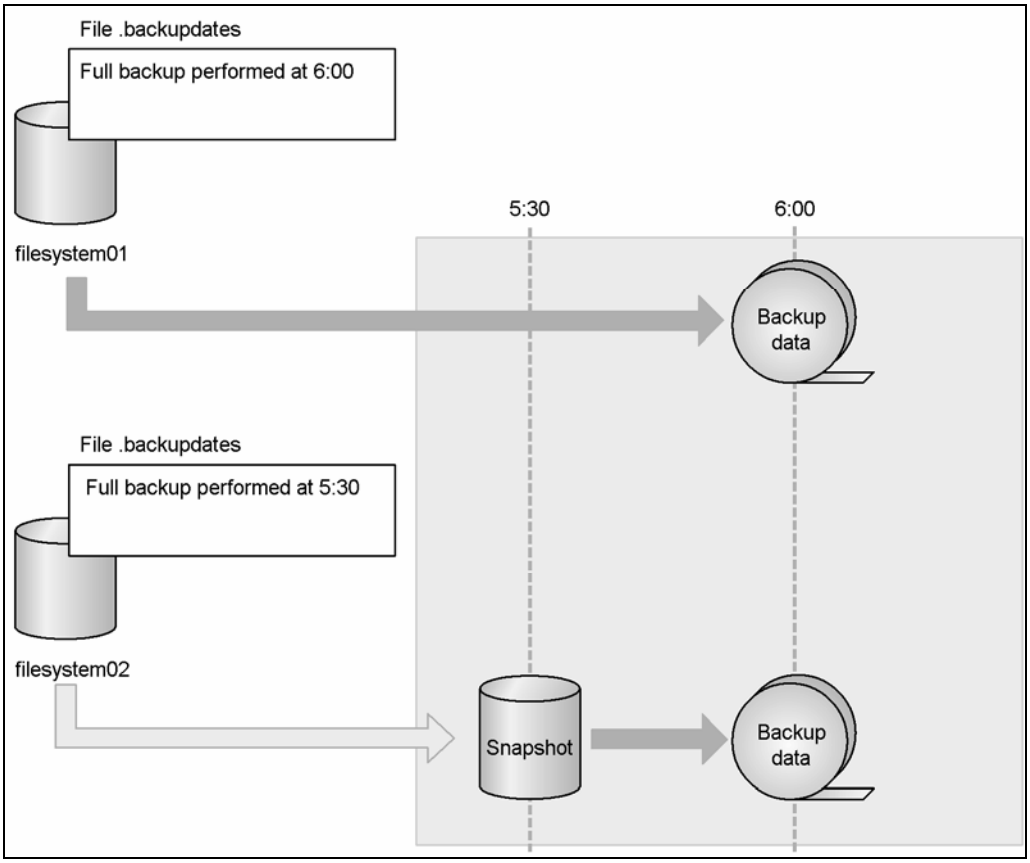


Figure 3.1 Backup History Information

In filesystem01, history information is recorded as an offline backup performed at 06:00. In filesystem02, history information is recorded as an offline backup performed at 05:30, which was when the differential-data snapshot for the backup target was taken.

- For one file system, we recommend that incremental backup be performed with one NDMP policy. If an incremental backup is performed for one file system with multiple NDMP policies, the acquired backup data differs from the one acquired with a single NDMP policy. Examples of an incremental-data backup performed with one NDMP policy and with multiple NDMP policies are shown below.

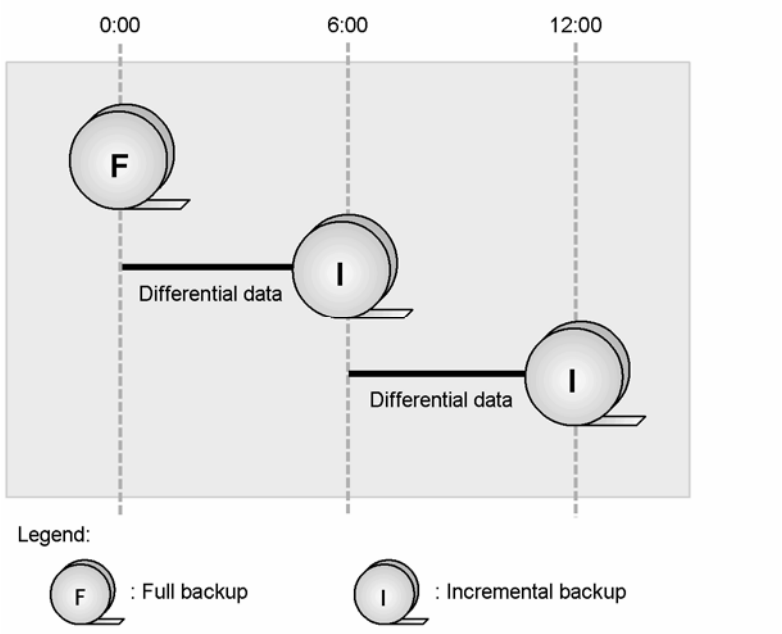


Figure 3.2 Incremental Backup Performed with one NDMP Policy

- When performing an incremental backup with a single NDMP policy, the differential data for the last backup acquired with the same policy is backed up. The incremental backup at 06:00 will back up the differential data for the period after 00:00. Similarly, the incremental backup at 12:00 will back up the differential data for the period after 06:00.

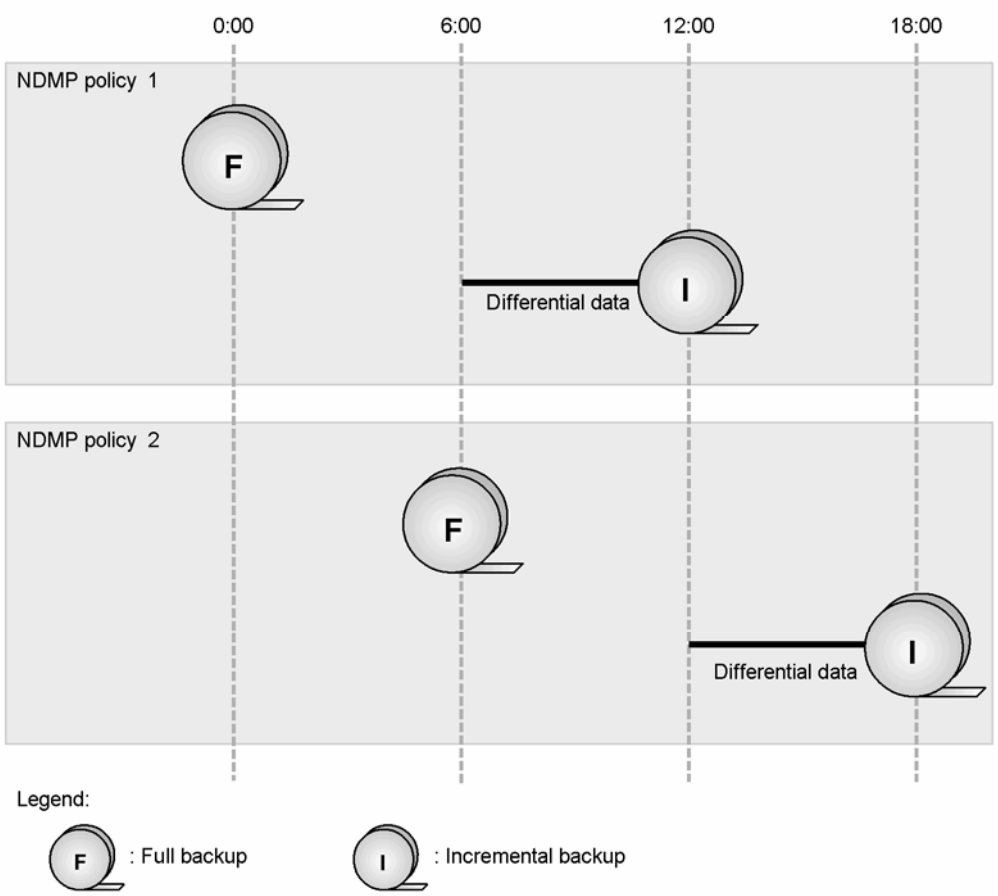


Figure 3.3 Incremental Backup Performed with Multiple NDMP Policies

- When performing an incremental backup with multiple NDMP policies, the differential data is backed up based on the history information for all backups executed within the file system. The incremental backup at 12:00 will back up the differential data for the period after the full backup performed at 06:00 with NDMP policy 2, not the full backup performed at 00:00 with NDMP policy 1. Similarly, the incremental backup at 18:00 will back up the differential data for the period after 12:00.

3.3 Operating a GUI Using a Wheel Mouse

When using a wheel mouse, do not rotate the wheel while pressing the **Shift** key. This operation might cause the window to change to another and the running operation to end abnormally. If an error occurs due to using the wheel mouse and the **Shift** key, you must log out by clicking **Close** in the menu area, and then log in again.

If **Close** is not displayed in the menu area, click the button (on the title bar) that closes the window, and then log in again. When you log in again, sometimes a window confirming the forced login appears. Click **Login** to forcibly log in.

3.4 Flow of LAN-based Operations

The following sections describe the flow of operations during LAN-based backup and restore operations.

3.4.1 Flow of Operations Described for LAN-based Backup

When performing backup operations, you must set an operating environment for the backup server and media server that are placed outside the disk subsystem. The steps for preparing for a LAN-based backup are as follows:

1. Setup the operating environment (see section 3.5).
2. Estimate the capacity required on the tape device (see section 3.8).
3. Mount a volume to be backed up (see section 3.8).
4. Do one of the following:
   - For offline backup, stop access from the client to the backup-source directories and files (see section 3.13.3).
   - For online backup using a differential-data snapshot, set up the differential-data snapshot storage device (see section 3.13.4).
5. Check the operational status of the NDMP server (see section 3.14.2).
6. Execute the backup using backup management software (see section 3.13).

When the operating environment setup has finished, estimate (from the amount of data to be backed up) the capacity needed for a target tape device, and prepare an appropriate tape device. Also, mount the target volumes (such as a file system) on which backup operations are to be performed.

When you complete the preparatory tasks, check the operating status of the NDMP server, and then use the backup management software on the backup server to perform backup operations.

3.4.2 Flow of Operations Described for LAN-based Restore

When performing restore operations, set an operating environment for the backup server and media server in the same manner as when backup operations are performed. The steps for preparing for a LAN-based restore operation are as follows:

1. Setup the operating environment for executing a restore operation (see section 3.5).
2. Prepare the restore-destination file system (see section 3.11).
3. Mount the file system where the restoration is to be performed (see section 3.11).
4. Preparing the restore-destination directory (see section 3.11.
5. Stop access from the clients (see section 3.8)

6. Check the operational status of the NDMP server (see section 3.14.2).
7. Execute the restoration using backup management software (see section 3.13).

When the settings for the operating environment are completed:

1. Estimate the capacity of the target file system from the amount of data to be restored, and prepare an appropriate file system.
2. In the restore-destination (target) file system, remake the directory configuration that existed at the time of the backup, and stop access from the client to the target file system.
3. Then mount the target file system with read/write enabled.

When you complete the preparatory tasks, check the operating status of the NDMP server and then use the backup management software on the backup server to perform restores.

If necessary, you can control the NDMP server, change the password for the NDMP server, and view or change the NDMP server timeout information.

3.5 Environment Settings for Backup Restore

This section describes the operating environment required to perform backup or restoration.

3.5.1 Registering a Backup Server in the /etc/hosts File

Consider how the NAS Modular system is used and register information about backup servers in the `/etc/hosts` file accordingly. Registered information is applied to both nodes in the cluster. Registering the IP addresses and host names of backup servers in the`/etc/hosts` file allows you to restrict the clients that can access the NDMP server to only those that are registered in the `/etc/hosts` file.

If you do not register any information about backup servers in the `/etc/hosts` file, any client can access the NDMP server. When an unregistered client attempts to access the NDMP server, the KAQB14211-W and KAQB14213-W messages are output to the NDMP server log located at:

`(/enas/log/ndmpserver.log)`

To register information about backup servers in the `/etc/hosts` file perform the next steps:

1. In the **Edit System File** window of NAS Manager, add the information about the backup servers in the `/etc/hosts` file, in the following format:

   `IP-address host-name backup-server-name [host-name-alias ...]`

   – Backup server names must begin with `BackupServer`.
   – Backup server names can only contain alphanumeric characters and underscores (_).

– A maximum of 256 information items of backup servers can be registered in the /etc/hosts file. If 257 or more items are registered, items from the 257th onwards are invalid.

The following is an example of adding information items in the /etc/hosts file.

```
# BACKUP SERVER ADDRESS
#
10.208.151.19 back-1 BackupServer01
10.208.151.197 back-2 BackupServer02
```

For details on how to edit the /etc/hosts file, see *NAS Appliance Manager User's Guide* (MK-95DF757).

2. Restart the NDMP server.

   If the NDMP server is not restarted, backup or restore processing may terminate abnormally. For details on how to restart the NDMP server, see section 3.14.4.

3. Check the NDMP server log to confirm that information about backup servers has been registered in the /etc/hosts file correctly.

   Important: If 257 or more records of information about backup servers have been registered, message KAQB14212-W is output to the NDMP server log. Also, if an invalid IP address has been registered as a backup server, message KAQB14214-W is output to the NDMP server log.

3.6 Tape Device Management

The system administrator performs the following tasks, as required, to use a tape device: Estimating the capacity of the backup media. See section 3.8. This task is described in the next section.

3.7 Setting up the Operating Environment to Link with NetBackup

When NAS Backup Restore is linked with NetBackup, data can be backed up to or restored from tape devices connected to the following locations:

- Tape devices connected to the backup server (media server), when the backup server is also the media server
- Tape devices connected to a media server that is separate from the backup server
- Tape devices connected over Fibre Channel to the NAS unit

In order to perform a backup and restore using NetBackup, the following operations are necessary on backup and media servers:

1. Install NetBackup.

   Install NetBackup and configure the optional NetBackup for NDMP on the backup server and media server. On the media server, you must also complete setup of NDMP Mover Agent to enable use of the NDMP remote functionality.

2. Set up the NetBackup environment.

   Set up the NetBackup environment so that the NetBackup `bptm` log can be acquired at both the backup server and the media server.

   – Create the following directory under the installation directory of NetBackup in the backup server and the media server:

     NetBackup-installation-directory`/netbackup/logs/bptm`

   – Also, set **Log Level** for NetBackup to **5,** and revise the expiration date for the log file according to the disk capacity of the backup server.

3. Grant access permissions for the NDMP server and media server. In NetBackup, grant access permissions for the NDMP server on the NAS Unit and the media server.

   – When using a tape device that is connected to a media server, access permissions to both the media server and the NDMP server are granted to the backup server.

   – When using a tape device that is connected to a NAS Unit, access permissions to the NDMP server are granted to the backup server.

   – When using a tape device that is connected to a NAS Unit on a different cluster, access permissions are granted to the NDMP servers on both nodes in the cluster.

     Note: If the password for the NDMP server is changed when a backup or restoration is performed, you must grant access permissions again on the backup servers.

   a) On the backup server, execute the `set_ndmp_attr –auth` server-name command.

   b) For the host name of the NDMP server, specify the *service* IP address of the NAS Unit that corresponds to the volume (such as the file system) containing the data to be backed up.

      Important: If the *fixed* IP address of the NAS Unit is specified for the host name, backup and restoration on the failover destination will end abnormally if operations are interrupted.

4. At execution of the `set_ndmp_attr –auth` server-name command, you are prompted for the NDMP server password. Enter the password set for the NDMP server in the password parameter.

   a) Also, when you change the NDMP server password, re-execute the `set_ndmp_attr` command at the backup server to achieve the following results.

      – Grant access permissions for the media server, specify the IP address or host name of the media server as server-name, as shown next:

        `set_ndmp_attr -auth` *server-name*

      – Grant access permissions for the NDMP server, specify the service IP address as server-name. If you specify a fixed IP address as server-name, a backup or restore will terminate abnormally during degenerated operation.

        When this command is executed, you are prompted to enter the user name and password for the NDMP server. Specify the user name and password set on the NDMP server.

      – Use the `set_ndmp_attr` command with the **–verify** option specified to check the granted access permissions, as shown next:

`set_ndmp_attr -verify` *server-name*

For the *server-name*, specify the host name or IP address specified above.

To check whether access permissions have been granted to a media server, specify the host name or IP address of the media server as server-name.

b) When this command is executed, it prompts you to enter the password for the NDMP server. Specify the password set in the NDMP server.

c) In a NAS Modular system, execute `set_ndmp_attr -verify server-name` Set up the NDMP storage devices:

- Set the target tape device as an NDMP storage device.
- When a tape drive is added, specify the device name in the following format:

  `media-server-name:device-file-path-for-the-tape-drive`

5. Set up the storage device

   To use a tape device, you must set the tape device as an NDMP storage device. Use the following procedure on the backup server to set the tape device as an NDMP storage device.

   - When you use a tape device connected to the media server, set the tape device as an NDMP storage device.
   - When you use a tape device connected over Fibre Channel to a NAS Unit, register the tape changer, and then set the tape device as an NDMP storage device.

     Note: When using a tape device connected over Fibre Channel to the NAS unit, it is not necessary to set up a media server.

   a. Set the target tape device as an NDMP storage device.

   b. Select **Media and Device Management,** then **Configure Storage Devices**. With this operation, you can specify tape device settings all at once. This operation makes the system recognize the media.

   c. In a NAS Modular system, the device name of a tape drive is specified in the following format:

      media-server-name:*device-file-path-for-tape-drive*

   d. Specify the host name or IP address of the media server as media-server-name.

6. Add a storage unit.

   Select **Storage Units** and then create a storage unit.

   - For **Storage unit type**, select **NDMP.**
   - For **NDMP host, specify the host name or IP address for the backup server.**

7. Make the system recognize the media of the target tape device.

   Select **Media and Device Management** and then **Configure Volumes**. With this operation, the system recognizes the media.

8. Add the NDMP policies.

   Add NDMP policies such as attributes, clients, backup schedules, and Backup Selections lists to the NetBackup settings on the backup server so that data on the node is backed up or restored.

a. In the Backup Selections list, specify the directories that serve as the backup target base points, in the following format:

```
/mnt/path-for-a-directory-that-will-serve-as-a-backup-target-base-point/
```

b. Specify the directories to be used as the base point of the backup target, so that they satisfy the following conditions:

- The maximum path length is 1,023 bytes, including `/mnt/`. The forward slash (/) at the end of the path can be omitted.
- Wildcard characters cannot be used.
- If a directory name contains spaces, specify a higher-level directory name that does not contain spaces.
- If an entry in the list contains an invalid path to a directory, the data in that directory is not backed up.

Note: The Backup Selections list is used to specify multiple directories for backup. If an entry in the list contains an invalid path, the data in that directory is not backed up. Only the data in correct directories will be backed up.

Important: In the NAS system, some environment variables can be set for each base-point directory to be backed up.

- For the directory that is the base point of the first backup target specified in the Backup Selections list, always specify the TYPE environment variable.
- All other environment variable specifications are optional.
- Each environment variable must be specified before the directory specified for the base point of a backup target, using the following format:

  `SET` *environment-variable-name*`=`*value*

Settings for environment variables are inherited until the same environment variables are the next to be specified. Thus, you can omit the environment variable specification if you are using the same settings as those for the base directory for the backup target specified immediately before.

3.7.1 Environment Variable Descriptions

Settings for environment variables are inherited. Thus, you can omit the environment variable specification if you are using the same settings as those for the base directory specified immediately before. See the next table for environment variable lists that can be set for a directory that serves as the base point of a backup target.

Table 3.5 Environment Variable Descriptions

Environment Variable	Description
FILES#1	Specify the files and directories within the directory specified for the base point of the backup target, as paths from the shortest relative path of the directory to serve as the base point. Do not specify a path that contains a symbolic link, as this might cause an error to occur during backup. The maximum specifiable length is 1,023 bytes. When performing a backup for each directory specified for the base point of the backup target, you can omit the `FILES` specification (the system assumes that `./` is specified). When backing up individual directories and files below a directory specified for the base point of the backup target, you can omit the initial `./` of each relative path. When a directory or file specified for `FILES` contains the following characters, specify them as follows: ▪ Space characters Specify the name of a directory that contains no spaces, above the directory or file that you want to back up. Example: To back up `./staffA/temp 1`, specify as follows: `./ staffA` ▪ Quotation marks (`"`), asterisks (`*`), question marks (`?`), or backslashes (`\`) Specify a backslash (`\`) before each of these characters. Example: To back up `./ staff"deleted"`, specify as follows: `./ staff\"deleted\"` ▪ Left brackets (`[`) and the corresponding right brackets (`]`) Specify a backslash (`\`) before each left bracket only. Example: To back up `./[ staff]`, specify as follows: `./\[ staff]`

Environment Variable	Description
FILES#1 *(Continued)*	When specifying multiple directories and files, separate each relative path with a space, and enclose all the paths in quotation marks (") as follows. "*relative-path-of-backup-target relative-path-of-backup-target*" The following wildcard characters can be used in FILES. ▪ [*Character-or-symbolCharacter-or-symbolCharacter-or-symbol*...] #2 Use this pattern to specify each of the single characters or symbols in [ ] as a target. You cannot specify an exclamation mark (!) at the beginning of the characters or symbols. Example: To back up userA, userB, and userD, which are immediately below the directory specified for the base point of the backup target, specify as follows: ./user[ABD] ▪ [! *Character-or-symbolCharacter-or-symbolCharacter-or-symbol*...] #2 Use this pattern to specify any character or symbol other than those in [!] as a target. Example: To back up directories and files whose names begin with user but not userA, userB, and userD, immediately below the directory specified for the base point of the backup target, specify as follows: ./user[!ABD] ▪ [*Character-or-symbol*–*Character-or-symbol*] #2 Use this pattern to specify any character or symbol within the range indicated by the hyphen (–). Specify the values in ascending order. The range is specified based on ASCII codes. Example: To back up userA, userB, userC, userD, and userE, which are immediately below the directory specified for the base point of the backup target, specify as follows: ./user[A-E] ▪ Question mark (?) Use this to specify any single character. Example: To back up all directories and files that are immediately below the directory specified for the base point of the backup target and have names of the format user*X*, specify as follows: ./user? To target all hidden directories and files in the format of ./.*X*/, such as ./.A/ and ./.B/, specify as follows: ./.[!.]/

Environment Variable	Description
FILES#1 (Continued)	Asterisk (*) Use this to specify any string longer than 0 characters. Example 1: To back up all directories and files that are immediately below the directory specified for the base point of the backup target and have names beginning with user, specify as follows: ./user* Note that hidden directories and files are not backed up even if you use an expression like ./userA/* to specify all directories and files below a given directory. To target all directories and files including hidden ones, specify the parent directory for FILES and specify y for RECURSIVE. To back up hidden directories and files individually, specify as follows: Example2: The following example specifies (for the backup operation) all directories and files with names beginning with ., such as ./.user: ./.[!.]* Example 3: The following example specifies (for the backup operation) all directories and files with names beginning with .., such as ./..user: ./..[!.]* Example 4: To back up all directories and files with names beginning with at least three periods (.) such as ./...user and ./....user, specify as follows: ./...* Note that in FILES, to avoid occurrence of an error during backup, do not specify a path that includes a symbolic link. If a relative path includes an invalid path, no backup is acquired for all the paths specified in FILES. In FILES, you can specify wildcard characters. For details on specifiable wildcard characters, see ANCHORID=jbru100[@ Do not delete AnchorID @]*A. Wildcard Characters Specifiable in the FILES Environment Variable*[@ Do not delete AnchorEND @]. #1 The directory specified for the base point of the backup target, and the path specified for the environment variable FILES, are combined as the path for the backup target. For example, if you specify /mnt/filesystem01/home for the base point directory for the backup target, and ./unit01 for the environmental variable FILES, /mnt/filesystem01/ home/unit01 is set as the backup target. If the total number of directories and files immediately below the directory specified as the backup target exceeds 10,000, the backup might end abnormally. Adjust the hierarchy levels so that this number is less than 10,000. #2 If you enter an asterisk (*), question mark (?), left bracket ([), or right bracket (]) in [ ], the symbol is interpreted as a regular symbol.

The following table shows the environment variables that can be set for a directory that will serve as the base point of a backup target.

Table 3.6 Environment Variables Set for Directory Base Point of Backup Target

Environment variable	Description
TYPE	Specify the format type. Specify `tar` in NAS Backup Restore. Be sure to specify the environment variable `TYPE` for the first base point directory specified in the backup target list.
FILES[#1]	Specify directories and files below the base directory of the backup target in the relative path normalized from the base directory for the backup target. Up to 1,023 bytes can be specified. The ./ at the beginning of the relative path can be omitted. When performing backups according to base directory of the backup target, the FILES specification can be omitted. (It is processed as an item in which the ./ has been omitted.) The FILES environment variable is specified only when individually backing up paths that include symbols and wild cards. In that case, only one path should be specified. If a specified path includes a symbolic link, an error will occur during backup. For details on paths that can be specified in the FILES environment variable, see Appendix B. Paths specifiable in the FILES environment variable.
HIST	Specify whether or not to store the backed up directories and files in the file history. By recording to the history file, you can restore in either directory or file units. The initial setting is `n`. If you specify a value other than the following values, such as `a` or `b`, the system assumes `n`: ▪ `f` Stores the backed up directories and files in the file history. ▪ `n` Does not store in the file history.
SNAPSHOT	Specify the backup method. The initial setting is n. If you specify a value other than the following values, such as a or b, the system assumes ▪ `n: sync` Specify when performing an online backup using a differential-data snapshot. ▪ `n` Specify when performing an offline backup
RECURSIVE	Specify the backup method for the directories and files under the directory specified for `FILES`. The initial setting is `y`. If you specify a value other than the following values, such as `a` or `b`, the system assumes `y`: ▪ `y` Backs up all the directories and files under the directory specified for `FILES`. ▪ `n` Backs up the directories and files immediately below the directory specified for `FILES`.
QUOTA	Specify whether or not to back up the quota information. The initial setting is `n`. If you specify a value other than the following values, such as `a` or `b`, the system assumes `n`: ▪ `y` Backs up quota information. Backs up quota information registered in the node that is to be backed up. To back up quota information, the backup source volume must be mounted with the quota settings enabled. If the volume has been mounted with the quota settings disabled, processing ends with an error. ▪ `n` Does not back up quota information.

Environment variable	Description
EXCLUSIVE	Specify whether to prohibit concurrent execution of multiple backup or restore operations on the same file system. Data inconsistency is preventable by prohibiting the following operations on the file system during backup or restore operations. ▪ Executing a restore operation during backup processing ▪ Executing a backup operation during restore processing ▪ Executing another restore operation during restore processing *Note:* Multiple backup operations can be performed simultaneously. The initial setting is `n`. If you specify a value other than the following values, such as `a` or `b`, the system assumes `n`: ▪ `y` Prohibits concurrent execution. ▪ `n` Permits concurrent execution.

[#1] The path created from the combination of the directory specified for the base point of the backup target and the path specified for the environment variable FILES is set as the backup target. For example, if you specify /mnt/filesystem01/home for the base point directory for the backup target, and ./unit01 for the environment variable FILES, /mnt/filesystem01/home/unit01 is set as the backup target. If the total number of directories and files immediately below the directory specified as the backup target exceeds 10,000, the backup might end abnormally. Adjust the hierarchy levels so that this number is less than 10,000.

The following table gives examples of Backup Selections lists:

Table 3.7 Sample Settings for Environment Variables for Backup Selections Lists

Item	Case 1	Case 2	Case 3
Base point directory for the backup target	`/mnt/filesystem01/home`	`/mnt/filesystem01/home`	`/mnt/filesystem02/work`
TYPE	`tar`	`tar`	`tar`
FILES	`./unit01`	`./unit02`	`./`
HIST	`f`	`f`	`f`
SNAPSHOT	`n`	`n`	`sync`
RECURSIVE	`y`	`y`	`y`
QUOTA	`y`	`y`	`n`
EXCLUSIVE	`y`	`y`	`y`

In this case, specify the following for the Backup Selections list:

```
SET TYPE=tar
SET FILES=./unit01
SET HIST=f
SET SNAPSHOT=n
SET RECURSIVE=y
SET QUOTA=y
SET EXCLUSIVE=y
/mnt/filesystem01/home
SET FILES=./unit02
/mnt/filesystem01/home
SET FILES="./"
SET SNAPSHOT=sync
SET QUOTA=n
/mnt/filesystem02/work
```

For details on each task shown above, refer to the VERITAS Software Corp. documentation.

3.8 Preparing for Backup Operations Overview

If the NAS Modular system is newly installed or the system environment is changed, perform the next steps (as necessary) to enable the execution of backups. On the NAS Modular system, perform the following tasks:

1. Register the backup servers in the /etc/hosts file. For details on how to register a backup server in the /etc/hosts file, see section 3.5.1.
2. Prepare the tape device. Begin by estimating the capacity of the tape device, considering the amount of data to be backed up. For details on how to estimate the capacity of the backup media required for backup, see Step 4.
3. Prepare a differential-data snapshot storage device. This task is necessary for online backup operations. To perform online backup operations using a differential-data snapshot, you must set up a differential-data snapshot storage device. For details on how to set up a differential-data snapshot storage device, see section 3.13.4.
4. Estimate Tape Device Capacity.
   a) Prepare media to store backup data. You must prepare media that can store: quota information, i-node information, and ACL information, in addition to the directories and files to be backed up.
   b) Use the estimated value calculated by the following the guideline formula shown next to prepare a tape device that has sufficient capacity.

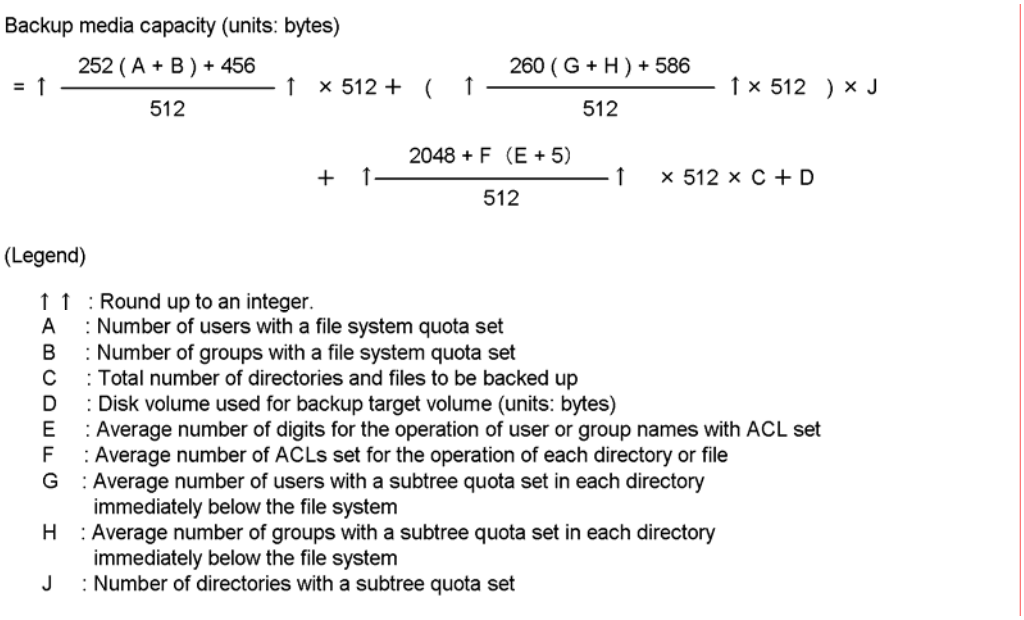


Figure 3.4 Formula for Estimating the Backup Media Capacity

c) Check the disk usage for a backup-target volume by using the **List of File Systems** window or the `enas_fslist` command. For details on the **List of File Systems** window and the `enas_fslist` command, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

If the capacity of the tape device is insufficient the backup operation will fail and an error will occur.

3.9 Preparing for Backup Restore Using NetBackup Overview

To perform a backup and restoration by using NetBackup, the following operations are necessary on any backup servers and media servers connected externally to the disk array:

1. Perform the following tasks on any backup servers and media servers:
   - Install NetBackup.
   - Set up the NetBackup environment.
   - Grant access permissions to the NDMP server and any media servers.
   - Set up the storage device.
   - Add the NDMP policy.

   For details on the above tasks, see section 3.7.
2. Block access from clients to the volume to be backed up.

   This task is required for performing an offline backup. For details on how to block access from clients, see section 3.10, Step 2.
3. Make sure that the target volume to be backed up (such as a file system or differential-data snapshot) has been mounted. For notes on the mount status of the volume to be backed up, see section 3.10.

4. Make sure that the NDMP server is running normally. For details on how to check whether the NDMP server is running normally, see section 3.14.2.
5. From a backup server, use backup management software such as NetBackup to perform the backup. For details on how to perform a backup, see section 3.13.
6. Once backup processing completes, re-open access from clients to the volume that was backed up.

   This operation is necessary when executing an offline backup. For details on the operations required for re-opening access from clients, see section 3.13.3.

Note: With NAS Backup Restore, backup/restore can be executed on the node that has the volume to be backed up or the node for the failover destination.

Important: This product does not support restoration of backed-up nodes to other clusters, nor does it support restoration of backed-up data to previous versions or editions.

3.9.1 Registering the Information about a Tape Device

Tape devices connected over Fibre Channel to the NAS Unit cannot be used simply through a physical connection. If a new tape device is introduced in place of a previous tape device, the information for the connected tape device must be registered on the NDMP server.

When you replace a tape device, delete registered information of that tape device, and then register information of a new tape device. For details on how to delete registered tape device information, see section 3.7.

For details on how to register on the NDMP server the information for the tape device connected to the NAS Unit, see section 4.3.

3.10 Performing a Backup

After preparing for backup operations, perform the next steps to begin the backup:

1. Mounting a Volume for Backup. Before executing backup operations observe the following prerequisites:
   - Mount the target volume (such as a file system) on which backup operations are to be performed.
   - When backing up the quota information, enable the quota settings for the volume to be backed up, and then mount the volume.

     Important: If the volume has been mounted with the quota settings disabled, the backup ends with an error.
   - When you perform backup, including incremental backups, the history of backups is managed by the .backupdates file in the file system. Because the .backupdates file must be updated when an incremental backup is performed, mount the file system as readable and writable.

For details on how to mount the file system, refer to the *NAS Manager Modular User's Guide* (MK-95DF757). For details on how to mount the differential-data snapshot, refer to the *NAS Sync Image Modular User's Guide* (MK-95DF758).

2. Stopping Client Access.

   To perform an offline backup of a file system, directories and files at the backup source must be set so that they do not update during the backup processing. Clients should be prevented from accessing the backup source directories and files for file systems mounted with read/write permissions.

   Note: When performing an offline backup of a differential-data snapshot, the following procedure is not necessary because directories are not to be updated by the client. Since read-only directories and files cannot be updated by clients, for read-only or differential-data snapshot backup sources, the following operations can also be skipped:

   To stop access from clients, you can use the following procedure:

   a) In the node where the backup-source directories and files exist, stop the NFS, CIFS, and FTP services. For details on how to stop these services, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

   b) In the volume where the backup-source directories and files exist, delete the NFS and CIFS shares. For details on how to delete the NFS and CIFS shares, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

   c) Perform the following operations according to the type of backup-source volume:

      – If the backup source is a file system:

        Prevent all clients from accessing the file system by un-mounting and then remounting the file system. For details on how to mount and un-mount a file system, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

      – If the backup source is mounted with read/write permissions:

        Make sure that no clients are accessing the backup source.

   d) Un-mount and then remount the file system. To block access from all clients, un-mount and then remount the file system. For details on how to un-mount and mount a file system, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

3. Define Copy Device for Online Backup

   When an online backup is performed, an online backup-dedicated copy device must be defined using NAS Backup Restore before obtaining the backup file system data.

   Important: Online backup is not possible unless this task is completed.

   In online backup, the data copied is written to a tape device. This backup is taken automatically. Since you can define only one online backup-dedicated copy device for a single file system, if a copy device has already been defined, cancel the definition and then re-define the copy device.

4. Define Differential-data Snapshot Storage Device

   If you are performing an online backup using a differential-data snapshot, the differential-data snapshot storage device must be set up using a NAS Sync Image Modular before the file system backup. An online backup using a differential-data snapshot cannot be performed without completing this operation.

Important: The online backup using a differential-data snapshot cannot be performed without completing this operation.

In the case of an online backup using a differential-data snapshot, the backup to the tape device is executed based on the differential-data snapshot (the differential-data snapshot for the backup is automatically created). Only one differential-data snapshot storage device can be set for a file system.

An online backup ends with an error when the quantity of differential-data snapshot reaches the number of reserved generations or the capacity of the differential-data snapshot storage device is insufficient. To prevent this error, after the differential-data snapshot storage device has been set up, check the status of the differential-data snapshot storage device periodically and then delete unnecessary differential-data snapshot as needed.

For details on how to set up a differential-data snapshot storage device, view the status of a differential-data snapshot storage device, or delete a differential-data snapshot, refer to the *NAS Sync Image Modular User's Guide* (MK-95DF758).

5. Check NDMP Server Operating Status

   Check whether the NDMP server is running normally. For details on how to check the operating status of the NDMP server, see section 3.14.

3.11 Preparing for Restore Operations Overview

If a change is made to the NAS Modular system environment, perform the following preparations as necessary for executing a restoration.

On the NAS Modular system, perform the following tasks:

1. Register the backup server in the `/etc/hosts` file. For details on how to register a backup server in the `/etc/hosts` file, see section 3.5.1.
2. Perform the following tasks on any backup servers:
   - Grant access permissions to the NDMP server and any media servers.
   - Set up the storage device.

   For details on the above tasks, see section 3.7.
3. Prepare the restore-destination file system.

   For notes on the capacity of the restore-destination file system, see section 3.12.
4. Block access from clients to the restore-destination directory.

   For details on how to block access from clients, see section 3.12, Step 4.
5. Make sure that the restore-destination file system has been mounted.

   For notes on the mount status of the restore-destination file system, see section 3.12, Step 2.
6. Make sure that the NDMP server is running normally.

   For details on how to check the operating status of the NDMP server, see section 3.12, Step 5.

7. From a backup server, use backup management software such as NetBackup to perform the restoration. For details on how to perform a restoration, see section 3.12.

Once restoration processing completes, re-open access from clients to the directory of the restoration destination. For details on the operations required for re-opening access from clients, see section 3.13.3.

3.12 Performing Restore Operations

You must perform the following tasks before executing restore operations.

1. Prepare the Restore-Destination File System

   Before executing restore operations, prepare a target file system on which restore operations are to be performed.

   - For a file system to be restored, a capacity that is at least 105% of the size of the restore data is required. If the actual capacity is less than 105% of the size of the restore data, restoration might end abnormally.
   - When preparing a file system to be restored, check the capacity of the backup data.
   - In the restore destination, prepare a file system that is not being operated by NAS Sync Image Modular. If a file system being operated by NAS Sync Image Modular is restored, the differential-data snapshot storage device capacity in NAS Sync Image Modular becomes insufficient, and created differential-data snapshot might become invalid.
   - During restore operations, if the file system information must be returned to the backed-up state, create a new file system and set it up so that its settings are the same as the backed-up settings. Then restore the data in this file system. For details on how to create and set up a file system, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

2. Mount the Restore File System

   Before executing restore operations, mount the target file system as a read/write file system on which restore operations are to be performed.

   When you restore the quota information, enable the quota settings for the file system, and then mount the file system. Restoration might end abnormally if mounting is performed with the quota settings disabled. For details on how to mount a file system, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

3. Prepare the Restore-Destination Directory

   Before performing restoration operations, recreate the configuration from the mount point to the parent directory for the data to be restored, as well as the permissions settings, on the restoration-destination file system.

   If the directories in the data for the restoration source do not exist in the restoration-destination file system when restoration operations are performed, the directories is automatically created, but the permission settings might differ from those during backup. For example, consider the case illustrated in Figure 3.5 in which the `file01` file in the data for the restoration source is restored to the `restore_unit01` directory on the restoration-destination file system.

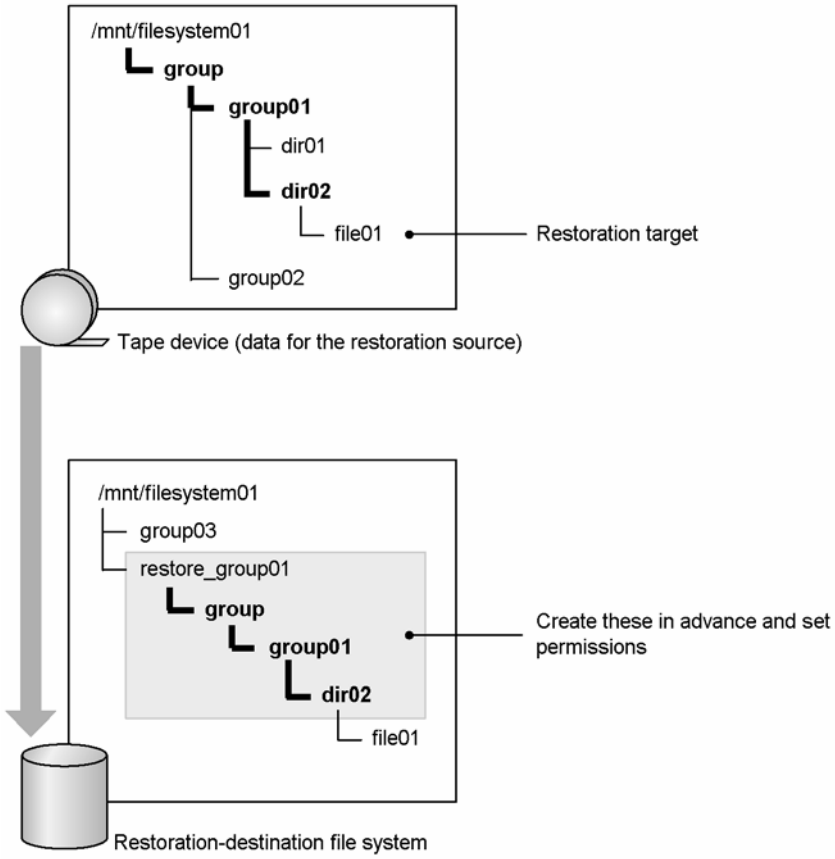


Figure 3.5 Example of a Created Restore-Destination Directory

In this case, create the group directory in the `restore_group01` directory, create the `group01` directory in the `group` directory, create the `dir02` directory in the `group01` directory, set the appropriate permissions, and then restore the `file01` file.

4. Stop Access from Clients

   To ensure the integrity of the data to be restored, prevent access to the restoration-destination directories from all clients. To stop access from clients, you can use the following procedure:

   a) In the node where the restore-destination file system exists, stop the NFS, CIFS, and FTP services. For details on how to stop these services, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

   b) In the restore-destination file system, delete the NFS and CIFS shares. For details on how to delete the NFS and CIFS shares, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

   c) Un-mount and then remount the file system. To stop access from all clients, un-mount and then remount the file system. For details on how to un-mount or mount a file system, refer to the *NAS Manager Modular User's Guide* (MK-95DF757).

5. Check Operating Status of NDMP Server

   Check whether the NDMP server is running normally. For details on how to check the operating status of the NDMP server, see section 3.14.

6. To execute restoration, the file system of the restoration destination must be mounted as read/write enabled.

   Note: If the file system is mounted as read-only, restoration will terminate with an error.

   When restoring quota information, you must enable the quota settings for the file system, and then mount the file system. If you simultaneously restore the restoration data and quota settings (the files `.quota.user`, `.quota.group`, and `.quota.subtree`) when the quota settings are disabled for the mounted file system, only the data will be restored and the quota information will not be set for the file system of the restoration destination (a warning message is output). If you restore only the quota settings, the restoration will terminate with an error.

3.13 Prerequisites for Using Backup Restore in NetBackup

Using NetBackup, you can back up file system data to a tape device and restore the data from the tape device to the file system.

This section provides an overview of how to perform a backup or restore by using NetBackup. For details on how to perform a backup or restore and how to manage backup data by using NetBackup, refer to the appropriate VERITAS Software Corp. documentation.

When using NetBackup to perform backup and restore, consider the issues described next:

- When restoration is performed on a directory basis, the processing time increases not with the amount of data to be restored, but with the amount of data to be backed up.
- Use the DAR function allows a reduction restoration processing time. For details on how to use DAR functionality, refer to the appropriate VERITAS Software Corp documentation.
- When the file system is mounted as read-only, the .backupdates file cannot be updated. Even if you perform an incremental backup, a full backup is always obtained. If space is insufficient on the file system, the history of incremental backups may not be correctly collected in the `.backupdates` file. In such a case, copying differential data to a tape device starts from the point when the history of incremental backups is correctly collected in the .backupdates file.

Multiple backup and restore processes can be executed concurrently on one node. Table 3.8 details the maximum number of backup and restore processes concurrently executable on one node.

Table 3.8 Max Qty Backup/Restore Processes Executed on One Node

Disk Array	Maximum
TagmaStore AMS 1000	5
TagmaStore AMS 500	5
TagmaStore AMS 200	2
TagmaStore WMS 100	2

The next section describes how to execute a backup or restore in NetBackup. For details, see the appropriate VERITAS Software Corp. documentation.

3.13.1 NDMP Policy in NetBackup and .backupdates File

Perform the backup operation by specifying an NDMP policy in NetBackup on the backup server. If the CIFS client sets ACL functionality for the directories and files to be backed up, that information is also automatically saved.

When you perform an incremental backup, the `.backupdates` file containing the backup history is output to the mount point of the file system. While the file system is mounted as read-only, the `.backupdates` file cannot be updated. Thus, even if you perform an incremental backup, a full backup is always obtained. If space is insufficient on the file system, the history of incremental backups may not be correctly collected in the `.backupdates` file. In such a case, copying of differential data to a tape device begins at the point when the history of incremental backups is correctly collected in the `.backupdates` file.

3.13.2 Variable Quota and Backup Target Information

If the environment variable `QUOTA` is set to `y` in the Backup Selections list, quota information set in the file systems and directories for backup selections is backed up when a backup is made. If multiple unique directories are specified as backup target base point in the Backup Selections list, quota information is backed up for each directory specified as a base point of a backup target.

When quota information is backed up, the file in which the quota information is stored is output to the media used as the backup destination. For details on the names and output locations for files storing quota information, see 3.13.5.

Quota information is output to a file immediately under each base point directory specified as the base point of a backup target. User quota information is output to the `.quota.user` file while group quota information is output to the `.quota.group` file. The next example shows the case in which backup is performed with the Backup Selections list specified as follows:

```
SET TYPE=tar
SET FILES=./unit01
SET HIST=f
SET SNAPSHOT=n
SET RECURSIVE=y
SET QUOTA=y
SET EXCLUSIVE=y
/mnt/filesystem01/home
SET FILES=./unit02
/mnt/filesystem01/home
SET FILES="./"
SET SNAPSHOT=sync
SET QUOTA=n
/mnt/filesystem02/work
SET SNAPSHOT=sync
SET QUOTA=y
```

```
/mnt/filesystem03
```

In this case, quota information is backed up to media, in the configuration shown next in Figure 3.6:

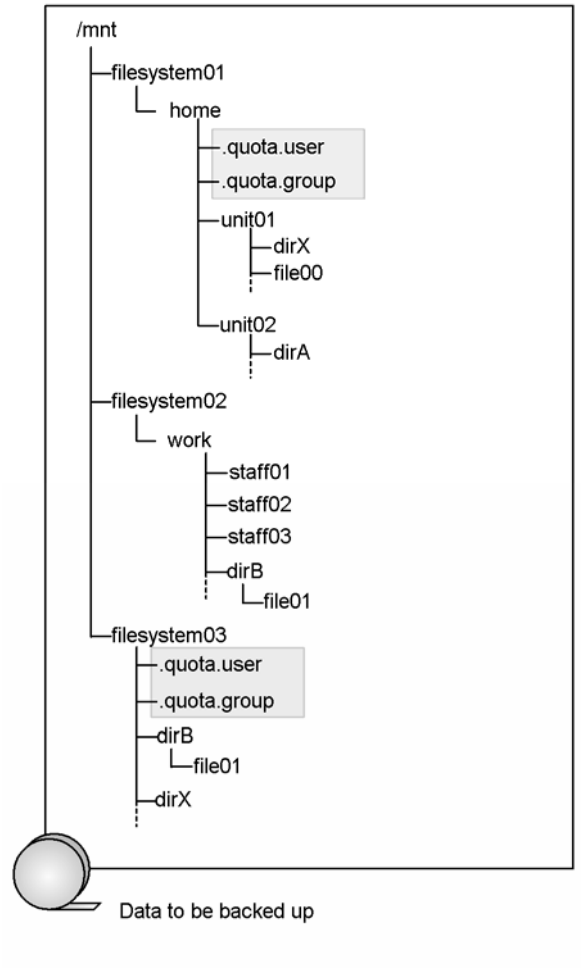


Figure 3.6 Sample Configuration of Backed up Data

During processing to backup, do not update quota information that is set on the backup source volume because integrity cannot be guaranteed between quota information set on the backup-source volume and quota information backed up to a tape device.

The following data can be backed up to media:

- File system information (Quota information).
- Directory file attributes.
- Directory files.

For details on the file system information (Quota information) and directory file attributes that can be backed up, see *Appendix B Target data for backup and restoration*.

3.13.3 Performing an Offline Backup

When the environment variable SNAPSHOT is omitted or set to n in the Backup Selections list, if backup is performed from NetBackup, an offline backup is performed.

In addition to normal file systems, NAS Sync Image differential-data snapshot that have already been created and copy destination file systems that have been created by using the remote copy function can also be specified as backup sources. However, when specifying differential-data snapshot or copy destination file systems that have been created by using remote copy functions, as backup sources, be aware of the following:

- To acquire an incremental backup by specifying a differential-data snapshot as the backup-source, NAS Sync Image must be installed. If NAS Sync Image has not been installed, a full backup will be performed. Even if the NAS Sync Image license is not set up, if differential-data snapshot exists, you can perform a full backup or incremental backup by specifying the differential-data snapshot as the backup source.
- If the copy-destination file system created by the remote copy functionality is specified as the backup source, you cannot operate an incremental backup.

For the backup-source, you can specify not only a normal file system but also a previously created NAS Backup Restore or a NAS Sync Image Modular differential-data snapshot. When you specify differential-data snapshot as the backup-source, consider the following:

After the offline backup finishes, if necessary, carry out the following operations so that the clients can access the backup-source directories and files:

- Start the NFS, CIFS, and FTP service.
- Create the NFS and CIFS shares.

For details on each operation, see *NAS Manager Modular User's Guide* (MK-95DF757).

3.13.4 Performing an Online Backup Using Differential-data Snapshot

When the environment variable SNAPSHOT is set to sync in the backup target list, if a backup is performed from NetBackup, an online backup is performed using differential-data snapshot, consider the follow:

- To perform an online backup using a differential-data snapshot, the cluster, your login node, and resource group on that node, must be running normally. The online backup may end with an error if there are problems in the cluster, node, or resource group. Check the status of the cluster, node, or resource group before starting the backup. For details on how to check the status of a cluster, node, or resource group, see *NAS Manager Modular User's Guide* (MK-95DF757).
- Differential-data snapshot is deleted in the background after data is copied to a tape device. However, if a separate process is executed in the file system (taking or deleting a different Sync Image) during the time the first data is being taken or deleted, the first online backup may take longer to complete. For an automatic backup eliminating scheduling conflicts, set the backup execution time by taking into account the automatic creation schedule of the differential-data snapshot set in the file system.

- Do not restart the CIFS service during an online backup or CIFS clients might not be able to access or write data to the file system.
- When a backup is executed, differential-data snapshot is created and mounted and then its data is stored to a tape device. As it is created, the differential-data snapshot is assigned a name by the system beginning with `SyncBackup`. Also, the differential-data snapshot is mounted using a mount point name beginning with `@SyncBackup`.
- When the backup finishes successfully, the differential-data snapshot is automatically un-mounted and deleted.

If you perform a backup of a large file system, it may take a long time before the backup finishes. An online backup ends with an error under any or all of the following circumstances:

- If the capacity of the differential-data snapshot storage device is insufficient.
- If the amount of differential-data snapshot reaches the number of reserved generations.
- If the number of volumes mounted in the cluster reaches the maximum.

3.13.5 Backing up quota information

With NAS Backup Restore, quota information set for each file system and directory can be backed up. The quota information set for an individual directory is called a subtree quota. For details on quota information, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

This section explains the names and output locations for the files output when backing up quota information.

3.13.5.1 Output locations for quota information

If you back up quota information for a file system that is mounted with its quota function enabled, files storing the quota information for the file system will be created at the backup location regardless of whether that quota information exists at the backup source. Files storing subtree quota information are only created when subtree quotas are set at the backup source.

The following table shows the relationship between the quota information that is backed up and the name of the files where quota information is stored.

Table 3.9 Relationship between Backed Up Quota Info and Quota Info Store Files

Quota information that is backed up		File where quota information is stored
Quotas set for a file system	Default quotas, user quotas and grace periods	`.quota.user`
	Group quotas and grace periods	`.quota.group`
Quotas set for a directory (subtree quota)	Quotas and grace periods for the directory	`.quota.subtree`

Quota information that is backed up		File where quota information is stored
	Default quotas, user quotas and grace periods	`.quota.user`
	Group quotas and grace periods	`.quota.group`

3.13.5.2 Output Location for Files Storing Quota Information

When the mount point for a file system is specified as the backup target, files storing quota information are output to different locations depending on whether the backup target is the mount point for the file system or a directory below the mount point. If the specified backup target is the mount point for the file system, the files storing quota information are output to the following location on the media:

- The point immediately below `/mnt/`*path-of-the-backup-target-directory*

  For example, if `/mnt/filesystem01` is the backup target, after the backup, the files `.quota.user` and `.quota.group`, which store quota information for the file system, are output directly below the mount point for the media at the backup location.

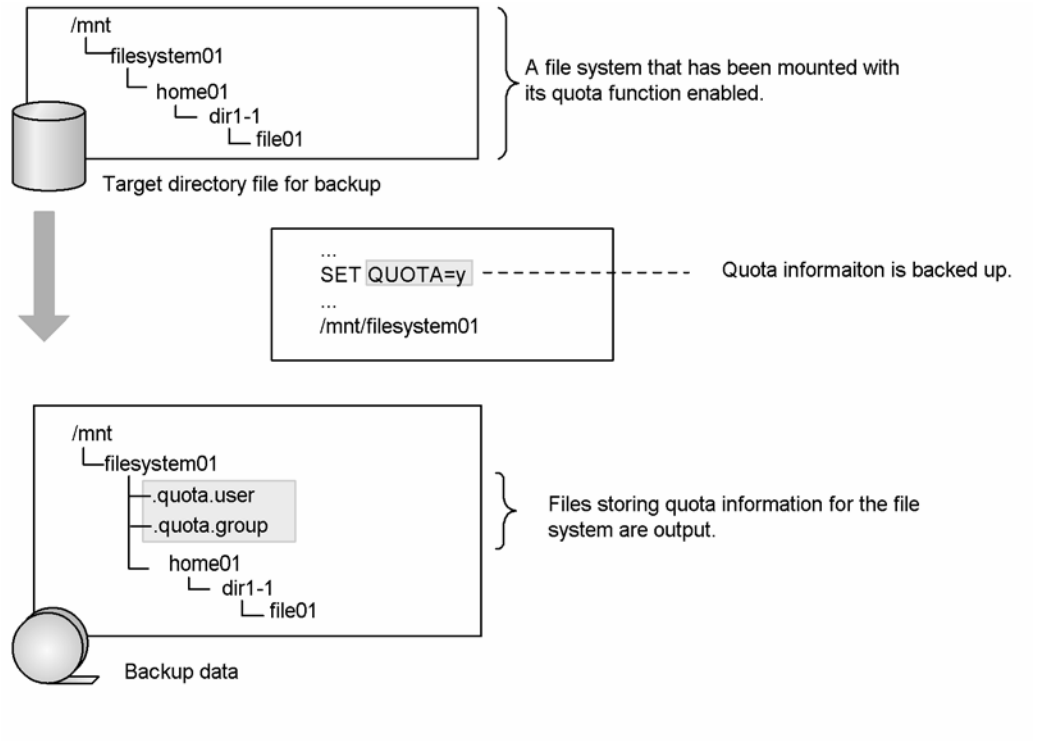


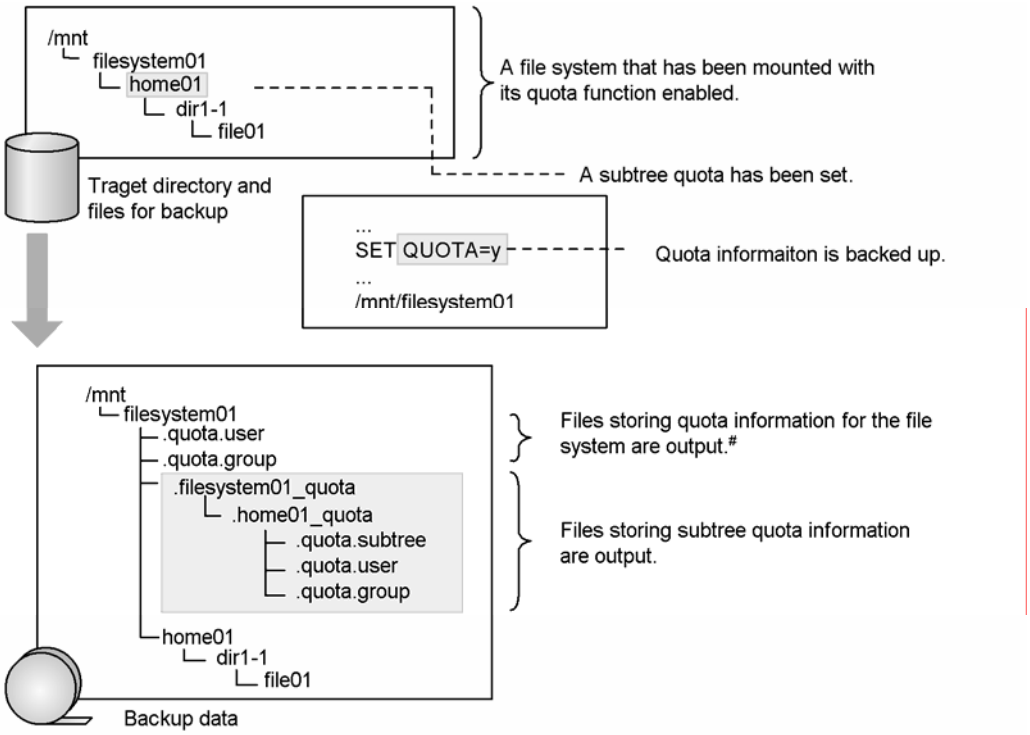
Figure 3.7 Output Location of Files Storing Quota Information

In the case, when the mount point for the file system is specified as the backup target, if subtree quotas are set for directories under the file system to be backed up, the output location for the files storing subtree quota information set in the file system is output to the following location on the media:

- /mnt/*path-of-the-backup*-target-directory/.file-system-name_quota/.directory-name-where-subtree-quotas-are-set_quota

  For example, if /mnt/filesystem01 has been set for the directory that is the base point of the backup target, and a subtree quota has been set for the /mnt/filesystem01/home01 directory, after the backup, the .filesystem01_quota/.home01_quota directory is created directly below the mount point for the media at the backup location, and the files .quota.subtree, .quota.user, and .quota.group, which store the subtree quota information are output into that directory.

  The output location of files storing quota information when a subtree quota is set for the directory under the backup file system is shown in Figure 3.8.



#: If you back up quota information for a file system that is mounted with its quota function enabled, the files .quota.user and .quota.group for the file system will be output regardless of whether that quota information exists at the backup source.
If there are no quotas set, all values in those files will be 0.

Figure 3.8 Output Location of Files Storing Quota Information

3.13.5.3 Output Location for Files Storing Quota Information

The output location for files storing quota information when a directory below the mount point is specified as the backup target varies depending upon whether the backup target is the mount point for the file system or a directory below the mount point. If a directory below the mount point is specified for the backup target, the output location for the files storing quota information is output to the following location on the media:

- The point immediately below `/mnt/`*path-of-the-backup-target-directory*

  Note: that if multiple directories under the same file system are specified as backup targets, after the backup, quota information for the file system is also output to the multiple locations.

  For example, if `/mnt/filesystem01/home01` and `/mnt/filesystem01/home02/dir2-1` have been set as the backup targets, after the backup, the `/mnt/filesystem01/home01` and `/mnt/filesystem01/home02/dir2-1` directories are created at the backup location media, and the files `.quota.user` and `.quota.group` that store quota information are output into those directories respectively.

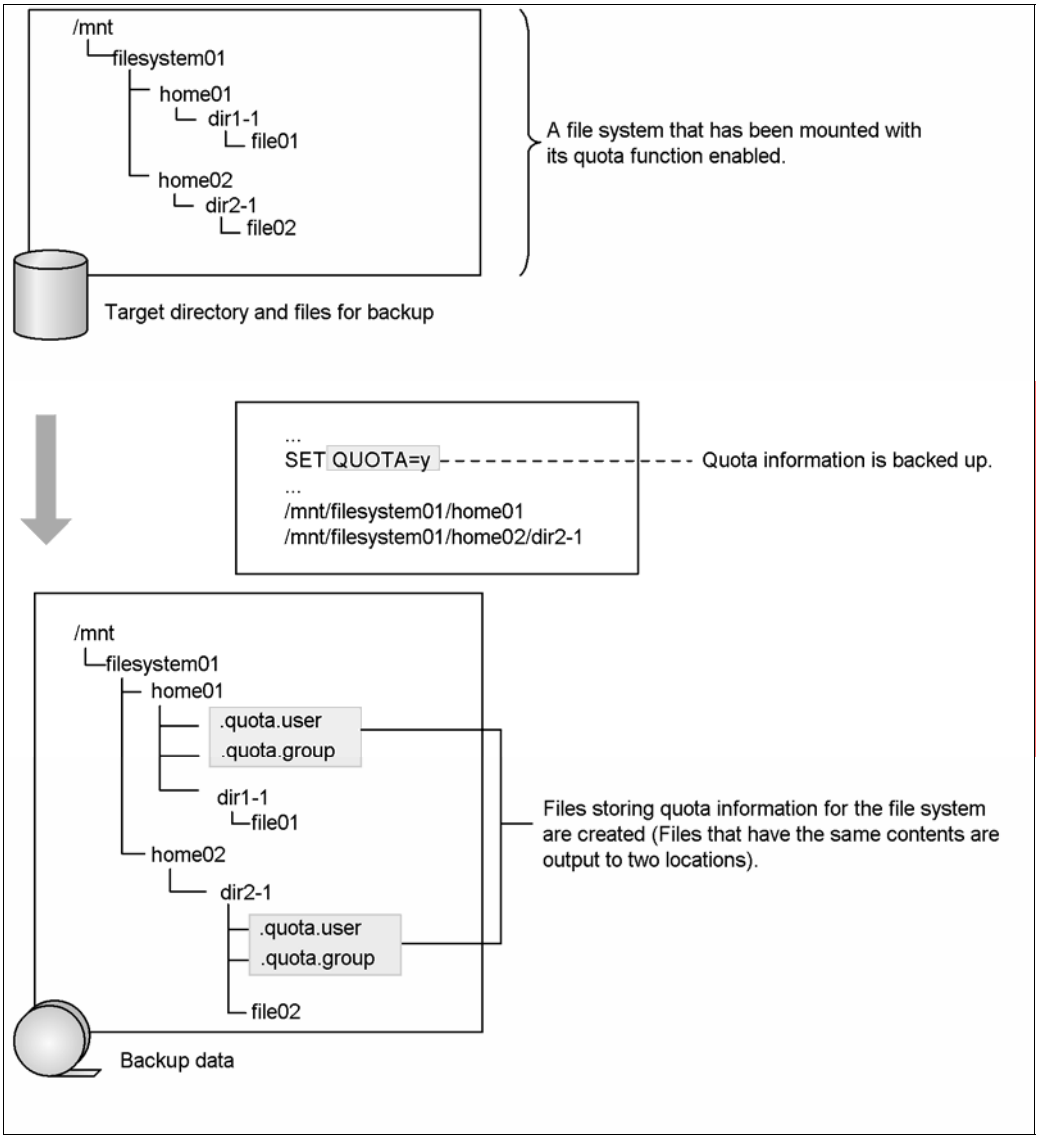


Figure 3.9 Output Location of Files Storing Quota Information

In this case, when a directory under the mount point for the file system is specified for the backup target, if a subtree quota is set for a backed-up directory, the output location for files storing the subtree quota information set in the file system is output to the following location on the media:

- /mnt/*path-of-the-backup-target-directory*/.*directory-name-where-subtree-quota-is-set*_quota

  For example, subtree quota information is set in the /mnt/filesystem01/home01 and /mnt/filesystem01/home02 directories. In this case, if /mnt/filesystem01/home01 and /mnt/filesystem01/home02/dir2-1 have been set as the backup targets, after the backup, the /mnt/filesystem01/home01/.home01_quota and /mnt/filesystem01/home02/dir2-1/.home02_quota directories are created at the backup location media, and the files .quota.subtree, .quota.user, and .quota.group that store subtree quota information are output into those directories respectively.

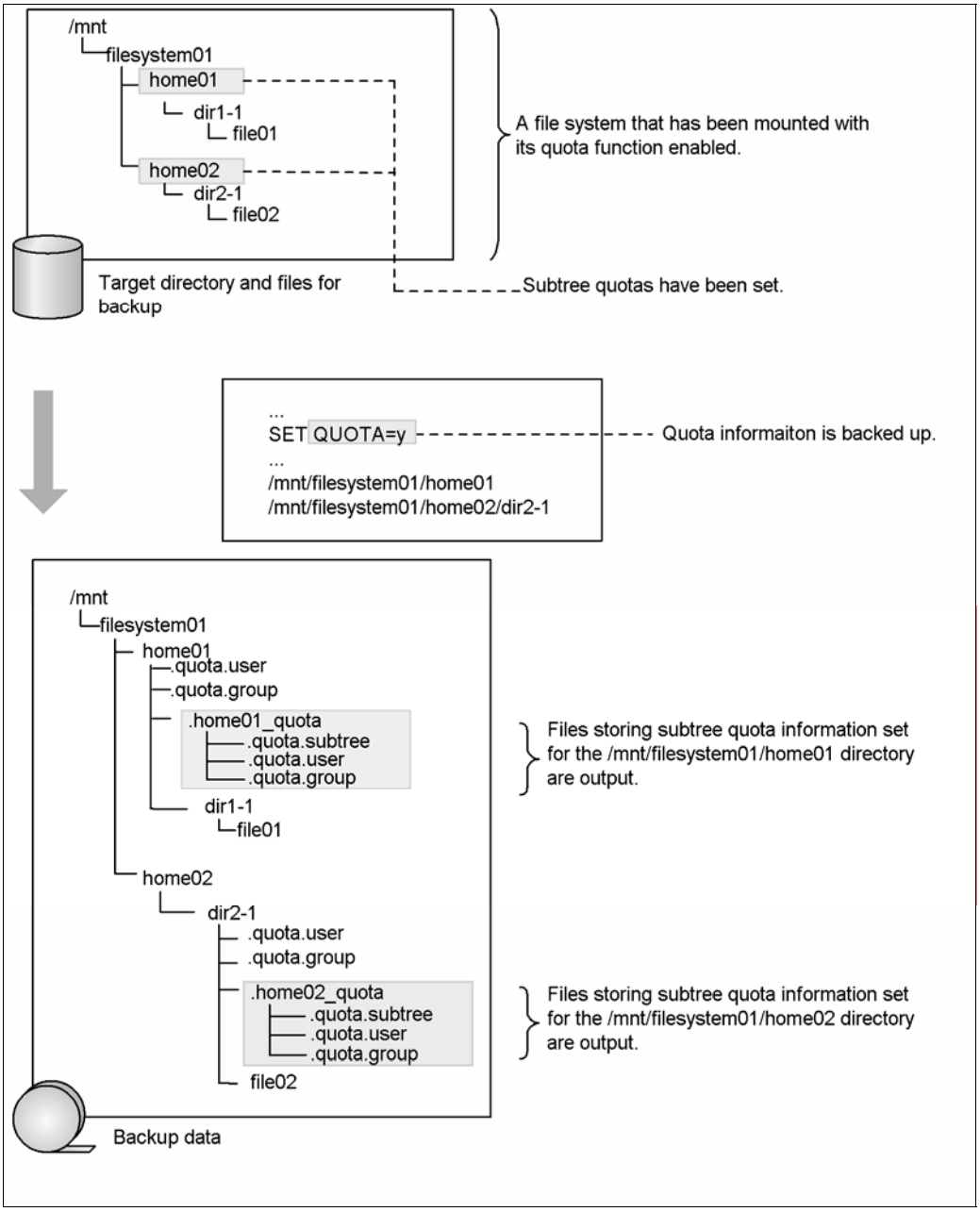


Figure 3.10 Output Location of Files Storing Quota Information

The output location of files storing quota information, when a subtree quota is set for a backed-up directory, has the following important notes when backing up Quota Information

- During processing to back up, do not update quota information that is set on the backup source volume because integrity cannot be guaranteed between quota information set on the backup-source volume and quota information backed up to a media.
- When a symbolic link is included in the backup target, do not back up the quota information. If the quota information is backed up when a symbolic link is included in the backup target, quota information for the link destination might be backed up, rather than the quota information for the symbolic link location.

3.13.6 Executing a Restore in NetBackup

Set the data to be restored with NetBackup. You can select file systems, directories, files, and quota information as the data to be restored. Perform the restore operation by selecting the data to be restored from the list of backups:

- If data for multiple file systems exists in the data to be restored, restore the data for each file system.
- If multiple directories and files with the same relative paths exist within the selected data, the data might be restored to an unintended state.

For example, Figure 3.11 illustrates the case in which the work directory and filesystem03 file system are restored using the restoration source data in the following configuration:

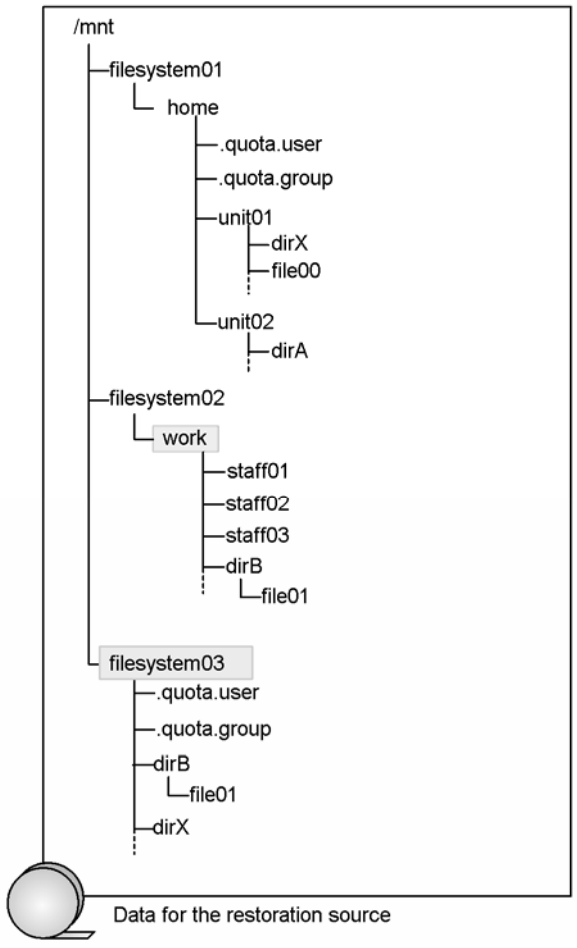


Figure 3.11 Sample Configuration of Restoration Source Data

In this case, after restoration processing for the `work` directory finishes, perform restoration for the `filesystem03` directory.

Caution: If these restorations are performed at the same time, the `dirB` directory and `file01` file in each directory might be restored to an invalid state.

Once restoration finishes, perform the following operations as necessary, and revise the settings so that clients can access the restore-destination file systems.

- Start the NFS, CIFS, and FTP service.
- Create the NFS and CIFS shares.

For details on each operation, see *NAS Manager Modular User's Guide* (MK-95DF757).

3.13.7 Restoring Quota Information

When restoring quota information, specify the files storing the quota information you want to restore. You can specify one or more of the following files: `.quota.user, .quota.group, and .quota.subtree` files.

By restoring the files storing quota information, the quota information is set for the file system or directory for the restore destination. However, the following may apply depending upon the quota information settings for the file system or directory at the restore destination:

- If quota information is set in the file system or directory at the restore destination, it is updated with the quota information set when the backup is acquired.
- Directories and files created after a backup is acquired, and quota settings for users and groups added after a backup is acquired keep the same settings as before the restoration was performed.
- If a directory has not been prepared in the file system at the restore destination, you cannot restore only subtree quotas, without restoring the directory at the same time. If you attempt to do so, the subtree quotas will not be restored and a warning message will be output.

For details on files to be selected and data that is restored when restoring quota information, see the next sections.

3.13.8 Restoring Files by Specifying Each File

When you are restoring specified files, ensure that the total number of the specified directories and files does not exceed 10,000. If the total exceeds 10,000, problems may occur in the operation of the restore target node. When you need to restore more than 10,000 directories and files, specify the parent directory that contains the target directories and files.

3.13.9 Restoring a File System

When restoring a file system, select all data in the file system that is selected for restoration and the files storing quota information.

An example is shown below for restoring the quotas set for a file system.

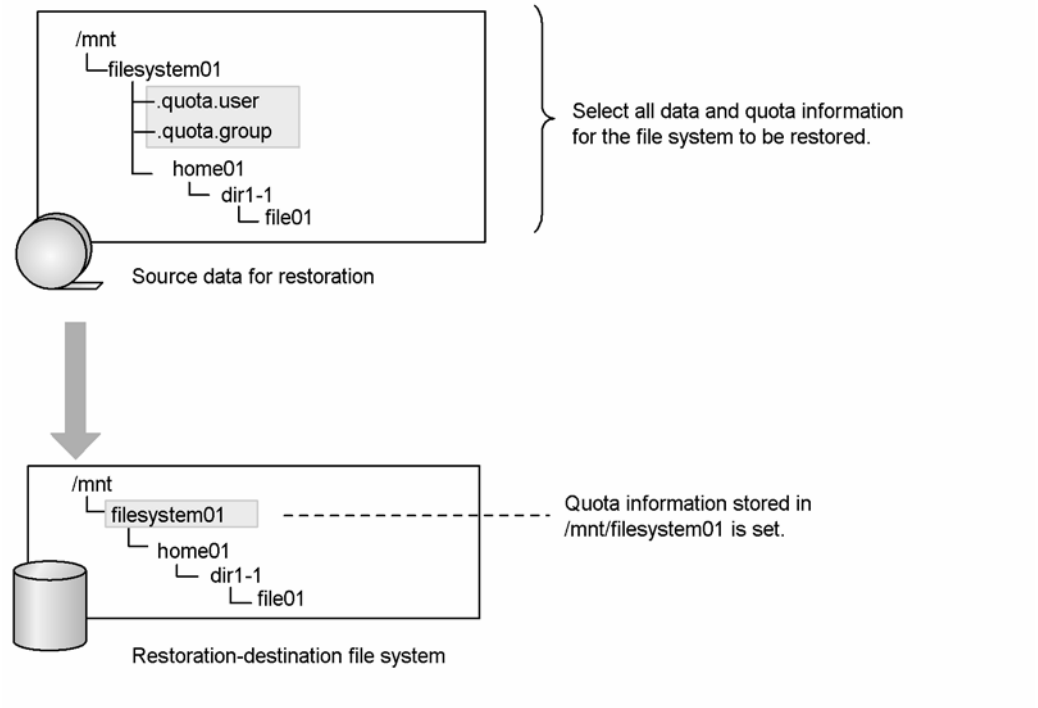


Figure 3.12 Example of Eestoring File System (Qhen Restoring Quotas for File System)

An example is shown below for restoring subtree quotas.

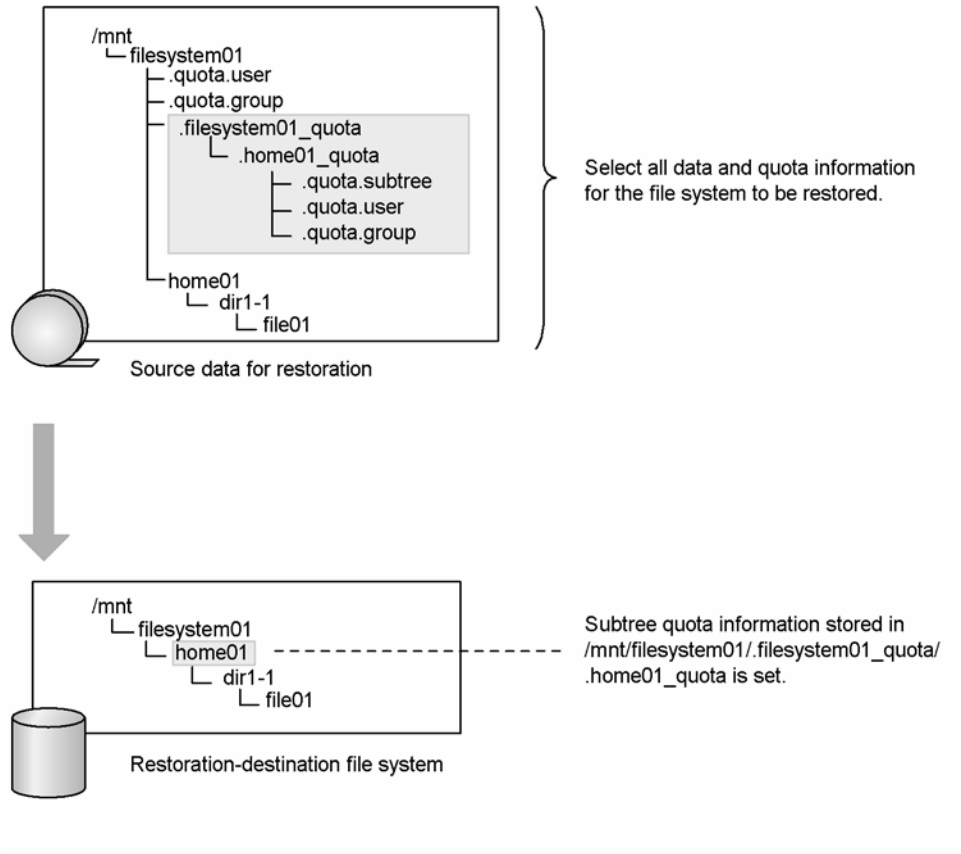


Figure 3.13 Example of restoring a file system (when restoring subtree quotas)

3.13.10 Restoring a Directory

When restoring a directory, select all data in the directory that is selected for restoration and the files storing quota information.

An example is shown below for restoring the quotas set for a file system.

If there are multiple files storing quota information below the file system that is to be restored, select only one copy each of the `.quota.user` file and the `.quota.group` file.

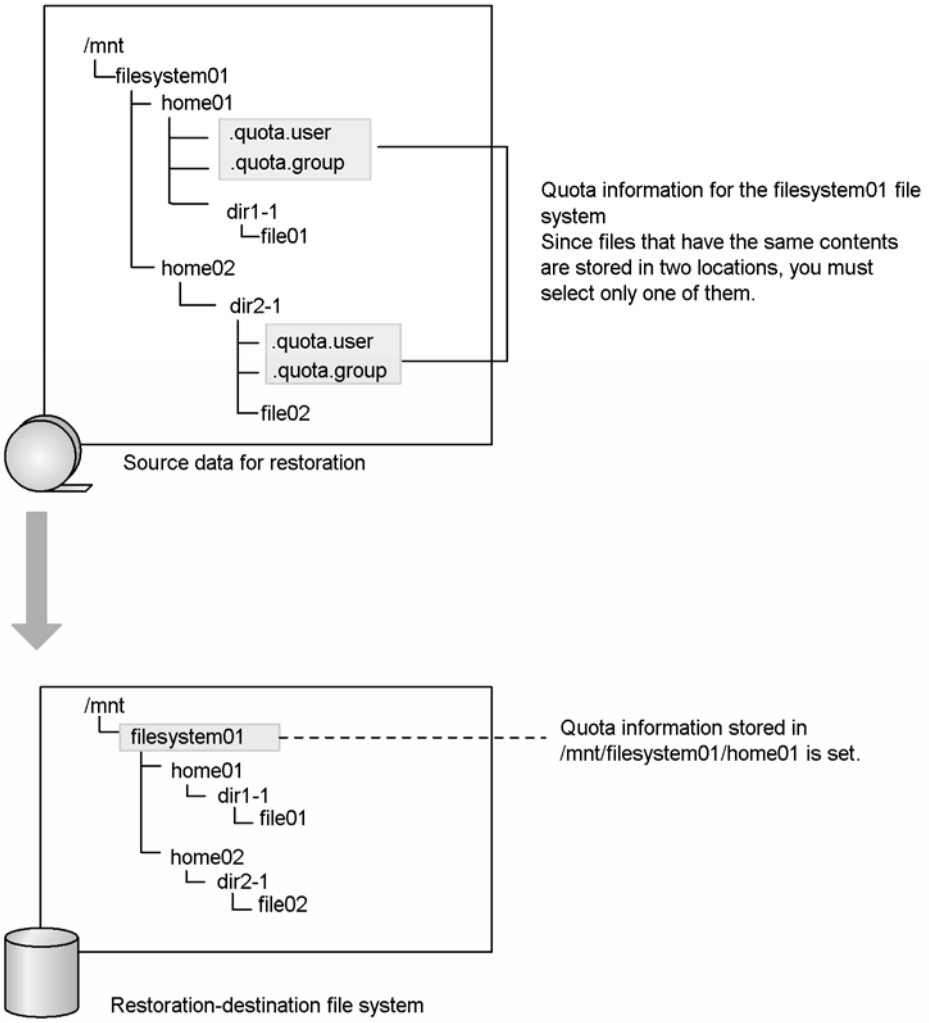


Figure 3.14 Example of restoring a directory (when restoring quotas for a file system)

An example is shown below for when restoring subtree quotas.

Note that when subtree quotas are restored, subtree quota information is set for the directory directly under the mount point, which is at a higher level than the restore destination.

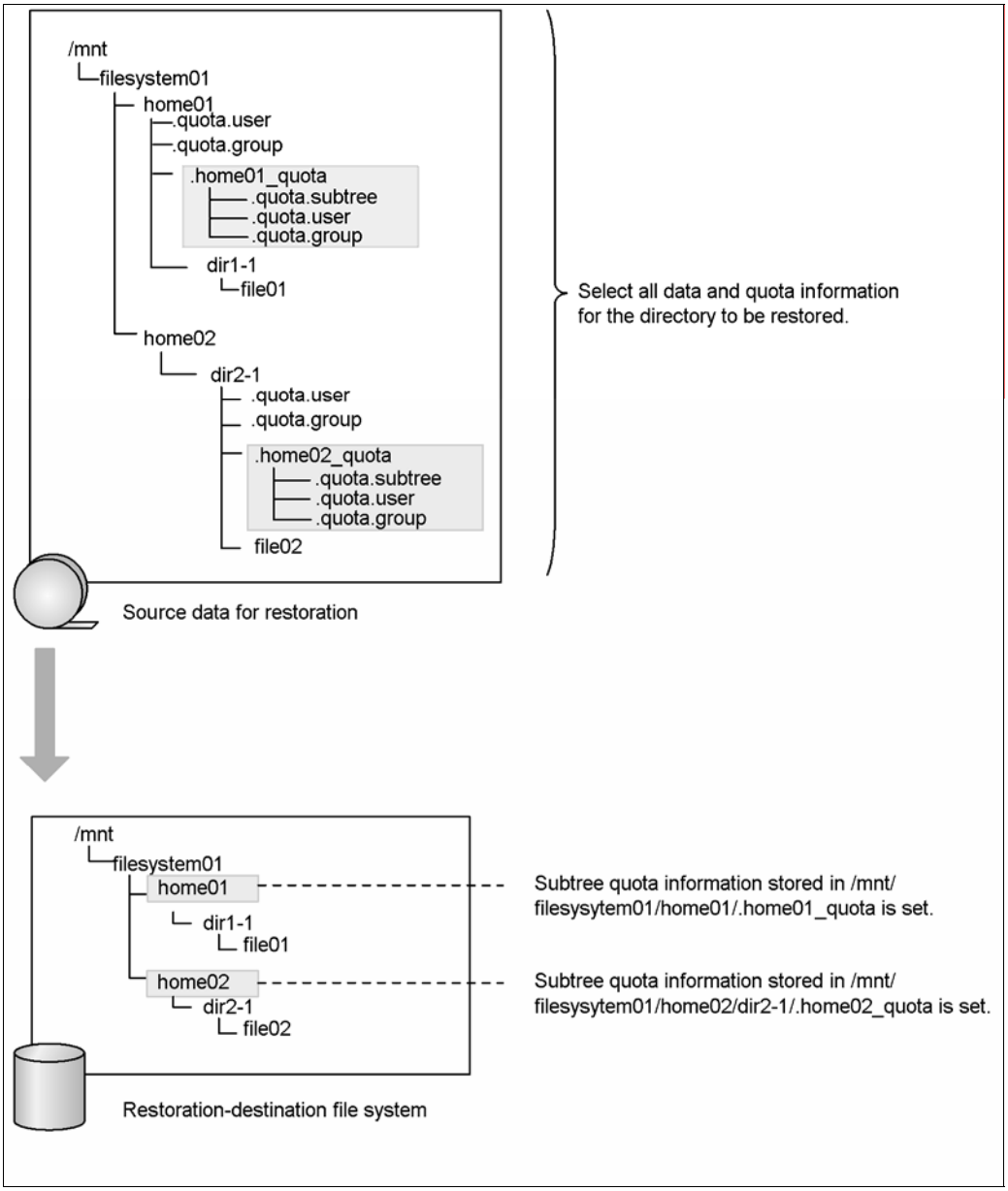


Figure 3.15 Example of restoration by directory (when restoring subtree quotas)

Important: Cautions for restoring quota information

- During a restoration, any quotas that are set for the file systems and directories at the restore destination will be updated to the quota information set in the files `.quota.user`, `.quota.group`, and `.quota.subtree`. When restoring quota information, check if quotas have been set at the restore destination, and if it is OK to update the quota at the restore destination to the quotas as they were when the backup was made.
- If multiple copies of the files `.quota.user`, `.quota.group`, or `quota.subtree` are restored to the same restore-destination, you (the system administrator) might end up restoring the quota information to an unintended state. Therefore, when restoring quota information, we recommend that you do so by selecting one `.quota.user` file , one `.quota.group` file or one `.quota.subtree` file.

- Do not change the quota information set for the restore-destination file system during restoration processing, because the quota information backed up to the media will not be set properly on the restore-destination file system.

Subtree quotas can also be restored to a directory that has already been used by users, and for which subtree quotas has not been set. In this case, the system administrator must use the `stquotaset` command to count the i-node and block usage of the directories and files under the target directory and include them in whole quota usage. For details on the `stquotaset` command, see the *NAS Manager Modular User's Guide* (MK-95DF757).

3.14 Controlling the NDMP Server

The NDMP server that executes backup and restore starts automatically when the node is started. This section describes how to use the NAS Backup Restore GUI to check the NDMP server's operating status and to stop and restart the NDMP server. For details on command-driven procedures, see the `NDMPcontrol` command in section 5.7.

You can use the NAS Backup Restore GUI or commands to control the NDMP server. For example, you can check the NDMP server's operating status and stop or restart the server as required. Figure 3.16 shows the transitions among the NAS Backup Restore windows used when controlling the NDMP server.

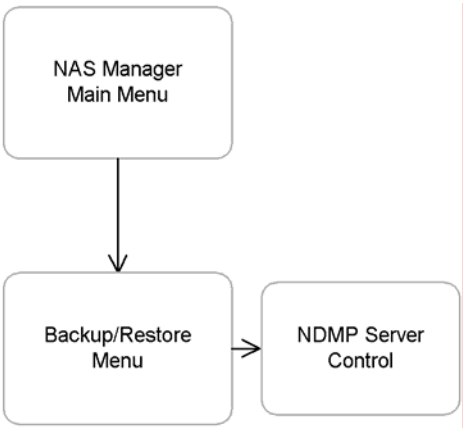


Figure 3.16 Window Transitions during NDMP Server Control

To control the NDMP server through the NAS Backup Restore GUI, log on to the NAS Unit by specifying, in a URL, the fixed IP address used for NAS Unit `mngl`.

To display the windows used while controlling the NDMP server, click the **Backup/Restore** button in the **Main Menu** window of NAS Manager (as illustrated in Figure 3.17).

3.14.1 Login User Name and Password for the NDMP Server

A login user name and password are required when connecting to the NDMP server.

The Initial password `ndmp` is specified as the default. The login user name is "root".

In order to prevent unauthorized access, make sure you change the default password after the license is registered and the NAS OS LU data is restored. The new password remains until un-installation is performed. For details on how to change the password, see section 3.14.8.

3.14.2 Checking Operating Status of the NDMP Server

1. Log on to a NAS unit and in the **Main Menu** window click the **Backup/Restore** button.

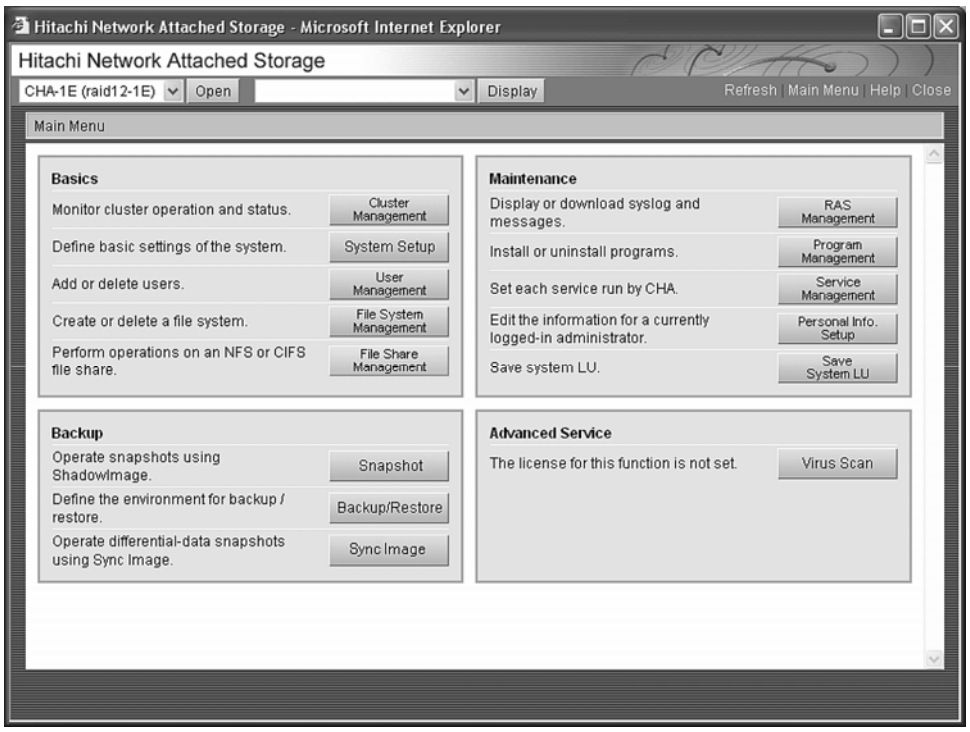


Figure 3.17 Main Menu Window

Click **NDMP Server Control** in the **Backup/Restore Menu** window as illustrated in Figure 3.18.

2. The **Backup/Restore Menu** window opens, as illustrated next.

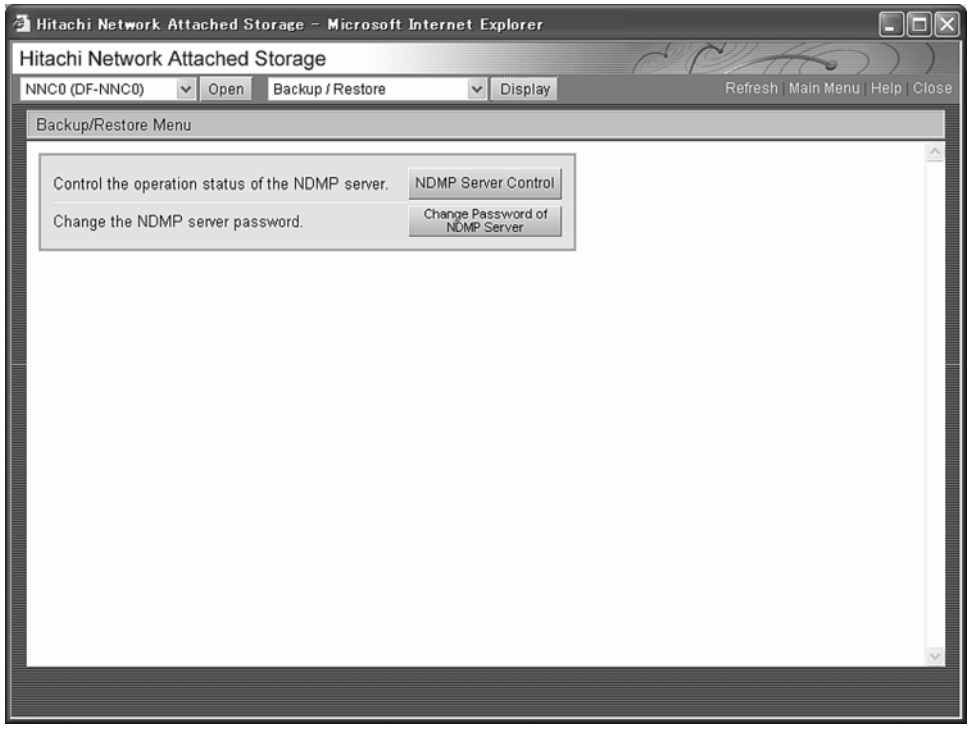


Figure 3.18 Backup/Restore Menu Window

3. In the **Backup/Restore Menu** window, click the **NDMP Server Control** button. The **NDMP Server Control** window opens, as illustrated next.

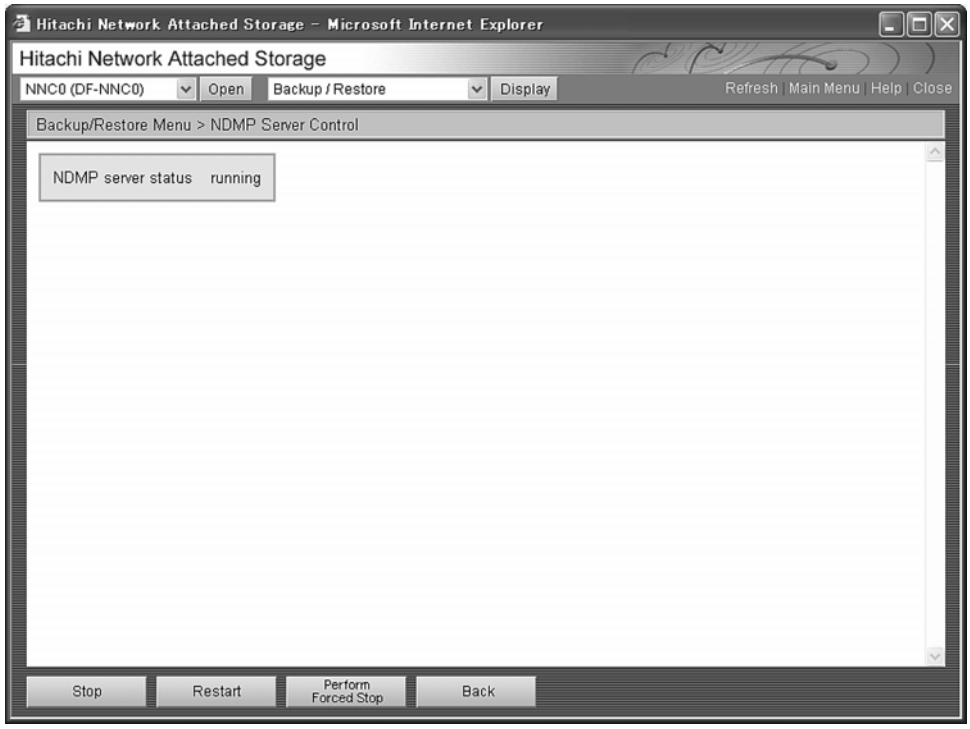


Figure 3.19 NDMP Server Control Window

4. The **NDMP Server Control** window shows the operating status of the NDMP server. The operating status of the NDMP server appears as one of the following strings:

   `running`

   The NDMP server is running.

   `stopped`

   The NDMP server has stopped.

   `error`

   The number of backup servers or media servers that are connected to the NDMP server has exceeded the limit. Do not connect more than 5 backup servers or media servers to the NDMP server.

3.14.3 Stopping the NDMP Server

When stopping the NDMP server, ensure that no backup and restore operations are performed. The NDMP server cannot be stopped during processing to backup or restore.

To stop the NDMP server:

1. In the **Main Menu** window (Figure 3.17), click **Backup/Restore**. The **Backup/Restore Menu** window opens (Figure 3.18).
2. Click **NDMP Server Control**. The **NDMP Server Control** window appears (Figure 3.19). If the NDMP server is running, but is not connected to either the backup server or media server, the **Stop** button is displayed.
3. Click **Stop**. The NDMP server stops and the **Backup/Restore Menu** window reappears.

3.14.4 Restarting the NDMP Server

When restarting the NDMP server, make sure that no backup and restore operations are executed. The NDMP server cannot be restarted during the backup or restore operations.

To restart the NDMP server:

1. In the **Main Menu** window (Figure 3.17), click the **Backup/Restore** button. The **Backup/Restore Menu** window (Figure 3.18) opens.
2. Click **NDMP Server Control**. The **NDMP Server Control** window opens (Figure 3.19). If the NDMP server is running but is not connected to either the backup server or media server, **Restart** is displayed.
3. Click **Restart**. The NDMP server restarts and the **Backup/Restore Menu** window re-opens.

3.14.5 Starting the NDMP Server

To start the NDMP server after the NDMP server stopped while the node was in operation:

1. In the **Main Menu** window (Figure 3.17), click **Backup/Restore**. The **Backup/Restore Menu** window (Figure 3.18) opens.
2. Click **NDMP Server Control**. The **NDMP Server Control** window (Figure 3.19) opens. If the NDMP server is stopped, **Start** is displayed.
3. Click **Start**. The NDMP server starts and the **Backup/Restore Menu** window re-opens.

3.14.6 Performing a Forced Stop of the NDMP Server

You can perform a forced stop of the NDMP server while it is connected to a backup server or media server.

3.14.7 Prerequisites/Precautions

Check the connection status at both the backup server and media server before you perform a forced stop of the NDMP server:

- If you perform a forced stop of the NDMP server while it is connected to the backup server or media server, backup and restore operations running on these servers may terminate abnormally.
- If you perform a forced stop of the NDMP server while an online backup using a differential-data snapshot is being performed, the differential-data snapshot might not be automatically un-mounted and deleted. In such a case, the next time you perform an online backup, the previous differential-data snapshot that was not deleted is automatically un-mounted and deleted.

To perform a forced stop of the NDMP server:

1. In the **Main Menu** window (Figure 3.17), click **Backup/Restore**. The **Backup/Restore Menu** window (Figure 3.18) opens.
2. Click **NDMP Server Control**. The **NDMP Server Control** window (Figure 3.19) opens.
3. Click **Perform Forced Stop**. A dialog box confirming the forced stop of the NDMP server appears.
4. Click **OK**. The NDMP server is forced to stop, and the **Backup/Restore Menu** window reappears.

3.14.8 Changing the NDMP Server Password

This section describes how to use the NAS Backup Restore GUI to change the NDMP server password. For details on command-driven procedures, see the `NDMPpasswd` command in section 5.8.

You can use the NAS Backup Restore GUI or CLI commands to change the password for connecting to the NDMP server.

- You must change the password after setting up the license and restoring the NAS OS LU data. Then you must also change the NDMP server password for each node.
- You should specify the same NDMP server password for all the nodes in a cluster configuration. If different passwords are set for each node in the cluster, if backup or restore is executed during operations that fail or are uncompleted, a recognition error occurs in the failover-destination node.

Figure 3.20 shows the transitions among the NAS Backup Restore windows used when changing the NDMP server password. To change NDMP server password through the NAS Backup Restore GUI or control the NDMP server using the NAS Backup Restore GUI, perform the next steps:

1. Log on to the NAS unit by specifying, in a URL, the fixed IP address used for NAS Unit *mng1*.
2. To display the NAS Backup Restore windows used while changing the NDMP server password, click **Backup/Restore** in the **Main Menu** window of NAS Manager.
3. Then click **Change Password of NDMP Server** in the **Backup/Restore Menu** window.

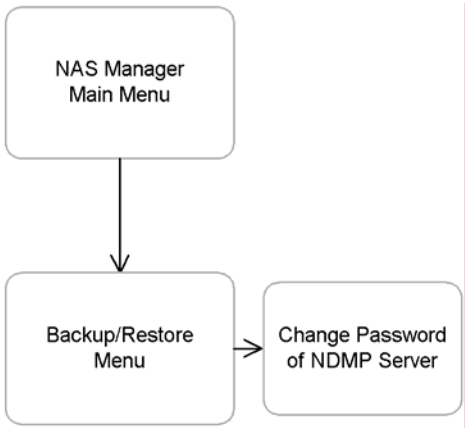


Figure 3.20 Changing the NDMP Server Password

3.14.9 Procedure to Change the NDMP Server Password

To change the NDMP server password:

1. In the **Main Menu** window (Figure 3.17), click **Backup/Restore**. The **Backup/Restore Menu** window (Figure 3.18) opens.
2. Click **Change Password of NDMP Server**. The **Change Password of NDMP Server** window opens, as illustrated next in Figure 3.21.

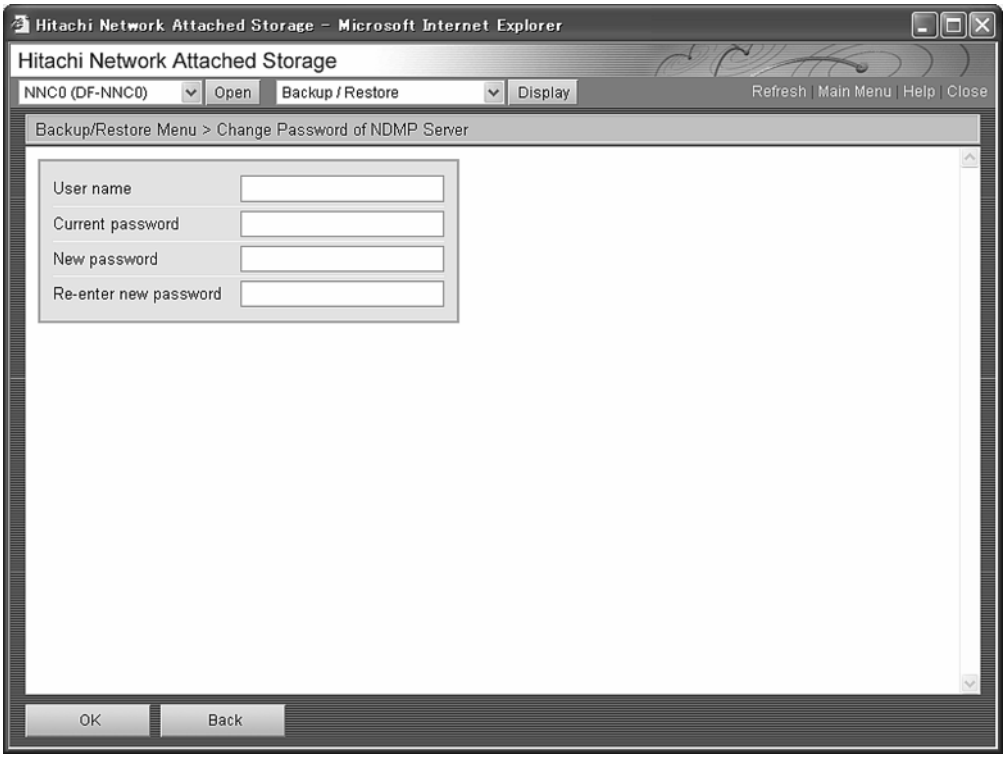


Figure 3.21 Change Password of NDMP Server Window

3. Enter the following information:
   - **Username** for connecting to the NDMP server.
   - **Current password.**
   - **New password** (1 to 32 characters alphanumeric and underscores).
   - **Re-enter new password** (new password can not be the same string as the string you specified for **User name** or **Current password**).
4. Click **OK**. The NDMP server password changes and the **Backup/Restore Menu** window re-opens.
5. After changing the password, execute the `set_ndmp_attr` command at the backup server to set up the access permission to the NDMP server again.

   The following table lists the information to be specified in the Change Password of NDMP Server window.

Table 3.10 Information Specified in the Change Password of NDMP Server Window

Item	Description
User name	Enter the user name (root) for connecting to the NDMP server.
Current password	Enter the current password.
New password	Enter the new password. Enter from 1 to 32 characters. You can use alphanumeric characters and underscores (_). You cannot enter the same string as the string you specified in either User name or Current password. For New password, specify a value that a third party will not easily guess.
Re-enter new password	Re-enter the new password.

3.14.10 Displaying and Modifying NDMP Server Timeout Information

You can use a NAS Backup Restore command to display and modify the timeout information that is set for the NDMP server. The NDMP server is set to timeout if communication between the backup server and the NDMP server or data transmission from the media server to the NDMP server stops for a certain period of time.

- The timeout value for the NDMP server is initially set to 480 minutes. If necessary, you can change the timeout value of the NDMP server for each node, based on actual backup operations.
- Set the same timeout value for both of the nodes in a cluster. If different timeout values are set and backup is performed during failed or unsuccessful operations, backup processing might end abnormally before the data transfer is complete.

For details on displaying and modifying the timeout information that is set for the NDMP server, see section 5.6.

3.15 Deleting Registered Tape Device Information

If a tape device connected over a Fibre Channel to a NAS Unit is no longer needed, delete the registered information about the tape device from the NDMP server.

The system administrator should log in to the NAS Unit to which the tape device is connected, delete the information registered for the tape device, and then remove the tape device from the NAS Unit.

1. Delete the tape device set as the NDMP storage device in NetBackup.

   To delete a tape drive, select **Media and Device Management, Devices,** and then **Drives,** and then delete the appropriate tape drive.

   To delete a tape changer (robot), select **Media and Device Management, Devices,** and then **Robots,** and then delete the appropriate tape changer.

2. Delete the media for the tape device.

   Select **Media and Device Management, Media,** and then **Volume Groups,** and then delete the appropriate media.

3. Delete information registered for the tape device.

   For details on how to delete information registered for a tape device, see section 4.4.3.

4. Turn the power off to the tape device to be removed from the NAS Unit, and then disconnect it from the FC port on the NAS Unit.

Chapter 4 Operations Using Commands

In addition to using the GUI to perform NDMP server management, you can also use CLI commands to perform these operations. This chapter explains how to perform these operations. For details on the syntax of a command, see Chapter 5, Commands.

For details on how to use commands to perform remote copy, see the manuals for ShadowImage.

Table 4.1 lists the operations that you can perform using commands:

Table 4.1 Operations Performed by Using Commands and Reference Info

Operation	See	
	Commands Used	GUI Used
Controlling the NDMP server by using commands	4.1	3.1.4
Changing the NDMP server password	4.2	3.14.8
Changing NDMP server timeout information	4.3	-
Checking/changing the transfer rate of FC ports on the NAS Unit	4.4.1	-
Registering tape device information	4.4.2	-
Canceling registered tape device information	4.4.3	-

The following examples assume that you have logged in to the NAS Unit and manually execute commands.

To use commands to operate NAS Backup Restore, you must have registered at least one public key to be used in an account for Secure Shell (SSH). For details on registering a public key, see the manual NAS Manager Modular User's Guide.

There are two methods of executing commands. One method is to log in to the NAS Unit and then execute the commands. The other method is to execute the commands from a remote host.

The methods for executing commands by the system administrator are explained in this section.

4.1 Controlling the NDMP Server by Using Commands

This section explains how to use commands to control the NDMP server. The example assumes that the NDMP server will be restarted.

To control the NDMP server follow the next steps:

1. Use the NDMPcontrol command to check whether you can change the operating status of the NDMP server.

   ```
   $ sudo NDMPcontrol –l
   ```

   For details on the syntax of the NDMPcontrol command, see NDMPcontrol in section 5.7. (NDMPcontrol controls the NDMP server.)

2. Use the NDMPcontrol command to control the NDMP server.

   ```
   $ sudo NDMPcontrol –s
   ```

   For details on the syntax of the NDMPcontrol command, see NDMPcontrol in section 5.7.

3. Use the NDMPcontrol command to check the operating status of the NDMP server.

   ```
   $ sudo NDMPcontrol –l
   ```

   For details on the syntax of the NDMPcontrol command, see NDMPcontrol in section 5.7. (NDMPcontrol controls the NDMP server.)

4.2 Changing the NDMP Server Password by Using Commands

This section explains how to use commands to change the NDMP server password. The example assumes that you set the same password for both nodes in the cluster.

To change the NDMP server password:

1. Use the `NDMPpasswd` command to change the NDMP server password. (NDMPpasswd changes the NDMP server password.)

   ```
   $ sudo NDMPpasswd
   ```

   For details on the syntax of the NDMPpasswd command, see NDMPpasswd in section 5.8.

2. Log in again to the other node in the cluster, and then perform step 1 again.

3. Execute the set_ndmp_attr command on the backup server to grant access permission for the NDMP server and media server again. For details on the syntax of the `set_ndmp_attr` command, see the appropriate VERITAS Corporation documentation.

   For details on granting access permissions, see section 3.7.

4. Execute the `set_ndmp_attr` command on a backup server to check whether access permissions are correctly granted to the NDMP server.

   For details on how to check access permissions, see section 3.7.

If there are multiple backup servers performing backup or restoration in the cluster, carry out steps 3 and 4 for each backup server.

4.3 Changing the NDMP Server Timeout Information by Using Commands

This section explains how to use commands to change the NDMP server timeout information. The example assumes the following conditions:

- Change the default timeout value from 480 minutes to 720 minutes.
- You have set the same value, 720 minutes, for both nodes in the cluster.

To change the timeout information for the NDMP server, follow the next steps:

1. Use the NDMPconfig command to check the current timeout value. (NDMPconfig displays and modifies NDMP server timeout information.)

   ```
   $ sudo NDMPconfig -l server_timeout
   ```

   For details on the syntax of the NDMPconfig command, see NDMPconfig in section 5.6.

2. Use the NDMPcontrol command to make sure of the following:
   - Neither backup nor restoration is being performed.
   - `Disconnected` is displayed for `backupsvrstatus` and `mediasvrstatus`.

3. Use the NDMPconfig command to change the timeout information for the NDMP server. (NDMPconfig displays and modifies NDMP server timeout information.)

   $ sudo NDMPconfig -m server_timeout 720

   When the timeout information for the NDMP server is changed, the NDMP server automatically restarts. For details on the syntax of the NDMPconfig command, see NDMPconfig in section 5.6.

4. Use the NDMPconfig command to make sure that the timeout value was changed correctly. (NDMPconfig displays and modifies NDMP server timeout information.) Make sure that the timeout value you set for `server_timeout` is displayed.

   ```
   $ sudo NDMPconfig -l server_timeout
   ```

   Changing the timeout information for the NDMP server automatically restarts the NDMP server. For details on the syntax of the `NDMPconfig` command, see NDMPconfig in section 5.6.

5. Use the NDMPcontrol command to check that the NDMP server is running normally. (NDMPcontrol controls the NDMP server.)

   ```
   $ sudo NDMPcontrol –l
   ```

   For details on the syntax of the `NDMPcontrol` command, see NDMPcontrol in section 5.7.

6. Log in again to the other node in the cluster, and then perform steps 1 to 5.

4.4 Using Commands to Control Tape Devices

This section and the sections that follow explain the procedures to follow for controlling the tape devices using commands.

4.4.1 Use Commands to Check/Change Transfer Rate of FC ports on NAS Unit

The system administrator can use commands to check/change the transfer rate of FC ports on the NAS Unit.

Before changing the transfer rate of FC ports on the NAS Unit, execute the tapelist command to make sure that no tape device information is registered. If the information of a tape device connected to the NAS Unit has been registered, you cannot change the transfer rate of FC ports. Delete the registered tape device information.

This section explains the method for checking/changing the transfer rate of FC ports on the NAS Unit. The example assumes the following conditions:

- The NAS Unit is connected to the tape device.
- The transfer rate of FC ports on the NAS Unit is being changed from 2 Gbps to 1 Gbps.

For details on how to delete registered tape device information, see section 4.4.3.

The procedure for checking/changing the transfer rate of FC ports on the NAS Unit is shown below.

1. Execute the tapelist command to make sure that no tape device information is registered. In the `Status` item, make sure that `D` is displayed for the right-hand item (registration status of the tape device).

```
$ sudo tapelist
Mar 30 11:35:12 KAQB11500-I tapelist command execution has started.
Mar 30 11:35:12 KAQB12225-I The list of tape device information will now be displayed.
LUN Model            Type              Status Path
--------------------------------------------------------------------------------
  0 L40              Medium Changer    D,D    /dev/enas/100000e00202d78e/sg00
  1 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst01
  2 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst02
  3 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst03
  4 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst04
Mar 30  11:35:12 KAQB11501-I tapelist command has finished.
```

   For some tape devices, if the transfer rates for the NAS Unit and FC port differ, the information for tape devices might not be displayed when the tapelist command is executed.

2. Execute the `enas_fcparm` command to check the transfer rate of the FC port.

   The transfer rate of the Fibre Channel port is displayed under `Speed`.

   For details on the syntax of the `enas_fcparm` command, see the manual *NAS Manager Modular User's Guide*.

```
$ sudo enas_fcparm -d
 Speed = 2Gbps
```

3. Execute the `enas_fcparm` command to change the transfer rate of the FC port on the NAS Unit.

   For details on the syntax of the `enas_fcparm` command, see the manual *NAS Manager Modular User's Guide*.

```
$ sudo enas_fcparm -s 1
```

4. Execute the `enas_fcparm` command again to check that the transfer rate of the FC port on the NAS Unit has been changed.

   For details on the syntax of the `enas_fcparm` command, see the manual *NAS Manager Modular User's Guide*.

```
$ sudo enas_fcparm -d
Speed = 1Gbps
```

4.4.2 Registering Tape Device Information Using Commands

This section explains how a system administrator can use commands to register information on the NDMP server about all tape devices connected to the NAS Unit over Fibre Channel.

To register tape device information on the NDMP server:

1. Execute the NDMPControl command to make sure of the following:
   - The NDMP server is running normally.

     Make sure that `running` is displayed for `NDMPsvrstatus`.
   - Neither backup nor restoration is being performed.

     Make sure that `disconnected` is displayed for `backupsvrstatus` and `mediasvrstatus`.

```
$ sudo NDMPcontrol -l
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB12201-I Operating statuses of NDMP servers:
NDMPsvrstatus allowrequest pid   backupsvrstatus mediasvrstatus
----------------------------------------------------------------
running       L,R,Q,F,H     1144 disconnected    disconnected
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

2. Execute the tapelist command to make sure that the tape device to be registered is connected to the NAS Unit and is running.

   `D` is displayed in the `Status` item for the left-hand item (connection status of the tape device).

```
$ sudo tapelist -d
Mar 30 11:35:12 KAQB11500-I tapelist command execution has started.
Mar 30 11:35:12 KAQB12225-I The list of tape device information will now be displayed.
LUN Model            Type              Status Path
-------------------------------------------------------------------------------
  0 L40              Medium Changer    D,D    /dev/enas/100000e00202d78e/sg00
  1 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst01
  2 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst02
  3 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst03
  4 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst04
Mar 30  11:35:12 KAQB11501-I tapelist command has finished.
```

3. Execute the tapeadd command to register the tape device information on the NDMP server.

   Registering the tape device information on the NDMP server automatically restarts the NDMP server.

```
$ sudo tapeadd -a
```

4. Execute the tapelist command to make sure that the tape device information is registered on the NDMP server.

   When registration of tape device information terminates normally, `A` is displayed in the `Status` item for the right-hand item (registration status of the tape device).

```
$ sudo tapelist -d
...
LUN Model            Type              Status Path
-------------------------------------------------------------------------------
  0 L40              Medium Changer    D,A    /dev/enas/100000e00202d78e/sg00
  1 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst01
  2 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst02
  3 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst03
  4 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst04
```

...

4.4.3 Canceling Registered Tape Device Information Using Commands

The system administrator can use commands to cancel tape device information registered on the NDMP server.

The following steps are necessary before canceling tape device information:

- Use NetBackup to delete the tape device set as an NDMP storage device.
- Use NetBackup to delete the tape device medium.

For details on the procedure for deleting a tape device and tape device media from NetBackup, and the procedure for removing a tape device from the NAS Unit after executing a command, see section 3.15.

This section explains how to cancel all tape device information registered on the NDMP server.

To cancel tape device information registered on the NDMP server:

1. Execute the NDMP Control command to make sure of the following:
   - The NDMP server is running normally.

     Make sure that `running` is displayed for `NDMPsvrstatus`.
   - Neither backup nor restoration is being performed.

     Make sure that `disconnected` is displayed for `backupsvrstatus` and `mediasvrstatus`.

```
$ sudo NDMPcontrol -l
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB12201-I Operating statuses of NDMP servers:
NDMPsvrstatus allowrequest pid   backupsvrstatus mediasvrstatus
---------------------------------------------------------------
running       L,R,Q,F,H     1144 disconnected    disconnected
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

2. Execute the tapelist command to check whether tape device information is registered on the NDMP server.

   If tape device information is registered, `A` is displayed in the `Status` item for the right-hand item (registration status of the tape device).

```
$ sudo tapelist -d
Mar 30 11:35:12 KAQB11500-I tapelist command execution has started.
Mar 30 11:35:12 KAQB12225-I The list of tape device information will now be displayed.
LUN Model            Type              Status Path
-------------------------------------------------------------------------------
  0 L40              Medium Changer    D,A    /dev/enas/100000e00202d78e/sg00
  1 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst01
  2 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst02
  3 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst03
  4 Ultrium 2-SCSI   Sequential-Access D,A    /dev/enas/100000e00202d78e/nst04
Mar 30  11:35:12 KAQB11501-I tapelist command has finished.
```

3. Execute the tapedel command to cancel the registered tape device information.

Canceling the tape device information on the NDMP server automatically restarts the NDMP server.

```
$ sudo tapedel -a
```

4. Execute the tapelist command to make sure that no tape device information is registered on the NDMP server.

   When cancellation of tape device information terminates normally, `D` is displayed in the `Status` item for the right-hand item (registration status of the tape device).

```
$ sudo tapelist -d
...
LUN Model            Type              Status Path
--------------------------------------------------------------------------------
  0 L40              Medium Changer    D,D    /dev/enas/100000e00202d78e/sg00
  1 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst01
  2 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst02
  3 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst03
  4 Ultrium 2-SCSI   Sequential-Access D,D    /dev/enas/100000e00202d78e/nst04
...
```

Chapter 5 Commands

This chapter describes how to execute commands used in NAS Backup Restore, how to specify parameters and options, and command formats for each command.

5.1 List of Commands

Use Table 5.1 to review the lists the NAS Backup Restore commands by function.

Table 5.1 NAS Backup Restore Commands

Function	Command	Description
NDMP server management	NDMPconfig	Displays and modifies NDMP server timeout information.
	NDMPcontrol	Controls the NDMP server.
	NDMPpasswd	Changes the NDMP server password.
Tape device management	tapeadd	Registers tape device information.
	tapedel	Cancels registered tape device information.
	tapelist	Displays information about tape devices.
Remote copy	Horc_devlist	Displays configuration information about a device file.
	Horc_logremove	Deletes CCI logs.
	Horc_printenv	Displays the CCI environment variable.
	Horc_pvol_freeze	▪ Suppresses NAS Sync Image Modular from performing operations on a copy-source file system. ▪ Stops access and holds writing from clients to the copy-source file system
	Horc_pvol_unfreeze	▪ Cancels suppression of operations on a copy-source file system from NAS Sync Image Modular. ▪ Restarts access and writing, from clients, to the copy-source file system.
	Horc_setenv	Sets up or modifies the CCI environment variable.
	Horc_svol_define	Reserves device files. (LVM is not used.)
	Horc_svol_delete	Releases device files. (LVM is not used.)
	Horc_svol_import	Connects a copy-destination file system to a NAS Unit. (LVM is not used.)
	Horc_svol_vmdefine	Reserves device files. (LVM is used.)
	Horc_svol_vmdelete	Releases device files. (LVM is not used.)
	Horc_svol_vmimport	Connects a copy-destination file system to a NAS Unit. (LVM is used.)
	Horc_unsetenv	Deletes the CCI environment variable.

5.2 Command Execution

To use commands to operate NAS Backup Restore, you must have registered the public key to be used in Secure Shell (SSH). For details on how to register the public key, see the *NAS Manager Modular User's Guide* (MK-95DF757).

There are two methods of executing commands. One method is to log in to the NAS Unit and then execute the commands. The other method is to create a shell script and then execute the commands automatically. The two command execution methods are described separately in this section.

5.2.1 Log in to NAS Unit to Execute Commands

You can log in to the NAS Unit and then execute the commands. Follow the next steps to execute commands:

1. Log in to the target NAS Unit by using `SSH`.
   a) To perform a snapshot operation or view system information, specify the service IP address for the NAS Unit.
   b) To execute a command to perform a backup and restore operation or a remote copy operation, specify a fixed IP address for the NAS Unit.
   c) For UNIX, execute the `ssh` command from the control terminal. For example:

      ```
      ssh {-1|-2} user-name-of-the-ssh-account@
      fixed-IP-address-of-the-NAS-Unit
      ```

      In addition, you can create a shell script on a remote host to automatically execute multiple commands. For details on creating a shell script, see the documentation for the OS for the remote host.
   d) For Windows: Use SSH-compliant communications software.
2. Use the `sudo` command to execute the NAS Backup Restore commands.

   Example of executing the `NDMPcontrol` command:

   ```
   $ sudo NDMPcontrol -l vol1
   ```

5.2.2 Create a Shell Script to Automatically Execute Commands

Snapshot functionality operations and the Backup or restore functionality operations can be automated. This method is useful, for example, when you regularly take snapshots. Automate operations by creating a shell script to execute commands following the next steps:

Specify the command to be executed from the remote host as shown below.

```
ssh {-1|-2} user-name-of-the-SSH-account@fixed-IP-address-of-the-
NAS-Unit sudo command-to-be-executed
```

In addition, you can create a shell script on a remote host to automatically execute multiple commands. For details on creating a shell script, see the documentation for the OS for the remote host.

5.2.3 Specifying Command Arguments and Options

Use the following points when specifying command arguments and options. In the examples below, *command-name* represents the command name.

- An argument that includes a space must be enclosed in quotation marks (`"`). An example of specifying 1 2 as the argument of the `-a` option is shown next:

  ```
  command-name -a "1 2"
  ```

- A quotation mark (`"`) in a string must be prefixed by backslash (`\`). An example of specifying `1"2` as the argument of the `-a` option is shown next:

  ```
  command-name -a 1\"2
  ```

- Each command option can be specified once only. An example of specifying a duplicated option that results in an error is shown next:

  ```
  command-name -a 1 -a 2
  ```

- When suppressing messages that are output by the command during standard output or if a standard error occurs, specify the `-nomsg` option at the end of the argument and the option to be specified. This option is effective when the command is executed automatically. However, when the `NDMPpasswd` command is interactively used, the `-nomsg` option cannot be specified. An example of suppressing the message output by the *command-name* command is shown next:

  ```
  command-name -a 1 -b 2 -nomsg
  ```

- Specify the `-h` option directly after the command name when viewing the command format. An example of how to display the format of *command-name* is shown next:

  ```
  command-name -h
  ```

5.3 Notes on Command Execution

Do not use commands other than those listed in this manual. Also, keep the following in mind when executing NAS Backup Restore commands:

- To execute commands for the remote copy functionality, the cluster, node, and resource group on the node must be running normally.
- When an error occurs in the cluster, node, or resource group, the operation that was performed might fail and an error might occur.
- When you execute one of the following commands, the other nodes in the cluster must also be running normally.
  - Horc_svol_import
  - Horc_svol_vmimport

For details on how to view the status of the cluster, node, or resource group, or what actions to take when an error occurs, see the *NAS Manager Modular User's Guide* (MK-95DF757).

5.3.1 Performing Operations from AMS/WMS NAS Manager

Caution: If you perform any of the following operations from NAS Manager concurrently with the execution of a NAS Backup Restore command, the operation from NAS Manager or NAS Backup Restore might fail and an error might occur:

- Starting and stopping a cluster.
- Performing a forced stop for a cluster.
- Changing a cluster configuration.
- Starting and stopping a node.
- Performing a forced stop for a node.
- Starting and stopping a resource group.
- Performing a forced stop for a resource group.
- Disabling and restarting resource group monitoring.
- Un-mounting a backup volume or a restoration destination volume.
- Changing the execution node of a resource group.
- Un-mounting the file system on which operations are to be performed.

5.3.2 Notes on Concurrent Use of GUI and Commands

Do not execute operations using the GUI while commands are being used to perform operations. Also, do not execute operations using commands when the GUI is being used to perform operations on the system.

5.4 Using a Remote Copy Command

Remote copy commands can cause difficulty if used for normal backup restore operations. Follow the remote copy instructions in *Hitachi ShadowImage in-System Replication Software User's Guide* (MK-95DF709). The inappropriate use of a remote copy command can cause data on the NAS Modular system to become unusable.

5.5 Setting the Time Across All Networks

Before you execute a command, make sure that the time is set correctly across all the networks. If there is any discrepancy, the recorded time at which a backup is taken could differ from the actual time. For details on time synchronization, see the *NAS Manager Modular User's Guide* (MK-95DF757).

5.6 NDMPconfig

The NDMPconfig command displays and modifies NDMP server timeout information.

Syntax

Format 1

`NDMPconfig` *[-l server_timeout*`] [-nomsg]`

Format 2

`NDMPconfig -m` *server_timeout timeout-value* [-nomsg]

NDMPconfig -h

Description

The `NDMPconfig` command displays and modifies the timeout information that is set for the NDMP server.

The NDMP server is set to timeout when no communication to the backup server or no data transmission to the media server (tape device) occurs for a certain period of time.

Tips and Remarks

The timeout value for the NDMP server is initially set to 480 minutes. If necessary, you can change the timeout value of the NDMP server for each node, based on actual backup operations.

Set the same timeout values for each node in a cluster. If different timeout values are set and a timeout occurs when a backup is executed during degenerated operation, backup processing might terminate abnormally before data transmission completes.

Also, if the timeout information is changed while the NDMP server is in operation, the NDMP server restarts automatically. After executing the command, check the operating status of the NDMP server.

If this option is not specified, the command is executed as if -l were specified.

Table 5.2 Information Displayed by the NDMPconfig Command

Item	Description
server_timeout	Displays the timeout value that is set for the NDMP server (in minutes).

The next table (Table 5.3) shows arguments and options for using NDMPconfig.

Table 5.3 NDMPconfig Arguments and Options

Argument	Option
-h	Specify this option to view the command syntax.
-l server_timeout	Displays the NDMP server's timeout information. Table 5.4 lists the information displayed when you specify the -l option.
-m server_timeout	Modifies the NDMP server timeout information. This assumes that backup or restore operations are not in progress.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.
timeout-value	Specifies a new timeout value for the NDMP server (in minutes). You must specify a value in the range 5-1,440.

The next table shows NDMPconfig operation return values and their meanings.

Table 5.4 NDMPconfig Return Values

0	Completed successfully.
1	The specified option is invalid. Specify a correct option.
2	The number of arguments or options is invalid. Specify the arguments and options correctly.
3	The number of characters in an argument is invalid. Specify the argument correctly.
4	The specified argument format is invalid. Specify the argument correctly.
5	The specified timeout value is outside the valid range. Specify a valid timeout value.
6	An attempt to output a message has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
8	An attempt to allocate memory has failed. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
11	No license is set up for NAS Backup Restore. Set up a NAS Backup Restore license, and then re-execute.
12	An attempt to acquire cluster information has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
13	A device error occurred. A NAS Cluster Management LU failed or the NAS Cluster Management LU is blocked. Contact maintenance personnel.
14	An attempt to acquire license information has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.

15	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
20	An unexpected error occurred. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
21	The command cannot be executed with the specified option. Re-execute this command after backup and restore processing is completed.
22	An attempt to stop the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
23	An attempt to start the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
24	An attempt to update the operating status of the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
25	The operating status of the NDMP server could not be updated. Use the `NDMPcontrol -l` command to confirm the operating status of the NDMP server, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
31	An attempt to acquire timeout information set for the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
32	An attempt to modify timeout information set for the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.

Examples

In this example, the command displays timeout information set for the NDMP server:

```
$ sudo NDMPconfig -l server_timeout
Mar 30 11:35:12 KAQB11500-I NDMPconfig command execution has started.
Mar 30 11:35:12 KAQB12216-I NDMP server time-out information:
  server_timeout 10
Mar 30 11:35:12 KAQB11501-I NDMPconfig command has finished.
```

```
$ sudo NDMPconfig
Mar 30 11:35:12 KAQB11500-I NDMPconfig command execution has started.
Mar 30 11:35:12 KAQB12216-I NDMP server time-out information:
  server_timeout 10
Mar 30 11:35:12 KAQB11501-I NDMPconfig command has finished.
```

In this example, the command modifies the timeout information that has been set for the NDMP server:

```
$ sudo NDMPconfig -m server_timeout 1440
Mar 30 11:35:12 KAQB11500-I NDMPconfig command execution has started.
Mar 30 11:35:12 KAQB11705-W Items are applied only to the logged-in node. If
necessary, log in to each node on the cluster and check each setup.
Mar 30 11:35:12 KAQB11501-I NDMPconfig command has finished.
```

5.7 NDMPcontrol

The NDMPcontrol command controls the NDMP server.

Syntax

Format 1

```
NDMPcontrol [-l] [-nomsg]
```

Format 2

```
NDMPcontrol {-s|-r|-q|-f} [-nomsg]
NDMPcontrol -h
```

Description

The `NDMPcontrol` command displays the operating status of the NDMP server on the NAS Unit that you are logged on to, or controls the NDMP server.

The options that you can specify in this command depend on the operating status of the NDMP server at command execution, and on the connection status between the NDMP server and the backup server or media server. Therefore, we recommend that you specify the `-l` option to check the available command options before you attempt to start or stop the NDMP server. If this option is not specified, the command is executed as if -l were specified. For the display result when the -l option is specified, see Examples below.

Tips and Remarks

The NDMP server may take a long time to start or stop even if the command completes successfully. After executing the NDMPcontrol command, run the NDMPcontrol -l command to check the NDMP server's operating status.

If `stopped` is displayed under NDMPsvrstatus or if `connected` is displayed under backupsvrstatus or mediasvrstatus, the connection to the NDMP server will be automatically ended. After executing the command, use the NDMPcontrol -l command to check the connection status.

If you restart the NAS OS while the NDMP server is running, the NDMP server restarts automatically.

Table 5.5 Information Displayed by -l Option in NDMPcontrol Command

Item	Description
NDMPsvrstatus	Displays the NDMP server operating status: ▪ `running`: The NDMP server is running. ▪ `stopped`: The NDMP server has stopped. ▪ `error`: The number of backup servers or media servers that are performing backup and restoration exceeds the maximum of five (5). Make sure that the limits for the number of backup servers or media servers that simultaneously execute backup and restoration are not exceeded.

Item	Description
allowrequest	Displays currently available options. When multiple options are specified, the options are delimited with commas. ▪ L: The -l option can be specified. ▪ S: The -s option can be specified. ▪ R: The -r option can be specified. ▪ Q: The -q option can be specified. ▪ F: The -f option can be specified. ▪ H: The -h option can be specified.
pid	Displays the process ID of the NDMP server. The process ID is shown as a whole number from 1 to 99999. If the NDMP server has stopped, no ID is displayed.
backupsvrstatus	Displays the connection status between the NDMP server and backup server: ▪ connected: The NDMP server and backup server are connected. ▪ disconnected: The NDMP server and backup server are disconnected.
mediasvrstatus	Displays the connection status of the server that controls the NDMP server and media server, when using a tape device connected to a media server to execute backup/restore: ▪ connected: The NDMP server and media server are connected. ▪ disconnected: The NDMP server and media server are disconnected.

For the displayed result when the -l option is specified, see *Examples* below.

#1 When multiple options can be specified in the command, the options are delimited with commas. The next table (Table 5.6) shows arguments and options for using NDMPsvrstatus.

Table 5.6 NDMPsvrstatus Argument and Options

Argument	Options
-f	Performs a forced stop of the NDMP server. Specify to perform a forced stop of the NDMP server while it is connected to the backup server or the media server. ▪ If you perform a forced stop of the NDMP server while it is connected to the backup server or media server, backup and restoration might terminate abnormally. ▪ If you perform a forced stop of the NDMP server while an online backup using differential-data snapshot is being performed, the differential-data snapshot might not be automatically un-mounted or deleted. In such a case, the next time you perform an online backup, the differential-data snapshot that was not deleted is automatically un-mounted and deleted. Check the connection status at both the backup server and media server before you perform a forced stop of the NDMP server.
-h	Specifies this option to view the command syntax.
-l	This argument displays the operating status of the NDMP server or the available command options. You can use this option regardless of the operating status of the NDMP server, and regardless of the connection status between the NDMP server and backup server or media server. The information displayed when you specify the -l option is listed next in Table 5.7 shown next. *Note:* For the display result when the -l option is specified, see Examples below.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.
-s	Specify this option to start the NDMP server.
-r	Specify this option to restart the NDMP server.

Argument	Options
-q	Specify this option to stop the NDMP server.

The next table shows NDMPcontrol operation return values and their meanings.

Table 5.7 NDMPsvrstatus Return Values

0	Completed successfully.
1	The specified option is invalid. Specify a correct option.
2	The number of arguments or options is invalid. Specify the arguments and options correctly.
6	An attempt to output a message has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
8	An attempt to allocate memory has failed. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
11	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
12	An attempt to acquire cluster information has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
13	A device error occurred. A NAS Cluster Management LU failed or the NAS Cluster Management LU is being blocked. Contact maintenance personnel.
14	An attempt to acquire license information has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
15	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
20	An unexpected error occurred. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
21	The command cannot execute with the specified option. Use the `NDMPcontrol -l` command to check the available options, and then re-execute the command. Alternatively, re-execute after the NDMP server is disconnected from the backup server or media server.
22	An attempt to stop the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
23	An attempt to start the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.

24	An attempt to acquire the operating status of the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
25	An attempt to update the operating status of the NDMP server has failed. Use the `NDMPcontrol -l` command to check the operating status of the NDMP server, and then re-execute the command with the available option. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.

Examples

In this example, the command displays the operating status of the NDMP server and available options. In this example, the command is executed while the NDMP server is stopped:

```
$ sudo NDMPcontrol –l
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB12201-I Operating statuses of NDMP servers:
NDMPsvrstatus allowrequest pid  backupsvrstatus mediasvrstatus
-------------------------------------------------------------
stopped    L,S,F,H      disconnected  disconnected
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

In this example, the command displays the operating status of the NDMP server and available options. In this example, the command is executed while the NDMP server is running:

```
$ sudo NDMPcontrol
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB12201-I Operating statuses of NDMP servers:
NDMPsvrstatus allowrequest pid  backupsvrstatus mediasvrstatus
-------------------------------------------------------------
running    L,F,H    12345 connected    connected
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

In this example, the command starts the NDMP server:

```
$ sudo NDMPcontrol –s
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

In this example, the command restarts the NDMP server:

```
$ sudo NDMPcontrol –r
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Sep 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

In this example, the command stops the NDMP server:

```
$ sudo NDMPcontrol –q
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

In this example, the command performs a forced stop of the NDMP server:

```
$ sudo NDMPcontrol –f
Mar 30 11:35:12 KAQB11500-I NDMPcontrol command execution has started.
Mar 30 11:35:12 KAQB11501-I NDMPcontrol command has finished.
```

5.8 NDMPpasswd

The NDMPpasswd command changes the NDMP server password.

Syntax

`NDMPpasswd` *[user-ID old-password new-password confirm-password]* [-nomsg]

NDMPpasswd -h

Description

The `NDMPpasswd` command changes the password used to connect from a backup server to an NDMP server running on the NAS Unit.

You must change the password after setting up the license. You must change the password of the NDMP server for each node.

Tips and Remarks

Specify the same password for the nodes in a cluster. If different passwords are set, a recognition error occurs at the failover-destination node when you attempt to back up or restore during degenerated operation.

When you specify the command without specifying any argument, you can change the password interactively. The entered password is not shown, eliminating any risk of discovery by third parties. For security reasons, we recommend the interactive method.

After changing the password, execute the `set_ndmp_attr` command at the backup server to set up the access permission to the NDMP server again.

Table 5.8 lists the information that you specify when changing an NDMP server password interactively.

Table 5.8 Input Information when Changing the NDMP Server Password Interactively

Item	Description
userid	Enter the user name for connecting to the NDMP server.
oldpasswd	Enter the current password.
newpasswd	Enter the new password. Enter from 1 to 32 characters. You can use alphanumeric characters and underscores (_). You cannot enter a string that is the same as the string you entered in either `userid` or `oldpasswd`. In `newpasswd`, enter a string that a third party cannot easily guess.
confirmpasswd	Re-enter the new password.

Note: For an example of changing the NDMP server password interactively, see *Example* below.

Important: When the data for a NAS OS LU is restored, the password settings for the NDMP server are initialized. Change the NDMP server password before starting a backup or restoration operation. If the NDMP server password is not changed, backup and restoration might end abnormally. For details on how to change the NDMP server password, see section 3.14.8.

The next table (Table 5.9) shows arguments and options for using NDMPpasswd.

Table 5.9 NDMPpasswd Arguments and Options

Arguments	Options
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output. When the NDMPpasswd command is executed interactively, this option cannot be specified.
user-id	Specify the user name for connecting to the NDMP server.
old-password	Specify the current password.
new-password	Specify the new password. You must enter the password again in *confirm-password* to confirm. Enter from 1 to 32 characters. You can use alphanumeric characters and underscores (_). You cannot enter a string that is the same as the string you entered in *user-id* or *old-password*. Enter a new password that a third party will not easily guess.

The next table shows NDMPpasswd operation return values and their meanings.

Table 5.10 NDMPpasswd Return Values

0	Completed successfully.
1	The specified option is invalid. Specify a correct option.
2	The number of arguments or options is invalid. Specify the arguments and options correctly.
3	The number of characters in an argument is invalid. Specify the argument correctly.
4	The specified argument format is invalid. Specify the argument correctly.
6	An attempt to output a message has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
8	An attempt to allocate memory has failed. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
11	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
12	An attempt to acquire cluster information has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.

13	A device error occurred. A NAS Cluster Management LU failed or the NAS Cluster Management LU is being blocked. Contact maintenance personnel.
14	An attempt to acquire license information has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
15	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under /mnt. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
20	An unexpected error occurred. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
21	The user ID or old password is not registered on the NDMP server. Specify a user ID and old password that are registered on the NDMP server.
23	The same string is specified for the old and new passwords. For the new password, enter a different string from the old password.
24	The same string is specified for the user name and new password. For the new password, enter a different string from the user name.
25	Different strings are specified for the new password and confirmation of the new password. Enter the same string in the new password and in the confirmation of the new password.
26	An attempt to update the password of the NDMP server has failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, this command is used to change the NDMP server password interactively:

```
$ sudo NDMPpasswd
Sep 30 11:35:12 KAQB11502-Q Enter the value of the displayed parameter name,
and then press 'Enter'.
userid=
oldpasswd=
newpasswd=
confirmpasswd=
Mar 30 11:35:12 KAQB11500-I NDMPpasswd command execution has started.
Mar 30 11:35:12 KAQB11705-W Items are applied only to the logged-in node. If
necessary, log in to each node on the cluster and check each setup.
Mar 30 11:35:12 KAQB11501-I NDMPpasswd command has finished.
```

5.9 tapeadd

The tapeadd command registers tape device information.

Synopsis

```
tapeadd -a [-nomsg]
tapeadd -h
```

Description

The `tapeadd` command registers information about tape devices connected to the NAS Unit over fibre channel on the NDMP server.

- Tape devices to be registered on the NDMP server must be connected to the NAS Unit.
- On the NDMP server, a maximum of 256 tape changers and a maximum of 32 tape drives can be registered per NAS Unit.

Do not execute this command while performing backup/restoration. If you execute this command while the NDMP server is running, the NDMP server will be restarted automatically. After executing the command, check the operating status of the NDMP server.

Table 5.11 tapeadd Arguments and Options

Arguments	Options
-a	Specify this option to register tape device information onto the NDMP server.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

Table 5.12 tapeadd Return Values

`0`	Completed successfully. This value is also returned when the command is executed for a registered tape device.
`1`	The specified option is invalid. Specify a correct option.
`6`	Unable to allocate memory. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`7`	No license is set up for NAS Backup Restore. Set up a NAS Backup Restore license, and then re-execute.
`8`	Cluster information could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`9`	A device failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`10`	License information could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`11`	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`.

	▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
12	The command cannot be executed because a backup or restoration is being performed. Wait until the backup or restoration is completed, and then re-execute.
13	The NDMP server could not be stopped. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
14	The NDMP server could not be started. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
15	The operating status of the NDMP server could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
16	The operating status of the NDMP server could not be updated. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
17	Registered tape device information could not be acquired. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
18	Registered tape device information could not be updated. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
19	The command cannot be executed because another system administrator is performing operations for the target tape device. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
31	No tape devices are connected to the NAS Unit. Make sure that the tape device is connected to the NAS Unit and no error has occurred, and then re-execute. If an error occurred on the tape device, correct the error, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
34	The specified tape device cannot be registered because the total number of registered tape drives cannot exceed the maximum. The maximum number of tape drives that can be registered per NAS Unit is 32. Make sure that the total number of tape drives among the registered tape devices on one NAS Unit does not exceed 32.
35	The specified tape device cannot be registered because the total number of registered tape changers cannot exceed the maximum of 256. The maximum number of tape changers that can be registered per NAS Unit is 256. Make sure that the total number of tape changers among the registered tape devices on one NAS Unit does not exceed 256.
37	An attempt to register tape device information has failed. Make sure that no error occurred on the tape device, and then re-execute. If an error occurred, correct the error, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
98	Information about registered tape devices could not be recovered. Acquire the Backup Restore log files, and then contact maintenance personnel.
99	An unexpected error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command registering information on the NDMP server for the tape device connected over Fibre Channel to a NAS Unit:

```
$ sudo tapeadd -a
Mar 30 11:35:12 KAQB11500-I tapeadd command execution has started.
Mar 30 11:35:12 KAQB11501-I tapeadd command has finished.
```

5.10 tapedel

The tapedel command cancels registered tape device information.

Synopsis

```
tapedel -a [-nomsg]
tapedel -h
```

Description

The `tapedel` command cancels information about tape devices registered on the NDMP server.

Do not execute this command while performing backup/restoration. If you execute this command while the NDMP server is running, the NDMP server will be restarted automatically. After executing the command, check the operating status of the NDMP server.

Table 5.13 tapedel Arguments and options

Arguments	Options
-a	Specify this option to cancel information about tape devices registered on the NDMP server.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

Table 5.14 tapedel Return Values

0	Completed successfully.
1	The specified option is invalid. Specify a correct option.
6	Unable to allocate memory. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
7	No license is set up for NAS Backup Restore. Set up a NAS Backup Restore license, and then re-execute.
8	Cluster information could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
9	A device failed.

	Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
10	License information could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
11	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under /mnt. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
12	The command cannot be executed because a backup or restoration is being performed. Wait until the backup or restoration is completed, and then re-execute.
13	The NDMP server could not be stopped. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
14	The NDMP server could not be started. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
15	The operating status of the NDMP server could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
16	The operating status of the NDMP server could not be updated. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
17	Information about registered tape devices could not be acquired. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
18	Information about registered tape devices could not be updated. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
19	The command cannot be executed because another system administrator is performing operations for the target tape device. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
51	No tape device information is registered. An attempt was made to cancel tape device information when no tape device has been registered.
54	Registered information could not be canceled because the specified tape device was being used. Make sure that the tape device is not in use, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
98	Information about registered tape devices could not be recovered. Acquire the Backup Restore log files, and then contact maintenance personnel.
99	An unexpected error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

In the example shown next, the command cancels information about the tape devices registered on the NDMP server:

```
$ sudo tapedel -a
Mar 30 11:35:12 KAQB11500-I tapedel command execution has started.
Mar 30 11:35:12 KAQB11501-I tapedel command has finished.
```

5.11 tapelist

The tapelist command displays tape device information.

Synopsis

```
tapelist [-d|-A|-D] [-c] [-nomsg]
tapelist -h
```

Description

The `tapelist` command lists information about tape devices which are connected to the NAS Unit over Fibre Channel or which are registered on the NDMP server.

If you do not specify any option, the command displays information about both the running tape devices connected to the NAS Unit over Fibre Channel and the tape devices registered on the NDMP server.

Table 5.15 tapelist Arguments and Options

Arguments	Options
-A	Specify this option to view information only about tape devices registered on the NDMP server.
-c	Used to specify that the display format for each piece of information is to be delimited using a colon (:), rather than showing the item names.
-D	Specify this option to view information about only those tape devices (of the running tape devices) connected to the NAS Unit over Fibre Channel that are not registered on the NDMP server.
-d	Specify this option to view information only about running tape devices connected to the NAS Unit over Fibre Channel.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

Displayed information

The following table lists the information items displayed for a tape device.

Table 5.16 Information Displayed When Executing the Tapelist Command

Item	Description
`LUN`	Displays a decimal number for the LUN of the tape device connected over Fibre Channel to the NAS Unit.
`Model`	Displays the model name of the tape device connected to the NAS Unit over Fibre Channel.

Item	Description
	`Error` is displayed when information about the tape device could not be acquired because an error occurred on the tape device.

`Type`	Displays the type of the tape device connected to the NAS Unit over Fibre Channel.
	`Medium Changer`
	Tape changer
	`Sequential-Access`
	Tape drive
	`Error`
	Information about the tape device could not be acquired because an error occurred on the tape device.

`Status`	Displays the connection status and the registration status of the tape device in the following format:
	`tape-device-connection-status,tape-device-registration-status`
	Either of the following is displayed for *tape-device-connection-status*:
	`D`
	The tape device is connected to the NAS Unit and is running.
	`N`
	The tape device is not connected to the NAS Unit or is not turned on.
	Either of the following is displayed for *tape-device-registration-status*:
	`A`
	Tape device information is registered on the NDMP server.
	`D`
	Tape device information is not registered on the NDMP server.

`Path`	Displays the path to the device file on the tape device of the tape changer or tape drive.

Table 5.17 tapelist Return Values

`0`	Completed successfully.
`1`	The specified option is invalid. Specify a correct option.
`6`	Unable to allocate memory. Wait for a while, and then re-execute. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`7`	No license is set up for NAS Backup Restore. Set up a NAS Backup Restore license, and then re-execute.
`8`	Cluster information could not be obtained. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`9`	A device failed. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
`10`	License information could not be obtained.

	Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
11	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under /mnt. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
17	Registered tape device information could not be acquired. Re-execute the command. If the error occurs again, acquire the Backup Restore log files, and then contact maintenance personnel.
71	No information was found for the specified tape device.
99	An unexpected error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

In the examples shown next, the command views information about only those tape devices (of the running tape devices) connected to the NAS Unit over Fibre Channel:

```
$ sudo tapelist -d
Mar 30 11:35:12 KAQB11500-I tapelist command execution has started.
Mar 30 11:35:12 KAQB12225-I The list of tape device information will now be displayed.
LUN Model           Type             Status Path
-------------------------------------------------------------------------------
  0 P1000           Medium Changer   D,D    /dev/enas/210100e08b33180d/sg00
  1 ULTRIUM-TD1     Sequential-Access D,D   /dev/enas/210100e08b33180d/nst01
  2 ULTRIUM-TD1     Sequential-Access D,D   /dev/enas/210100e08b33180d/nst02
Mar 30 11:35:12 KAQB11501-I tapelist command has finished.
```

In this example, the command views information about both the running tape devices connected to the NAS Unit and the tape devices registered on the NDMP server:

```
$ sudo tapelist
Mar 30 11:35:12 KAQB11500-I tapelist command execution has started.
Mar 30 11:35:12 KAQB12225-I The list of tape device information will now be displayed.
LUN Model           Type             Status Path
-------------------------------------------------------------------------------
  0 P1000           Medium Changer   D,A    /dev/enas/210100e08b33180d/sg00
  1 ULTRIUM-TD1     Sequential-Access D,A   /dev/enas/210100e08b33180d/nst01
  2 ULTRIUM-TD1     Sequential-Access D,A   /dev/enas/210100e08b33180d/nst02
Mar 30 11:35:12 KAQB11501-I tapelist command has finished.
```

5.12 Horc_devlist

The horc_devlist command displays configuration information about a device file.

Syntax

```
horc_devlist [-c]
[-d {device-file-number|device-file-number-device-file-number}[,{device-file-number|device-file-number-device-file-number}...]] [-nomsg]
horc_devlist -h
```

Description

The `horc_devlist` command displays configuration information about a device file such as the device file number, size, and drive type.

Tips and Remarks

If you do not specify the `-d` option the command displays the configuration information about all device files assigned to the NAS Modular system. Table 5.18 lists the information displayed when you execute the command.

Table 5.18 Information Displayed Executing the horc_devlist Command

Item	Description
device	Displays the specified device file number in the following format: Displays the specified device file number in the following format: *Hexadecimal-notation (Decimal-notation)*
LUN	Displays the LU ID of the specified device file. When the LUN Expansion functionality is being using, the ID of the LU at the head of the linked LUs is displayed. However, when the status is either Error or Undef, -- may be displayed
type	Displays the drive type and size (in gigabytes) of the specified device file. For the drive type of the device file, either of the following is displayed: ▪ `FC` Displayed for an FC drive. ▪ `SATA` Displayed for a SATA drive. ▪ --(--) is displayed when the status displays Undef. When the status is Error, -- might be displayed for either the drive type or the capacity, or for both.
`size`	Displays the size (in gigabytes) of the specified device file When `Error` is displayed in the `status` item, `--` may be displayed.
LUSE	Displays the number of LUs using the LUN Expansion functionality. `--` is displayed if the specified device file is not using the LUN Expansion functionality.
`D-CTL`	Displays the number for the default controller assigned to the specified device file.
VLL	-- is always displayed.
status	Displays the status of the specified device file. ▪ `Normal`: Displayed when the status of the specified device file is normal. ▪ `Error`: Displayed when an error occurred in the specified device file. Acquire all log data, and then contact maintenance personnel. ▪ `Undef`: Displayed when the specified device file is not assigned to the NAS Modular system.
node	Displays the relationship between your login node and the other node that may be using or reserving a specified device file. ▪ `Own`: Displayed when the specified device file is either being used or reserved by another node in the cluster. ▪ `Other`: Displayed when the specified device file is either being used or reserved by the other node within the cluster. ▪ `--`: Displayed when the specified device file is either not in use or not assigned to NAS Modular system. (that is, when Undef is displayed in the status item).
used function	Displays the usage of the device file and the names of functions that are using the device file. ▪ `File:`*file-system-name* Displayed when the specified device file is used within the file system. When the -c option is specified,

Item	Description
	the colon (:) is not displayed. ▪ `Sync:` *file-system-name* Displayed when the specified device file is being used by the differential-data snapshot function of NAS Sync Image Modular. The name of the file system for which the differential-data snapshot storage devices is set up is displayed as the file system name. When the -c option is specified, the colon (:) is not displayed. ▪ `Remote Copy` Displayed when the specified device file is reserved as the copy destination of the file system by the Remote Copy function. ▪ `Free` Displayed when the specified device is not in use. ▪ `Unknown` Displayed either when the specified device usage status has changed during the command execution or when an attempt to acquire device file configuration information failed. If `Unknown` is displayed, re-execute the command. If `Unknown` is displayed again, the processing of another command might have been canceled. Perform the operations that are necessary when a command is canceled, and then re-execute the `horc_devlist` command. If the processing of the command was not actually canceled or the status does not change after you perform the operations necessary in the event of a command cancellation, check whether there are any failures displayed in the List of RAS Information (List of other log files) window, and remove the cause of any such failure. If no failures are found, acquire all log data, and then contact maintenance personnel. ▪ `--` Displayed when the specified device file is not in use but an error has occurred in that file, or when the specified device file is not assigned to the NAS Modular system. (that is, when Undef is displayed in the status item). *Note:* When Undef is displayed in the status item, -- is displayed in the items other than device and status. (- is displayed for the D-CTL item.)

The next table (Table 5.19) shows arguments and options for using Horc_devlist.

Table 5.19 Horc_devlist Arguments and Options

Arguments	Options
-c	Used to specify that the display format for each piece of information is to be delimited using a colon (:), rather than showing the item names. This is effective when executing another command immediately using the output from device file configuration information.
-d	Specify this option to view the configuration information about the specific device file.
device-file-number	Specify the device file number, about which you want to refer to the configuration information. Specify this argument when you want to view configuration information about a specific device file. When referring to the configuration information of a device file which is located at /dev/enas/lu0F, specify 0F. Use a comma (,) as the delimiter when referring to the configuration information of multiple device files.
device-file-number-device-file-number	Specify the device file number enclosed with hyphens (-). This is effective when referring to configuration information of multiple device files. Specify the smallest device file number in hexadecimal notation before the hyphen, and the largest in hexadecimal notation after the hyphen. Therefore, specify 0F-11 when selecting /dev/enas/lu0F, /dev/enas/lu10, and /dev/enas/lu11. When specifying multiple ranges, use a comma (,) as the delimiter.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_devlist operation return values and their meanings.

Table 5.20 Horc_devlist Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under /mnt. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the /enas/log/backuprestore.trace file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether or not an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If the node stopped during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.

Examples

In this example, the command displays configuration information about the device files:

```
$ sudo horc_devlist -d 01-05,08
```

```
$ sudo horc_devlist -d 01-05,08,50,51
Mar 30 16:23:40 KAQB11801-I The horc_devlist command has started.
  device     LUN type        size  LUSE D-CTL status node  used function
  01(   1)    51 FC      10.000GB    --     0 Normal Own   File:FS_01
  02(   2)    52 FC      10.000GB    --     0 Normal Own   Sync:SYNC_01
  03(   3)    53 FC      10.000GB    --     0 Normal Own   Sync:SYNC_01
  04(   4)    54 FC      10.000GB    --     0 Normal --    Free
  05(   5)    55 FC      10.000GB    --     0 Normal --    Free
  08(   8)    58 FC      10.000GB    --     0 Normal Own   Remote Copy
  50(  80)   300 FC       2.000GB     2     0 Normal --    Free
  51(  81)   302 FC       2.000GB     2     0 Normal --    Free
Mar 30 16:23:43 KAQB11802-I The horc_devlist command has finished.
```

In this example, the command displays configuration information about the device files without displaying the item names:

```
$ sudo  horc_devlist -c -d 01-05,08,50,51
Mar 30  16:25:26 KAQB11801-I The horc_devlist command has started.
01:1:51:FC:10.000GB:--:0:Normal:Own:File FS_01
02:2:52:FC:10.000GB:--:0:Normal:Own:Sync SYNC_01
03:3:53:FC:10.000GB:--:0:Normal:Own:Sync SYNC_01
04:4:54:FC:10.000GB:--:0:Normal:--:Free
05:5:55:FC:10.000GB:--:0:Normal:--:Free
08:8:58:FC:10.000GB:--:0:Normal:Own:Remote Copy
50:80:300:FC:2.000GB:2:0:Normal:--:Free
51:81:302:FC:2.000GB:2:0:Normal:--:Free
Mar 30  16:25:29 KAQB11802-I The horc_devlist command has finished.
```

5.13 Horc_logremove

The horc_logremove command deletes CCI logs.

Syntax

`horc_logremove` *[-i instance-number]* `[-nomsg]`

`horc_logremove -h`

Description

The `horc_logremove` command deletes the log files and traces output by the CCI daemon.

Before executing this command, you must stop the CCI daemon that outputs the log files, traces, and core files.

Tips and Remarks

None.

The next table (Table 5.21) shows arguments and options for using horc_logremove.

Table 5.21 Horc_logremove Arguments and Options

Arguments	Options
-h	Specifies this option to view the command syntax.
-i	Specify this option to delete the log files and traces output by the daemon that has the specified instance number. If you do not specify the –i option, the command uses the instance number set in the environment variable HORCMINST.
instance-number	Specify the instance number of the CCI daemon that outputs logs.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_logremove operation return values and their meanings.

Table 5.22 Horc_logremove Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
56	The environment variable `HORCMINST` has either not been set or the set value is not `16` or `17`. Specify the correct value for the environment variable `HORCMINST`, or specify `16` or `17` together with the `-i` option, and then re-execute.
57	The target CCI daemon that outputs logs is running.

	Stop the daemon, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether or not an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If the node stopped during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.

Example

In this example, the command deletes the logs output by the daemon that has the instance number 17:

```
$ sudo horc_logremove -i 17
Mar 30 11:35:12 KAQB11801-I The horc_logremove command has started.
Mar 30 11:35:12 KAQB11802-I The horc_logremove command has finished.
```

5.14 Horc_printenv

The horc_printenv command displays the CCI environment variable.

Syntax

`horc_printenv` *[environment-variable-name]* [-nomsg]

horc_printenv -h

Description

The `horc_printenv` command displays the CCI environment variable that is to take effect as of the next time you log in to the NAS Unit.

You can view the values set for the following environment variables:

```
HORCC_MRCF
HORCMINST
```

Tips and Remarks

If you do no specify an argument, only environment variables (from the above list) for which values have been set are displayed.

Table 5.23 lists the information displayed as the CCI environment variable.

Table 5.23 Information Displayed Executing the horc_printenv Command

Item	Description
environment variable	Displays the name of the CCI environment variable.
value	Displays the value set up in the environment variable.

The next table (Table 5.24) shows arguments and options for using horc_printenv.

Table 5.24 Horc_printenv Arguments and Options

Arguments	Options
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.
environment-variable-name	Specify the name of the CCI environment variable. Specify this argument when you want to view a specific environment variable. If you do not specify an argument, only environment variables (from HORCC_MRCF or HORCMINST) for which values have been set are displayed.

The next table shows horc_printenv operation return values and their meanings.

Table 5.25 Horc_printenv Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
10	The specified environment variable cannot be viewed in a NAS Modular system. Check whether this environment variable can be viewed, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
86	The file on the *NAS OS LU* could not be opened. Check whether an error has occurred in the NAS OS LU.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether or not an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.

Example

In this example, the command views the CCI environment variables:

```
$ sudo horc_printenv
Mar 30 11:35:12 KAQB11801-I The horc_printenv command has
started.
environment variable : value
HORCC_MRCF      : 1
HORCMINST      : 16
Mar 30 11:35:12 KAQB11802-I The horc_printenv command has
finished.
```

5.15 Horc_pvol_freeze

The horc_pvol_freeze command suppresses on the copy-source file system and holds access and data writes from clients.

Syntax

`horc_pvol_freeze -f` *copy-source-file-system-name* [-nomsg]

horc_pvol_freeze -h

Description

When the NAS Sync Image license has been set up, the `horc_pvol_freeze` command suppresses the following operations from NAS Sync Image to the copy-source file system (P-VOL of ShadowImage):

- Setting up, changing, and releasing of a differential-data snapshot storage device.
- Creating and deleting differential-data snapshot.

If the copy-source file system has been mounted, the `horc_pvol_freeze` command also stops access from NFS clients, and holds writing to the copy-source file system from CIFS clients and FTP clients. To execute this command log in to the NAS Unit.

Tips and Remarks

When executing the `horc_pvol_freeze` command note the following points:

- Execute the `horc_pvol_freeze` command before ShadowImage splits a pair. This command suppresses operations from NAS Sync Image such as setting and releasing a differential-data snapshot storage device, and creation and deletion of differential-data snapshot. Also, if the copy-source file system has been mounted, the command temporarily stops access from NFS clients that are using NFS protocol version 3 (vers=3). After data that is in the process of being written is applied, writing to the copy-source file system is held from CIFS clients and from NFS clients that are using NFS protocol version 2 (vers=2).
  - If automatic creation of a differential-data snapshot is scheduled in NAS Sync Image Modular, and the time for automatic creation of a differential-data snapshot falls after the `horc_pvol_freeze` command is executed but before the `horc_pvol_unfreeze` command is executed, automatic creation will fail. Do not execute the `horc_pvol_freeze` command near the time for automatic creation.
- Do not `perform` any of the operations listed below between the time the `horc_pvol_freeze` command is issued and the time the `horc_pvol_unfreeze` command is issued.
  - Starting and stopping a cluster, or performing a forced stop for a cluster.
  - Starting and stopping a node, or performing a forced stop for a node.
  - Starting and stopping a resource group, performing a forced stop for a resource group, or changing the execution node of a resource group.
  - Mounting or deleting a copy-source file system.

- Performing any of the following operations might make the copy-destination file system unusable:
  - Do not restart the CIFS service between the time the horc_pvol_freeze command is issued and the time the horc_pvol_unfreeze command is issued. If you restart the CIFS service during this time, the CIFS clients might not be able to access or write data to the file system.
  - If the horc_pvol_freeze command is executed while a client is accessing the copy-source file system, access for that client might time out. After executing the horc_pvol_freeze command and completing the required operations, execute the horc_pvol_unfreeze command as soon as possible. If the copy-source file system is mirrored using NAS Sync Image, it might take a long time for the horc_pvol_freeze command to complete. A timeout can easily occur in this situation.
  - After executing the horc_pvol_freeze command and splitting a pair by using ShadowImage, immediately execute the horc_pvol_unfreeze command. If one of the following operations is performed between the time the horc_pvol_freeze command is executed on the mounted file system and the time the horc_pvol_unfreeze command is executed, it will take a long time for the horc_pvol_unfreeze command to start executing, so a timeout might occur:
  - Expanding the file system.
  - Setting up quotas.
  - Setting up a grace period when the quota setting value is exceeded.
  - Creating an NFS share or CIFS share.
  - Creating a subdirectory (executing a NAS Manager enas_dircreate command).
  - Changing the directory attribute (executing a NAS Manager enas_diredit command).

The next table (Table 5.26) shows arguments and options for using horc_pvol_freeze.

Table 5.26 Horc_pvol_freeze Arguments and Options

Arguments	Options
-f copy-source-file-system-name	Specify the name of the copy-source file system for which you want to suppress operations from NAS Sync Image and block access from clients.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_pvol_freeze operation return values and their meanings.

Table 5.27 Horc_pvol_freeze Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
5	The file system name is not specified. Specify the file system name, and then re-execute.
6	The specified file system name is too long. Specify a file system name with the correct length, and then re-execute.
7	There is an error in the specified file system name. Specify the correct file system name, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
20	The specified file system does not exist. Specify the correct file system name, and then re-execute.
26	The specified file system is blocked. Remove the blockage, and then re-execute.
27	The specified file system is differential-data snapshot of NAS Sync Image Modular. Specify a file system name, and then re-execute.
73	The specified command is already being executed.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the File type drop-down list in the List of RAS Information (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
82	An error occurred during processing to stop access from the NFS client to the specified copy-source file system. Access from the NFS client is blocked. Contact maintenance personnel, and acquire the NAS dump. After restarting the NAS OS, acquire all log data.
83	An error occurred during processing to stop access from the CIFS client and FTP clients to the specified copy-source file system. Contact maintenance personnel, and acquire the NAS dump. After restarting the NAS OS, acquire all log data.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has blocked. Wait for a while, and then re-execute. If the node stopped during processing, either wait 15 minutes or restart it.
93	Acquisition of cluster information failed temporarily. Wait for a while, and then re-execute.
95	NAS Sync Image processing is either being performed or was canceled on the specified copy-source file system. If NAS Sync Image processing is being performed, re-execute after the processing has finished. If the processing was

	canceled, perform the necessary operations for when processing is canceled, and then re-execute
96	NAS Sync Image is not installed. Install NAS Sync Image, and then re-execute.
97	No license is set up for NAS Sync Imager. Set up the NAS Sync Image license, and then re-execute.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command suppresses operations from NAS Sync Image on the copy-source file system, blocks access from clients:

```
$ sudo horc_pvol_freeze -f FS_1
Mar 30 11:35:12 KAQB11801-I The horc_pvol_freeze command has started.
Mar 30 11:35:12 KAQB11802-I The horc_pvol_freeze command has finished.
```

5.16 Horc_pvol_unfreeze

If the copy-source file system has been mounted, the horc_pvol_unfreeze command re-opens access to the copy-source file system from clients.

Syntax

`horc_pvol_unfreeze -f` *copy-source-file-system-name* [-nomsg]

horc_pvol_unfreeze -h

Description

The `horc_pvol_unfreeze` command restarts data writes to the copy-source file system from CIFS clients and FTP clients once the copy-source file system has been mounted. The command also restarts access from NFS clients. When the NAS Sync Image Modular license is set up, the following operations from NAS Sync Image Modular to the copy-source file system can be performed:

- Setting up, changing settings, expanding, or releasing of differential-data snapshot storage devices.
- Creating or deleting differential-data snapshot.

Tips and Remarks

Execute the `horc_pvol_unfreeze` command after ShadowImage splits a pair. Check the file system access suppression status by using commands in NAS Manager. For details on viewing the file system access suppression status, see the manual *NAS Manager Modular User's Guide* ().

The next table (Table 5.28) shows arguments and options for using horc_pvol_unfreeze.

Table 5.28 Horc_pvol_unfreeze Arguments and Options

Arguments	Options
-f copy-source-file-system-name	Specify the name of the copy-source file system for which you want to re-open access from clients, and cancel suppression of operations from NAS Sync Image Modular.
-h	Specifies this option to view the command syntax.
-nomsg horc_setenv	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_pvol_unfreeze operation return values and their meanings.

Table 5.29 Horc_pvol_unfreeze Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
5	The file system name is not specified. Specify the file system name, and then re-execute.
6	The specified file system name is too long. Specify a file system name with the correct length, and then re-execute.
7	There is an error in the specified file system name. Specify the correct file system name, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
20	The specified file system does not exist. Specify the correct file system name, and then re-execute.
26	The specified file system is blocked. Remove the blockage, and then re-execute.
27	The specified file system is differential-data snapshot of NAS Sync Image Modular. Specify a file system name, and then re-execute.
73	The specified command is already being executed.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the File type drop-down list in the List of RAS Information (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
84	An error occurred during processing to restart access from the NFS client to the specified copy-source file system. Contact maintenance personnel, and acquire the NAS Dump. After restarting the NAS OS, acquire all log data.
85	An error occurred during processing to re-open access from the CIFS client and FTP client to the specified copy-source file system. Contact maintenance personnel, and acquire the NAS Dump. After restarting the NAS OS, acquire all the log files.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If the node stopped during processing, either wait 15 minutes or restart it.
93	Acquisition of cluster information failed temporarily. Wait for a while, and then re-execute.
95	NAS Sync Image Modular processing is either being performed or was canceled on the specified copy-source file system. If the NAS Sync Image Modular processing is being performed, re-execute after the processing has finished. If the

	processing was canceled, perform the necessary operations for when processing is canceled, and then re-execute.
96	NAS Sync Image is not installed. Install NAS Sync Image, and then re-execute.
97	No license is set up for NAS Sync Image. Set up the NAS Sync Image license, and then re-execute.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command re-opens access to the copy-source file system from clients, and enables operations from NAS Sync Image:

```
$ sudo horc_pvol_unfreeze -f FS_1
Mar 30 11:35:12 KAQB11801-I The horc_pvol_unfreeze command has started.
Mar 30 11:35:12 KAQB11802-I The horc_pvol_unfreeze command has finished.
```

5.17 Horc_setenv

The horc_setenv command sets up or modifies the CCI environment variable.

Syntax

`horc_setenv` *environment-variable-name setting-value* [-nomsg]

horc_setenv -h

Description

The `horc_setenv` command sets up or modifies the values specified in the following CCI environment variables:

`HORCC_MRCF`

`HORCMINST`

When you use SSH to log in to the NAS Unit, or create a shell script and execute a CCI command automatically, the environment variables will be set up automatically.

The environment variables must be set up and modified for each node. If you want to continue remote copy operations on the failover-destination node after failover has occurred, apply the same settings for the environment variables on both of the nodes in the cluster.

Tips and Remarks

If you use SSH to log in to the NAS Unit, and then execute this command, the specified value will take effect as of the next time you log in to the NAS Unit.

If you create a shell script and execute this command automatically, the specified value will take effect once the command finishes execution.

Do not execute this command while a shell script that automatically executes a CCI command is running. If you execute this command by mistake, the environment variable will be changed during the operation, and the CCI command might be executed using a non-assumed value.

Table 5.30 shows the values set for each environment variable.

Table 5.30 Values for Environment Variables Set Up or Modified by horc_setenv

Environment Variable	Description
HORCC_MRCF	Specify `1`.
HORCMINST	Sets the CCI instance number. Specify `16` or `17`.

The next table (Table 5.31) shows arguments and options for using horc_setenv.

Table 5.31 Horc_setenv Arguments and Options

Arguments	Options
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.
environment-variable-name	Specify the name of the environment variable to be set up or modified. The specifiable environment variables are HORCC_MRCF and HORCMINST.
setting-value	Specify the value to be set for the environment variable.

The next table shows horc_setenv operation return values and their meanings.

Table 5.32 Horc_setenv Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
86	The file on the NAS OS LU could not be opened. Check whether an error has occurred in the NAS OS LU.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.

Example

In this example, the command sets up or modifies the CCI environment variable:

```
$ sudo horc_setenv HORCC_MRCF 1
Mar 30 11:35:12 KAQB11801-I The horc_setenv command has started.
```

```
Mar 30 11:35:12 KAQB11879-W Settings are applied only to the node on which
the command was executed. Apply the same settings to the other node in the
cluster as necessary.
Mar 30 11:35:12 KAQB11802-I The horc_setenv command has finished.
```

5.18 Horc_svol_define

The `horc_svol_define` command reserves device files (LVM is not used) that will be used as the copy destination of a file system.

Syntax

`horc_svol_define -d` ***device-file-number*** [-nomsg]

horc_svol_define -h

Description

The `horc_svol_define` command reserves a device file to be used as the copy-destination of a file system.

When you reserve a device file, which is to be used as the copy destination of a file system that was created without using a volume manager (LVM), use the `horc_svol_vmdefine` command. For details on the `horc_svol_vmdefine` command, see section 5.21.

When you reserve a device file to be used as the copy destination of a file system that was created without using a volume manager (LVM), use the `horc_svol_define` command. To reserve a device file to be used as the copy destination of a file system that was created by using a volume manager, use the `horc_svol_vmdefine` command.

Before creating or re-synchronizing the copy-destination file system by using ShadowImage, reserve a device file to be used as the copy destination of the file system. By reserving the device files, you prevent other system administrators from using the specified device files when they create a file system.

Tips and Remarks

None.

The next table (Table 5.33) shows arguments and options for using horc_ svol_define.

Table 5.33 Horc_svol_define Arguments and Options

Arguments	Options
-d device-file-number	Specify the number of the device file to be used as the copy destination of the file system. If the path of the target device file is /dev/enas/lu0F, specify 0F. When specifying the copy destination of a file system operated by the NAS Sync Image Modular, both the device file that is used as the copy destination of the file system, and the device file that is used as the copy destination of the differential-data snapshot storage device, must be specified.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_svol_define operation return values and their meanings.

Table 5.34 Horc_svol_define Return Values

0	Completed successfully. Note that this value is also returned when the specified device file is reserved on your login node by the remote copy functionality.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
40	The specified device file does not exist. Specify the number of a device file that exists, and then re-execute.
43	The specified device file is in use by your login node. Specify a device file that is not in use, and then re-execute.
44	The specified device file is in use by another node. Specify a device file that is not in use, and then re-execute.
45	The specified device file is in use by another file system. Specify a device file that is not in use, and then re-execute.
47	The specified device file is being used by the NAS Sync Image Modular functionality. Specify a device file that is not in use, and then re-execute.
48	The specified device file is blocked. Remove the blockage, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command reserves a device file that will be used as the copy destination of a file system that was created without using a volume manager:

```
$ sudo horc_svol_vmdefine –d 19,1ª,1B
Mar 30 11:35:12 KAQB11801-I The horc_svol_vmdefine command has started.
Mar 30 11:35:12 KAQB11802-I The horc_svol_vmdefine command has finished.
```

5.19 Horc_svol_delete

The horc_svol_delete command releases device files (LVM is used).

Syntax

`horc_svol_delete -d` ***device-file-number*** [-nomsg]

horc_svol_delete -h

Description

After reserving the device files by using the `horc_svol_define` command and deleting a pair by using ShadowImage without connecting a copy-destination file system to a NAS Unit, release the reserved device files by using the `horc_svol_delete` command.

Tips and Remarks

Use the `horc_svol_delete` command to release the device file reserved by using the `horc_svol_define` command. For details on horc_svol_vmdelete command see section 5.22.

The next table (Table 5.35) shows arguments and options for using horc_svol_delete.

Table 5.35 Horc_svol_delete Arguments and Options

Arguments	Options
-d device-file-number	Specify the number of the device file used for the copy-destination file system. If the path of the target device file is /dev/enas/lu0F, specify 0F. When multiple device files comprise the copy-destination file system, specify all the device file numbers, separated by commas (,). When specifying a device file that was used as the copy destination of the file system operated by NAS Sync Image Modular, both the device file that was used as the copy destination of the file system, and the device file that was used as the copy destination of the differential-data snapshot storage device, must be specified.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_svol_delete operation return values and their meanings.

Table 5.36 Horc_svol_delete Return Values

0	Completed successfully. Note that this value is also returned when an unused device file is specified.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows:

	▪ The current directory is located under /mnt. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
40	The specified device file does not exist. Specify the number of a device file that exists, and then re-execute.
43	The specified device file is in use by your login node. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
44	The specified device file is in use by another node. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
45	The specified device file is in use by another file system. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
47	The specified device file is being used by the NAS Sync Image Modular functionality. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
48	The specified device file is blocked. Remove the blockage, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the /enas/log/backuprestore.trace file from the File type drop-down list in the List of RAS Information (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command releases a device file for the copy-destination file system that was created without using a volume manager:

```
$ sudo horc_svol_delete -d 01
Mar 30 11:35:12 KAQB11801-I The horc_svol_delete command has started.
Mar 30 11:35:12 KAQB11802-I The horc_svol_delete command has finished.
```

5.20 Horc_svol_import

The horc_svol_import command connects a copy-destination file system that split the ShadowImage pair to a NAS Unit (LVM is not used).

Syntax

`horc_svol_import -f` *copy-destination-file-system-name*

-d device-file-number [-nomsg]

horc_svol_import -h

Description

The `horc_svol_import` command connects the copy-destination file system (S-VOL) for which the pair is split by using ShadowImage to a NAS Unit.

To execute this command, specify the fixed IP address of the NAS Unit that has the device file reserved by the `horc_svol_define` command to log in to the NAS Unit.

Tips and Remarks

If a copy-destination file system created without using a volume manager (LVM) is to be connected to the NAS Unit, use the `horc_svol_import` command. If a copy-destination file system that was created using a volume manager is to be connected to the NAS Unit, use the `horc_svol_vmimport` command. For details on the `horc_svol_vmimport` command, see section 5.23.

Specify the number of the device file that comprises the copy-destination file system. If you specify a device file other than one that comprises the copy-destination file system, you may not be able to access the file system that contains the device file you specified.

The quota value set in the copy-source file system is reproduced in the copy-destination file system. If it was mounted so that the copy-destination file system can be read, the quota can be set and changed. For details on setting and changing the quota, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

In addition, the settings for the copy-source file system are reproduced in the copy-destination file system. If it was mounted so that the copy-destination file system can be read, the reproduced content can be changed. The reproduced content can be confirmed and changed using the `enas_fsctl` command for the NAS Manager. For the `enas_fsctl` command, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

The next table (Table 5.37) shows arguments and options for using horc_svol_import.

Table 5.37 Horc_svol_import Arguments and Options

Arguments	Options
-f copy-destination-file-system-name	Specify the name of the copy-destination file system using a maximum of 16 characters. The characters that can be specified are alphanumeric characters and underscores (_). Do not specify a name that already exists for a file system in the cluster.

Arguments	Options
-d device-file-number	Specify the number of a device file that was used as the copy-destination file system. For example, if the path of the device file is `/dev/enas/lu0F`, specify `0F`.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_svol_import operation return values and their meanings.

Table 5.38 Horc_svol_import Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
5	The file system name is not specified. Specify the file system name, and then re-execute.
6	The specified file system name is too long. Specify a file system name with the correct length, and then re-execute.
7	There is an error in the specified file system name. Specify the correct file system name, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
22	The specified file system name is in use by another file system. Specify a different file system name, and then re-execute.
24	The specified file system is being used by the NAS Sync Image functionality. Specify the correct file system name, and then re-execute.
40	The specified device file does not exist. Specify the number of a device file that exists, and then re-execute.
41	The specified device file is not reserved. Specify a device file that is reserved, and then re-execute.
44	The specified device file is in use by another node. Specify a device file that is not in use, and then re-execute.
45	The specified device file is in use by another file system. Specify the correct device file number, and then re-execute.
47	The specified device file is being used by the NAS Sync Image functionality.

	Specify the correct device file number, and then re-execute.
48	The specified device file is blocked. Remove the blockage, and then re-execute.
50	The number of file systems has reached the maximum. Delete unnecessary file systems, and then re-execute.
52	The specified copy-destination file system is a file system created by using a volume manager. Use the `horc_svol_vmimport` command to connect the copy-destination file system to the NAS Unit.
54	NAS Unit could not be connected to because the copy-destination file system containing the specified device file is not recognizable. Check that the file system was copied properly, and that there is no mistake in the specified device file, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the List of RAS Information (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
92	A communication processing error occurred between nodes. Remove the cause of the error, and then re-execute.
93	Acquisition of cluster information failed temporarily. Wait for a while, and then re-execute.
94	The remote copy functionality could not be operated, either because a failover occurred or because the resource group is offline. Perform failback and return the file system to the normal state or put the resource group online, and then re-execute.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command connects (to the NAS Unit) a copy-destination file system that was created without using a volume manager:

```
$ sudo horc_svol_import -f FS_1 -d 01
Mar 30 11:35:12 KAQB11801-I The horc_svol_import command has started.
Mar 30 11:35:12 KAQB11802-I The horc_svol_import command has finished.
```

5.21 Horc_svol_vmdefine

The `horc_svol_vmdefine` command reserves device files (LVM is used) that will be used as the copy-destination of a file system.

Syntax

`horc_svol_vmdefine`

`-d` *device-file-number*`[,`*device-file-number*`...]` [-nomsg]

horc_svol_vmdefine -h

Description

The `horc_svol_vmdefine` command reserves a device file to be used as the copy-destination of a file system.

Tips and Remarks

When you reserve a device file, which is to be used as the copy destination of a file system that was created by using a volume manager (LVM), use the `horc_svol_vmdefine` command.

When you reserve a device file, which is to be used as the copy destination of a file system that was created by using a volume manager, use the `horc_svol_vmdefine` command. To reserve a device file to be used as the copy destination of a file system that was created without using a volume manager, use the `horc_svol_define` command. For details on the `horc_svol_define` command, see section 5.18.

Before using ShadowImage to create or re-synchronize the copy-destination file system, reserve a device file to be used as the copy destination of the file system. By reserving the device files, you prevent other system administrators from using the specified device files when they create a file system.

The next table (Table 5.39) shows arguments and options for using horc_svol_vmdefine.

Table 5.39 Horc_svol_vmdefine Arguments and Options

Arguments	Options
-d device-file-number[,device-file-number...]	Specify the number of the device file to be used as the copy destination of the file system. If the path of the target device file is /dev/enas/lu0F, specify 0F. When you specify multiple device files, specify all the device file numbers, separated by commas (,). When specifying the copy destination of a file system operated by the NAS Sync Image Modular, both the device file that is used as the copy destination of the file system, and the device file that is used as the copy destination of the differential-data snapshot storage device, must be specified.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_svol_vmdefine operation return values and their meanings.

Table 5.40 Horc_svol_vmdefine Return Values

0	Completed successfully. Note that this value is also returned when the specified device file is reserved on your login node by the remote copy functionality.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
40	The specified device file does not exist. Specify the number of a device file that exists, and then re-execute.
43	The specified device file is in use by your login node. Specify a device file that is not in use, and then re-execute.
44	The specified device file is in use by another node. Specify a device file that is not in use, and then re-execute.
45	The specified device file is in use by another file system. Specify a device file that is not in use, and then re-execute.
47	The specified device file is being used by the NAS Sync Image Modular functionality. Specify a device file that is not in use, and then re-execute.
48	The specified device file is blocked. Remove the blockage, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether or not an error has occurred in the NAS Cluster Management LU.
91	Either another user has a portion of the resources used in processing or the node that held the resources was stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command reserves a device file, which is to be used as the copy destination of a file system that was created by using a volume manager:

```
$ sudo horc_svol_vmdefine -d 19,1A,1B
Mar 30 11:35:12 KAQB11801-I The horc_svol_vmdefine command has started.
Mar 30 11:35:12 KAQB11801-I The horc_svol_vmdefine command has finished.
```

5.22 Horc_svol_vmdelete

The horc_svol_vmdelete command releases device files (LVM is used).

Syntax

```
horc_svol_vmdelete
  -d device-file-number[,device-file-number…] [-nomsg]
horc_svol_vmdelete -h
```

Description

After using the `horc_svol_vmdefine` command to reserve a device file, if a ShadowImage pair is deleted without connecting the copy-destination file system to a NAS Unit, use the `horc_svol_vmdelete` command to release the reserved device file.

After reserving the device files by using the `horc_svol_vmdefine` command and deleting a pair by using ShadowImage without connecting a copy-destination file system to a NAS Unit, release the reserved device files by using the `horc_svol_delete` command.

To execute this command, specify the fixed IP address of the NAS Unit when you log in to the NAS Unit.

Use the `horc_svol_delete` command to release the device file reserved by using the `horc_svol_define` command. For details on the `horc_svol_delete` command, see `horc_svol_delete` in section 5.19.

Tips and Remarks

None.

The next table (Table 5.41) shows arguments and options for using horc_svol_vmdelete.

Table 5.41 Horc_svol_vmdelete Arguments and Options

Arguments	Options
-d device-file-number [,device-file-number...]	Specify the number of the device file used for the copy-destination file system. If the path of the target device file is /dev/enas/lu0F, specify 0F. When multiple device files comprise the copy-destination file system, specify all the device file numbers, separated by commas (,). When specifying a device file that was used as the copy destination of the file system operated by NAS Sync Image Modular, both the device file that was used as the copy destination of the file system, and the device file that was used as the copy destination of the differential-data snapshot storage device, must be specified.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_svol_vmdelete operation return values and their meanings.

Table 5.42 Horc_svol_vmdelete Return Values

0	Completed successfully. Note that this value is also returned when an unused device file is specified.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
40	The specified device file does not exist. Specify the number of a device file that exists, and then re-execute.
43	The specified device file is in use by your login node. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
44	The specified device file is in use by another node. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
45	The specified device file is in use by another file system. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
47	The specified device file is being used by the NAS Sync Image Modular functionality. Specify a device file that is reserved for the remote copy functionality, and then re-execute.
48	The specified device file is blocked. Remove the blockage, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command reserves a device file that will be used as the copy-destination file system that was created using a volume manager:

```
$ sudo horc_svol_vmdelete -d 19,1A,1B
Mar 30 11:35:12 KAQB11801-I The horc_svol_vmdelete command has started.
Mar 30 11:35:12 KAQB11802-I The horc_svol_vmdelete command has finished.
```

5.23 Horc_svol_vmimport

The horc_svol_vmimport command connects a copy-destination file system to a NAS Unit (LVM is used).

Syntax

`horc_svol_vmimport -f` *copy-destination-file-system-name*

-d device-file-number[,device-file-number…] [-nomsg]

horc_svol_vmimport -h

Description

The `horc_svol_import` command connects a copy-destination file system (S-VOL) split into pairs using ShadowImage to a NAS Unit.

To execute this command, all of the following conditions must be satisfied:

- You must have logged in by specifying the fixed IP address of the NAS Unit for which the `horc_svol_define` command was used to reserve the device file.
- The number of logical volumes on the node must satisfy the following conditions (If both of the following conditions are not satisfied, delete any unnecessary volumes that were created using an LVM):
  - When the copy-source file system is not operated by NAS Sync Image Modular:

    the-number-of-logical-volumes-on-the-node < 4,096
  - When the copy-source file system is operated by NAS Sync Image Modular:

    the-number-of-logical-volumes-on-the-node < 4,096 - *the-number-of-reserved-generations-for-differential-data snapshot* − 2

  If these conditions are not satisfied, delete unnecessary volumes (file systems) that were created using an LVM.

Tips and Remarks

If a copy-destination file system that was created using a volume manager (LVM) is to be connected to the NAS Unit, use the `horc_svol_vmimport` command.

If a copy-destination file system that was created without using a volume manager is to be connected to the NAS Unit, use the `horc_svol_import` command. For details on the `horc_svol_import` command, see section 5.20.

Specify the number of the device file that comprises the copy-destination file system. If you specify a device file other than one that comprises the copy-destination file system, you may not be able to access the file system that contains the device file you specified.

The quota value set in the copy-source file system is reproduced in the copy-destination file system. If it was mounted so that the copy-destination file system can be read, the quota can be set and changed. For details on setting and changing the quota, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

In addition, the settings for the copy-source file system are reproduced in the copy-destination file system. If it was mounted so that the copy-destination file system can be read, the reproduced content can be changed. The reproduced content can be confirmed and changed using the `enas_fsctl` command for the NAS Manager. For the `enas_fsctl` command, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

The next table (Table 5.43) shows arguments and options for using horc_svol_import.

Table 5.43 Horc_svol_import Arguments and Options

Arguments	Options
-f copy-destination-file-system-name	Specify the name of the copy-destination file system using a maximum of 16 characters. The characters that can be specified are alphanumeric characters and underscores (_). Specify the name not to overlap with the existent file system name in the cluster.
-d device-file-number [,device-file-number...]	Specify the number of the device file that was used as the copy-destination file system. For example, if the path of the device file is /dev/enas/lu0F, specify 0F. When multiple device files comprise the copy-destination file system, specify all the device file numbers, separated by commas (,). If the file system is used as the copy destination of a file system operated by NAS Sync Image Modular, both the device file that is used as the copy destination of the file system, and the device file that is used as the copy destination of the differential-data snapshot storage device, must be specified.
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.

The next table shows horc_svol_import operation return values and their meanings.

Table 5.44 Horc_svol_import Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
5	The file system name is not specified. Specify the file system name, and then re-execute.
6	The specified file system name is too long. Specify a file system name with the correct length, and then re-execute.
7	There is an error in the specified file system name. Specify the correct file system name, and then re-execute.
8	The device file number is not specified. Specify the device file number, and then re-execute.
9	There is an error in the specified device file number. Specify the correct device file number, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist.

	Change the current directory, and then re-execute.
22	The specified file system name is in use by another file system. Specify a different file system name, and then re-execute.
24	The specified file system is being used by the NAS Sync Image Modular functionality. Specify the correct file system name, and then re-execute.
40	The specified device file does not exist. Specify the number of a device file that exists, and then re-execute.
42	The specified device file is not reserved. Specify a device file that is reserved, and then re-execute.
44	The specified device file is in use by another node. Specify a device file that is not in use, and then re-execute.
45	The specified device file is in use by another file system. Specify the correct device file number, and then re-execute.
47	The specified device file is being used by the NAS Sync Image Modular functionality. Specify the correct device file number, and then re-execute.
48	The specified device file is blocked. Remove the blockage, and then re-execute.
49	The device files that comprise the copy-destination file system are insufficient. Specify all the device file numbers, and then re-execute.
50	The number of file systems has reached the maximum. Delete unnecessary file systems, and then re-execute.
51	The number of volumes such as file systems that are using a volume manager has reached the maximum. Delete unnecessary volumes that are using the volume manager, and then re-execute.
53	The specified copy-destination file system is a file system created without using a volume manager. Use the `horc_svol_import` command to connect the copy-destination file system to the NAS Unit.
54	The NAS Unit could not be connected to because the copy-destination file system containing the specified device file is not recognizable. Check that the copy-destination file system was copied properly, and that there is no mistake in the specified device file, and then re-execute.
55	The limit on the number of differential-data snapshot storage devices that can be created in a node has been reached. Release unnecessary differential-data snapshot storage devices, and then re-execute.
58	The number of logical volumes has reached the maximum. Delete unnecessary volumes such as file systems that are using the volume manager and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped.

	Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
92	A communication processing error occurred between nodes. Remove the cause of the error, and then re-execute.
93	Acquisition of cluster information failed temporarily. Wait for a while, and then re-execute.
94	The remote copy functionality could not be operated, either because a failover occurred or because the resource group is offline. Perform failback and return the file system to the normal state or put the resource group online, and then re-execute.
96	NAS Sync Image is not installed. Install NAS Sync Image, and then re-execute.
97	No license is set up for NAS Sync Image. Set up the NAS Sync Image license, and then re-execute.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.
99	An unknown error occurred. Acquire the Backup Restore log files, and then contact maintenance personnel.

Example

In this example, the command connects (to the NAS Unit) a copy-destination file system that was created by using a volume manager:

```
$ sudo horc_svol_vmimport -f FS_1 -d 01
Mar 30 11:35:12 KAQB11801-I The horc_svol_vmimport command has started.
Mar 30 11:35:12 KAQB11802-I The horc_svol_vmimport command has finished.
```

5.24 Horc_unsetenv

The horc_unsetenv command deletes the CCI environment variable.

Syntax

`horc_unsetenv` *environment-variable-name* [-nomsg]

horc_unsetenv -h

Description

The `horc_unsetenv` command deletes the CCI environment variable and prevents the environment variable from being set on a node the next time you log in to the NAS Unit.

You can delete the `HORCC_MRCF` environment variable, but cannot delete the `HORCMINST` environment variable.

To execute this command, specify the fixed IP address of the NAS Unit when you log in to the NAS Unit.

The environment variable must be deleted for each node. If you want to continue remote copy operations on the failover-destination node after failover has occurred, specify the same settings for the environment variables on all the nodes in the cluster.

Tips and Remarks

If you use SSH to log in to the NAS Unit, and then execute this command, the environment variable is deleted the next time you log in to the NAS Unit.

If you create a shell script and execute this command automatically, the environment variable is deleted once the command finishes execution.

Do not execute this command while a shell script that automatically executes a CCI command is running. If you execute this command by mistake, the environment variable is deleted during the operation, and the CCI command might be executed with a non-assumed value.

The next table (Table 5.45) shows arguments and options for using horc_unsetenv.

Table 5.45 Horc_unsetenv Arguments and Options

Arguments	Options
-h	Specifies this option to view the command syntax.
-nomsg	Specifies this option to suppress the messages in standard output and standard error output.
environment-variable-name	Specify the name of the environment variable to be deleted.

The next table shows horc_unsetenv operation return values and their meanings.

Table 5.46 Horc_unsetenv Return Values

0	Completed successfully.
4	There is an error in the type, quantity, or position of the argument or option that was specified. Specify the correct argument or option, and then re-execute.
11	An attempt to delete the specified environment variable has failed. Check whether this environment variable can be deleted, and then re-execute.
19	The current directory is invalid. Possible causes are as follows: ▪ The current directory is located under `/mnt`. ▪ The current directory is set in a directory that does not exist. Change the current directory, and then re-execute.
74	A signal that is attempting to cancel command execution has been detected.
80	An error occurred during command execution. Select the `/enas/log/backuprestore.trace` file from the **File type** drop-down list in the **List of RAS Information** (List of other log files) window in NAS Manager, and then take action based on the content of the KAQB11880-E message.
86	The file on the NAS OS LU could not be opened. Check whether or not an error has occurred in the NAS OS LU.
90	An attempt to access the NAS Cluster Management LU has failed. Check whether an error has occurred in the NAS Cluster Management LU.
91	Some of the resources to be used for processing are being used exclusively by another user, or the node being used exclusively has stopped. Wait for a while, and then re-execute. If a node stops during processing, either wait 15 minutes or restart it.
98	No license is set up for NAS Backup Restore. Set up the NAS Backup Restore license, and then re-execute.

Example

In this example, the command deletes the CCI environment variable:

```
$ sudo horc_unsetenv HORCC_MRCF
Mar 30 11:35:12 KAQB11801-I The horc_unsetenv command has started.
Mar 30 11:35:12 KAQB11879-W Settings are applied only to the node on which
the command was executed. Apply the same settings to the other node in the
cluster as necessary.
Mar 30 11:35:12 KAQB11802-I The horc_unsetenv command has finished.
```

Chapter 6 Troubleshooting

The troubleshooting chapter describes what action you should take if an error occurs during usage of functionality related to NAS Backup Restore. Always contact Hitachi maintenance personnel if you cannot identify the cause of an error or remedy the problem.

For information on responding to errors that affect the NAS system as a whole, see the *NAS Manager Modular User's Guide* (MK-95DF757).

6.1 General Troubleshooting - Checking Error Messages

This section describes how to identify the cause of any errors that may occur while you are performing operations related to NAS Backup Restore. If an error occurs when you perform an operation related to NAS Backup Restore, follow these steps:

1. If NAS Backup Restore terminates abnormally during execution of a NAS Backup Restore operation, check whether an error message was output immediately before termination to discover what caused the problem.
2. Check the error messages to identify what caused the error.
   - If an error results from an erroneous GUI operation, such as a wrong setting or action, an error message appears in the **Processing Results** window. Check the displayed error message to identify what caused the error.
   - If an error results from execution of a NAS Backup Restore command, an error message is output to the standard output. Check the displayed error message to identify what caused the error.
   - If an error occurs during backup or restore operations, an error message is output to the NDMP server log (`/enas/log/ndmpserver.log`). Use the **List of RAS Information** (list of other log files) window of NAS Manager to check the error message that was output, and identify the cause of the error.
3. If no error message was output, or if you are unsure what caused the error or what you should do, or if the problem persists after you take action. Collect the required information and contact maintenance personnel.

6.1.1 Error Prevents Backup or Restore

If an error prevents you from performing a backup or restoration, the cause of the error might pertain to the settings of the backup server, media server, or NetBackup. For details on the information set in the backup server and media server, see section 3.7.

Identify the cause of the error by checking the error messages and logs in the backup server or media server. For details on how to check error messages and logs from NetBackup, see the appropriate VERITAS Corporation documentation.

6.1.2 Error Message IDs

Both NAS Backup Restore messages and NAS Sync Image messages are sent to the backup server. The message IDs begin with **KAQB** for NAS Backup Restore messages and **KAQS** for NAS Sync Image messages.

For details on actions to be taken if messages are output, see *NAS Error Codes User's Guide* (MK-95DF760).

6.1.3 Checking Backup and Restore Job Results for NetBackup

Backup or restore operation results are displayed in the **Job Details** window in NetBackup. To identify the cause of the error, if any, see the log displayed in this window.

However, if a failover occurs during backup or restoration processing, sometimes the NAS Backup Restore messages do not appear in the **Job Details** window.

To check the NetBackup settings, investigate whether the information set in the backup servers and media servers is correct. For details on the information set in the backup servers and media servers, see section 3.9

6.1.3.1 Checking the Status of Cluster, Node, and Resource Groups

When using a tape device connected over Fibre Channel to the NAS Unit to perform backup/restoration, these operations might end in error if a failover occurs and causes operations to be affected.

View the status of resource groups for each node on the NAS Manager Browse Cluster Status (Resource group status) window and check whether a failover has occurred. For details on the Browse Cluster Status (Resource group status) window, see the manual *NAS Manager Modular User's Guide*.

If a failover occurs, see section 6.3.1 for information about measures to be taken.

6.2 Checking the Status of a Tape Device

Confirm that the tape device is physically connected to the NAS Unit, and that its power is turned on. In addition, execute the `tapelist` command without specifying any options, and check the status of the tape device.

If the information for the tape device being used is not displayed, `N` is displayed in the `Status` item as the connection status of the tape device, or `Error` is displayed for `Model` or `Type`:

- There may be a problem with the tape device.
- If the cause of the problem is interference with the tape device, call HDS support for measures to be taken.

- If `D` is displayed in the `Status` item as the registration status of the tape device:

The information for the tape device is not registered on the NDMP server.

6.2.1 Identifying Error Source

The key to correcting an error is identifying its source.

- Use product manuals or GUI message windows to identify errors if you determine that an error was neither a result of an incorrect operation nor a result of a problem at the backup server or media server. For example, use the NAS Manager GUI, NAS Backup Restore User's Guide, or *NAS Sync Image Modular User's Guide* (MK-95DF758) to check the *error information* and identify the cause of the error.
- For errors which occur in a cluster, node, or resource group on the node, check the error status in the **Browse Cluster Status** window in NAS Manager to identify what causes the error.
- When a hardware error occurs in the NAS Unit, such as insufficient memory or an NIC error, the error status of the resource group is displayed as `srmd executable error` in the **Browse Cluster Status** window.

  For details on viewing the status of the cluster, node, or resource group, see the *NAS Manager Modular User's Guide* (MK-95DF757).

  For hardware problems in the NAS unit, after an operation producing an error completes, contact the maintenance personnel to remove the error. For details on maintenance work, see *NAS Manager Modular User's Guide* (MK-95DF757).
- Repetitive timeout errors which occur during NAS Backup Restore processing are often caused by other operations executing at the same time. Make sure that multiple operations or schedules are not in conflict. Even when the `horc_pvol_freeze` command is executed and file system access is suppressed, a timeout may occur. Check the file system access suppression status by using commands in NAS Manager. For details on viewing the file system access suppression status, see the manual *NAS Manager Modular User's Guide* (MK-95DF757). If after eliminating scheduling conflicts, the same error still occurs, collect error information from the time when the timeout occurs and then contact maintenance personnel.
- If no error message is output or if you are unsure what caused the error or what you should do, or if corrective action fails, collect the required information and notify the maintenance personnel. For details on collecting information, see section 6.4.
- When operating NAS Backup Restore exclusively, use the NAS Manager GUI to check the error status of a file system, and then take appropriate action. For details, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).
- When linking with the differential-data snapshot function of NAS Sync Image, use the NAS Sync Image GUI to check the error status of a differential-data storage device, and then take appropriate action. For details, see the manual *NAS Sync Image Modular User's Guide* (MK-95DF758).

  For additional details on discovering the cause of an error, see section 6.3.

  For details on how to resolve errors, see section 6.3.

6.2.2 Checking System Messages

Important messages that affect the NAS system as a whole are output to the system messages log. These messages may be about hardware or software errors or incorrect GUI operations. System messages are output to the **List of RAS Information** (List of messages) window of NAS Manager to identify the cause of system errors. System messages of NAS Backup Restore have a message ID beginning with KAQB. In addition, when using a tape device connected to a NAS Unit, a message is also output by NAS File Sharing if connection interference or an input/output error is detected in the tape device connected over Fibre Channel to the NAS Unit.

If you cannot identify the cause of the error from a system message or if a message advises you to contact the maintenance personnel, download the error information and forward it to the maintenance personnel.

For details on checking system message by using the NAS Manager GUI, see the *NAS Manager Modular User's Guide* (MK-95DF757).

6.2.2.1 Checking NAS File Sharing Messages

If connection interference or I/O errors are detected with a tape device connected over Fibre Channel to the NAS Unit, an error message is output to the NAS File Sharing. The message IDs for messages from NAS File Sharing start with KAQG. Check the following messages.

- System messages

  For details on checking system messages, see the manual NAS Manager Modular User's Guide.

- Messages sent to the SNMP manager

  For details on checking SNMP notification, see the documentation for the software you are using. For details on measures to be taken, see the manual NAS Modular Error Codes.

6.2.2.2 Confirming the FC port on the NAS Unit is Linked Up

Confirm that the FC port is available to communicate the following two conditions must be satisfied:

- Message KAQG35060-I has been output to the system message log.

  For details on how to view the system message, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

- The green LED for the FC port is lit.

  For the location of the LED, see the documentation for the disk array.

If the conditions above are not satisfied, the FC port is not linked up. If the FC port on the NAS Unit is not linked up, interference might occur in the connection with the tape device or in the tape device itself. For details on the measures that should be taken, see section 6.3.

6.2.3 Procedure to Check Error Status

Use the GUI to check the error status for a file system or differential-data snapshot storage device and determine the source of the error.

Check the status of the file system by using **Device** or **Mount** status in the **List of File Systems** window. For details on the **List of File Systems** window, see *NAS Manager Modular User's Guide* (MK-95DF757). Some common status examples are shown next.

1. For a device file error in the file system, check the status as follows:
   - If **Device status** is `normal`, and **Mount status** is neither `error` nor `fatal error`:

     Go to the next step.
   - If **Device status** is `normal` and **Mount status** is `fatal error`:

     The file system is blocked. Take corrective action as described in section 6.1.
   - If both **Device status** and **Mount status** are `error`:

   A device file error has occurred in the file system. Check the error status by using **Device status** and **Mount status** in the **List of File Systems** window. For details on the **List of File Systems** window, see *NAS Manager Modular User's Guide* (MK-95DF757).
   - If **Device status** is `normal`, and **Mount status** is neither `error` nor `fatal error`:

     Go to the next step.
   - If **Device status** is `normal` and **Mount status** is `fatal error`:

     Take corrective action.
   - If both **Device status** and **Mount status** are `error`:
2. Check the error status of the differential-data snapshot storage device.

   If a differential-data snapshot storage device has been set for the file system, use the **List of File Systems used for Sync Image Modular** window to check the status of the differential-data snapshot storage device. If an error has occurred in the differential-data snapshot storage device, see *NAS Sync Image Modular User's Guide* (MK-95DF758) and take appropriate action.

6.3 Resolving Errors

Once you identify what caused the error from the error messages, check the required recovery procedure, and then take appropriate action to remedy the problem.

- Erroneous GUI Operation.

  If the error was due to an erroneous GUI operation, such as a invalid setting or action, an error message appears in the processing results window. Check the displayed error message to identify what caused the error, then perform the operation again.

  For details on the appropriate actions, please refer to the *Hitachi NAS Modular Error Codes Guide* (MK-95DF760).

- Incorrectly Entered Command.

  If the error was due to entering a NAS Backup Restore command incorrectly, re-execute the command, referring to the error message displayed in the standard output.

  For details on the appropriate actions, please refer to the *Hitachi NAS Modular Error Codes Guide* (MK-95DF760).

- Abnormal Online Backup Termination on Differential-data Snapshot.

  If an online backup is initiated using differential-data snapshot and terminates abnormally or you interrupt online backup processing, it is possible that the differential-data snapshot created for online backup may not be deleting automatically. Use the NAS Sync Image Modular GUI or appropriate command to check that the differential-data snapshot was created and then manually un-mounted and deleted. Abnormal termination can also be caused by you interrupting online backup processing.

  For details on how to un-mount and delete differential-data snapshot, see the NAS *Sync Image Modular User's Guide* (MK-95DF758).

- Connection Problem with Backup, Media, or NDMP Servers.

  If an error was caused by a failure in the connection between the NDMP server and either the backup server or media server, perform the following operations to check for a connection setting error, and then take action as required:

  - Use the `ping` command to check the status of the network and routing.
  - In the **List of RAS Information** (batch-download) window of NAS Manager, download the network information, and take action as indicated by the messages.
  - Execute the `set_ndmp_attr -verify` command of NetBackup to check whether the user name and password registered in the backup server match the user name and password registered in the NDMP server and media server.
  - In the **Edit System File** window of NAS Manager, check the contents of the `/etc/hosts` file, and correct the information for the registered backup server.
  - In the **List of RAS Information** (list of other log files) window of NAS Manager, check the NDMP server log (`/enas/log/ndmpserver.log`), and take action as indicated by the messages.

- Cluster, Node, or Resource Group Problems.

  If an error is due to a problem in the cluster, node, or resource group on the node, contact maintenance personnel to remove the error.

  For troubleshooting help with error statuses for cluster, nodes, or resource groups, as shown in the **Browse Cluster Status** window, see the *NAS Manager Modular User's Guide* (MK-95DF757).

  If, an error occurs in a cluster, node, or resource group on the node between the time the `horc_pvol_freeze` command was executed and the time the `horc_pvol_unfreeze` command was executed, resynchronize the ShadowImage pair. Then, on the failover-destination node, between the time the `horc_pvol_freeze` command was executed and the time the `horc_pvol_unfreeze` command was executed, retry the remote copy function operations.

- Error Due to File System Blockage.

  If the file system is blocked, you can restore the file system to the status it was.

- Error is in the Tape Device Connected to the NAS Unit

  If the cause of the error is in the tape device connected over Fibre Channel to the NAS Unit, check the following items and perform the necessary measures.

  – Is the power to the tape device turned on?

  If the power to the tape device is off, turn it on.

  – Is the FC cable connected correctly?

  If the FC cable is not connected correctly, fix the connection.

  – Is the FC cable not damaged?

  If the FC cable is damaged, replace it.

  – Is there an error in the tape device?

  If there is an error in the tape device, see the documentation provided by the vendor of the tape device, and perform the necessary measures.

After performing these measures, make sure that the NAS Unit and tape device are connected by Fibre Channel, that the FC ports are linked up, and that the tape device is operating normally. Then, use the following procedure for reregistering the information for the tape device on the NDMP server.

1. Execute the `tapelist` command without specifying any options, and make sure the tape device is connected.

   The information for the tape device is displayed. Check if `D` is displayed in the `Status` item for the left-hand item (connection status of the tape device). If `D` is displayed, this means the tape device is connected. Proceed to step 3.

   If the information for the tape device is not displayed, or if `N` is displayed in the `Status` item as the connection status of the tape device, proceed to step 2.

2. Fix the FC cable connection, and then check the connection of the tape device again.

   Fix the connection of the FC cable to the FC port on the NAS Unit, and then execute the `tapelist` command without specifying any options. The information for the tape device is displayed. If `D` is displayed in the `Status` item for the left-hand item (connection status of the tape device), proceed to step 3.

   If the information for the tape device is not displayed, or if `N` is displayed in the `Status` item for the left-hand item (connection status of the tape device), an error may have occurred in the FC port on the NAS Unit. Collect the error information from the time when the error occurred, and contact maintenance personnel.

3. Execute the `tapedel` command, and delete the information registered for the tape device that is connected.

   For details on how to delete the information registered for a tape device, see section 4.4.3.

4. Execute the `tapeadd` command to register the information for the tape device on the NDMP server.

   For details on how to register a tape device on the NDMP server, see section 4.4.2.

   If these operations do not resolve the problem, collect the error information from the time when the error occurred, and contact maintenance personnel.

6.3.1 Error on the Cluster, Node or Resource Group

If a failover occurred due to an error that pertains to the cluster, node, or resource group on the node, co-operate with maintenance personnel to correct the error.

For details on troubleshooting corresponding to the error status of the cluster, node, or resource group that you checked in the Browse Cluster Status window, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

If a failover occurs due to an error in a cluster, a node, or a resource group on a node during the time between the execution of the `horc_pvol_freeze` command and the execution of the `horc_pvol_unfreeze` command, resolve the error and perform a failback. Next, resynchronize the ShadowImage pair, and then execute the series of operations for the remote copy function on the failover node, from the execution of the `horc_pvol_freeze` command to the execution of the `horc_pvol_unfreeze` command.

6.3.2 Error Due to NetBackup Job Status or Tape Device Status

If a tape device connected to the local NAS Unit is being used and backup or restore operations are in progress, when a failover occurs or an error occurs with the tape device or tape device connection, the NetBackup job may remain in progress or the backup media may remain in the tape device drive.

To recover the NetBackup job or tape device error in such an event, carry out the following procedure and then try the operation again.

1. Check that there are no jobs in progress or queued jobs by using the NetBackup **Activity Monitor**.

   Cancel any jobs in progress. Additionally, cancel any queued jobs or temporarily interrupt them and make sure backup or restore operations are not executed.

2. Check that there is no backup media in the tape device connected to the NAS Unit.

   If backup media is in the tape device, proceed to steps 3 and 4.

3. Eject the backup media from the tape device.

   From **Media and Device Management** in NetBackup, select **Device Monitor** and execute Reset Drive for the drive containing the backup media.

4. Check that the backup media has been ejected from the tape device.

   If the backup media is not ejected from the tape device, operate the tape device manually and eject the backup media. For details on operating the tape device, see the document from the tape device vendor.

5. Check that the tape device is operating normally.

   If an error has occurred with the tape device, see the document from the tape device vendor and perform the necessary operations.

If the problem has not been resolved even after following this procedure, contact maintenance personnel.

6.3.3 Restoring File System after Error

To restore a file system that is blocked, cooperate with maintenance personnel and perform the following operations:

1. Ask maintenance personnel to collect the error information. When error information is collected, a failover automatically occurs.
2. Perform a failback for the resource group to which the failed file system belongs.

   For details on how to perform a failback, see *NAS Manager Modular User's Guide* (MK-95DF757).
3. Operations executed after a failback differ depending on whether the processing to mount a file system during that failback ended normally. In the **List of File Systems** window, check whether the blocked file system is mounted. For details on this window, see *NAS Manager Modular User's Guide* (MK-95DF757).
   - If the file system was successfully mounted, carry out the procedure described in 6.3.3.1.
   - If the file system was not successfully mounted, carry out the procedure described in 6.3.3.2.

6.3.3.1 Restoring from a Mounted File System

If the file system was successfully mounted during failback, do the following:

1. Delete the NFS file share or CIFS file share that was created in the failed file system.

   For details on how to delete an NFS file share or CIFS file share or issues with any other step in this procedure, see *NAS Manager Modular User's Guide* (MK-95DF757).
2. Un-mount the failed file system.
3. Manually perform a failover for the resource group on the node.
4. Stop the node.
5. Ask maintenance personnel to restart the NAS OS of the stopped node.
6. Start the stopped node.
7. Perform a failback for the resource group to the original node.
8. Perform steps 3 to 7 for the other node in the cluster.
9. Mount the file system.
10. If necessary, re-create an NFS file share or CIFS file share for the file system.

    When creating a file share, select **Do not create/change in Directory creation/change** the **Create NFS File Share** or **Create CIFS File Share** window.

6.3.3.2 Restoring from an Un-Mounted File System

If the file system was not successfully mounted during failback, do the following:

1. Delete the CIFS file share that was created in the failed file system.

   For details on how to delete a CIFS file share or issues with any other step in this procedure, see *NAS Manager Modular User's Guide* (MK-95DF757).

   For details on how to restore a file system, see section 6.3.3.

2. Manually perform a failover for the resource group on the node.
3. Stop the node.
4. Ask maintenance personnel to restart the NAS OS of the stopped node.
5. Start the stopped node.
6. Perform a failback for the resource group to the original node.
7. Perform steps 3 to 7 for the other node in the cluster.
8. Delete the NFS share that was created in the failed file system.
9. If necessary, re-create an NFS file share or CIFS file share for the file system.

   When creating a file share, select **Do not create/change** in the **Create NFS File Share** or **Create CIFS File Share** window.

6.4 Collecting Data

If you cannot identify the cause or location of an error or if you cannot fix the problem, you can use the NAS Manager GUI to collect the required information, as instructed in the error message or by Technical Support, and forward it to Technical Support.

You can use the **List of RAS Information** (Batch-download) window of NAS Manager to download the error information for NAS Backup Restore and the NDMP server. The downloadable NAS Backup Restore error information available from the **List of RAS Information** (Batch-download) window is shown next in Table 6.1.

Provide this information to maintenance personnel. For details on how to download error information on items such as all of the log data, see the manual *NAS Manager Modular User's Guide* (MK-95DF757).

For details on how to use the NAS Manager GUI to download error information, see the *NAS Manager Modular User's Guide* (MK-95DF757).

Table 6.1 NAS Backup Restore Error Information

Type of Information		Description
All log data	—-	All log files output by the NAS Modular system
System messages	/enas/data/em_alertfile	Important messages about the NAS Modular system
System log	/var/log/syslog	System log of the NAS OS.
Other logs	/var/log/kern.log	Kernel log
	/var/log/messages	OS messages

Type of Information		Description
	/var/log/lvm	LVM log
	/enas/log/management.log	Management log
	/enas/log/management.trace	Management trace log
	/enas/log/syncimage.log	Sync Image log
	/enas/log/syncimage.trace	Sync Image trace log
	/enas/log/ebr_alertfile	Backup Restore log
	/enas/log/backuprestore.trace	Backup Restore trace log
	/enas/log/ndmpserver.log	NDMP server log
	/enas/log/ndmptar.log	NDMP archive log
	/home/nasroot/log16/curlog/horcm_*node-name*.log	Remote Copy log
	/home/nasroot/log16/curlog/horcmlog_*node-name*/horccc_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log16/curlog/horcmlog_*node-name*/horcm.log	Remote Copy log
	/home/nasroot/log16/curlog/horcmlog_*node-name*/horcm_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log16/horcc_*node-name*.log	Remote Copy log
	/home/nasroot/log16/tmplog/horcm_*node-name*.log	Remote Copy log
	/home/nasroot/log16/tmplog/horcmlog_*node-name*/horccc_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log16/tmplog/horcmlog_*node-name*/horcm.log	Remote Copy log
	/home/nasroot/log16/tmplog/horcmlog_*node-name*/horcm_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log17/curlog/horcm_*node-name*.log	Remote Copy log
	/home/nasroot/log17/curlog/horcmlog_*node-name*/horccc_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log17/curlog/horcmlog_*node-name*/horcm.log	Remote Copy log
	/home/nasroot/log17/curlog/horcmlog_*node-name*/horcm_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log17/horcc_*node-name*.log	Remote Copy log

Type of Information		Description
	/home/nasroot/log17/tmplog/horcm_*node-name*.log	Remote Copy log
	/home/nasroot/log17/tmplog/horcmlog_*node-name*/horccc_*proccess-ID*.trc	Remote Copy log
	/home/nasroot/log17/tmplog/horcmlog_*node-name*/horcm.log	Remote Copy log
	/home/nasroot/log17/tmplog/horcmlog_*node-name*/horcm_*proccess-ID*.trc	Remote Copy log
Network info.	—-	Network information
core		Core files for all applications running on the NAS OS.

6.4.1 Collecting Error Info for the Backup and Media Servers

Error information relating to the backup server and media server error may be required by the maintenance personnel. For details on collecting the error information for the backup server and the media server, see the documentation of the backup management software you use.

6.5 Calling the Support Center

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
  San Diego, California, USA
  1-800-446-0744
- Hitachi Data Systems Europe
  Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
  North Ryde, Australia
  61-2-9325-3300

Appendix A Wildcard Characters Specifiable in the FILES Environment Variable

This appendix describes the symbols and wild cards that can be specified in the FILES environment variable for the Backup Selections list. The next sections explain a ths specifiable in the FILES environment variable.

A.1 Wild Cards Specifiable in the FILES Environment Variable

This appendix describes the symbols and wild cards that can be specified in the FILES environment variable for the Backup Selections list.

The following explains how to specify a path in the FILES environment variable when the path includes symbols:

- When spaces are included:

  Specify a directory in the hierarchy above that does not include a space.

  Example:

  When backing up ./staffA/temp 1
  ./staffA

- When quotation marks ("), asterisks (*), question marks (?), or backslashes (\) are included:

  Specify a backslash (\) immediately before the symbol.

  Example:

  When backing up ./staff"deleted"
  ./staff\"deleted\"

- When opening brackets ([ ] and closing brackets ( ]) are included:

  Specify a backslash (\) immediately before the opening bracket ([).

  Example:

  When backing up ./[staff]
  ./\[staff]

The following explains how to specify a path in the FILES environment variable when the path includes wildcards:

[*Character-or-symbolCharacter-or-symbolCharacter-or-symbol*...]

Use this pattern to specify each of the single characters or symbols in [ ] as a target.

You cannot specify an exclamation mark (!) at the beginning of the characters or symbols. If you enter an asterisk (*), question mark (?), left bracket ([), or right bracket (]) in [ ], the symbol is interpreted as a regular symbol.

Example:

To back up staffA, staffB, and staffD, which are immediately below the directory that is the base point of the backup target, specify as follows:

```
./staff[ABD]
```

[!*Character-or-symbolCharacter-or-symbolCharacter-or-symbol*...]

Use this pattern to specify any character or symbol other than those in [!]as a target. If you enter an asterisk (*), question mark (?), left bracket ([), or right bracket (]) in [ ], the symbol is interpreted as a regular symbol.

Example:

To back up directories and files whose names begin with staff but not staffA, staffB, and staffD, and which are immediately below the directory that is the base point of the backup target, specify as follows:

```
./staff[!ABD]
```

[*Character-or-symbol*-*Character-or-symbol*]

Use this pattern to specify any character or symbol within the range indicated by the hyphen (-). Specify the values in ascending order. The range is specified based on ASCII codes. If you enter an asterisk (*), question mark (?), left bracket ([), or right bracket (]) in [ ], the symbol is interpreted as a regular symbol.

Example:

To back up staffA, staffB, staffC, staffD, and staffE, which are immediately below the directory that is the base point of the backup target, specify as follows:

```
./staff[A-E]
```

Question mark (?)

Use this to specify any single character.

Example:

To back up all directories and files that are immediately below the directory that is the base point of the backup target and have names of the staff*X* format, specify as follows:

```
./staff?
```

To target all hidden directories and files in the format of ./.*X*/, such as ./.A/ and ./.B/, specify as follows:

```
./.[!.]/
```

Asterisk (*)

Use this to specify any string longer than 0 characters.

Example 1:

To back up all directories and files whose names begin with staff, and which are immediately below the directory that is the base point of the backup target, specify as follows:

```
./staff*
```

Hidden directories and files are not backed up even if you use an expression like ./staffA/* to specify all directories and files below a given directory. To target all directories and files including hidden ones, specify the parent directory for FILES and specify y for RECURSIVE. To back up hidden directories and files individually, specify as follows:

Example 2:

The following example specifies (for the backup operation) all directories and files with names beginning with `.`, such as `./.staff`:
`./.[!.]*`

Example 3:

The following example specifies (for the backup operation) all directories and files with names beginning with `..`, such as `./..staff`:
`./..[!.]*`

Example 4:

To back up all directories and files with names beginning with at least three periods (`.`) such as `./...staff` and `./....staff`, specify as follows:
`./...*`

A.2 Specifying Multiple Paths in the FILES Environment Variable

When you specify multiple paths for the `FILES` environment variable to perform backup/restore, note the following points:

- If the backup area of the specified multiple paths includes hard links and these areas are duplicated, backup can be completed correctly but an error occurs during restoration.
- If an invalid path is included in the specified multiple paths, an error occurs during backup.

To specify more than one path, use a space to separate the backup target paths, and enclose the entire string in quotation marks (`"`).

`"`*`Backup-target-path Backup-target-path`*`"`

Appendix B Target Data for Backup and Restoration

This section describes the file system information (quota information) and directory file attributes for backup/restoration.

The file system information (quota information) and the directory file attributes that are backed up/restored will differ depending upon the revised version of NAS Backup Restore that is used.

The quota information and directory file attributes that are backed up to media are shown in Table B.1.

B.1 Data Backed Up to Media for Each Revised Version

Table B.1 Quota Information Backed Up to

Quota information backed up			NAS Backup Restore revised version	
			04-00 to 04-01	04-02
Quotas set for a file system	Default quota. User's quota. Group quota.	Soft limit for block use capacity Hard limit for block use capacity Soft limit for i-node use capacity Hard limit for i-node use capacity	Backed up	Backed up
	Grace period	Grace period for block use capacity Grace period for i-node use capacity	Backed up	Backed up
Quotas set for a directory (subtree quota)	Quota for the directory Default quota User's quota Group quota	Soft limit for block use capacity Hard limit for block use capacity Soft limit for i-node use capacity Hard limit for i-node use capacity	Not backed up	Backed up
	Grace period	Grace period for block use capacity Grace period for i-node use capacity	Not backed up	Backed up

The relationships between the backed up directory file attributes and NAS Backup Restore revised version are shown in the next table.

Table B.2 Quota Info Directory File Attributes and NAS Backup Restore Revised Version

Directory file attributes backed up		NAS Backup Restore Revised Version	
		04-00	04-01 and later
i-node	Path name of file	Backed up	Backed up
	File mode	Backed up	Backed up
	User ID of owner	Backed up	Backed up
	Group ID of owner	Backed up	Backed up

Directory file attributes backed up			NAS Backup Restore Revised Version	
			04-00	04-01 and later
	Last modified time (ctime)		Backed up	Backed up
	Last edited time (mtime)		Backed up	Backed up
	Last access time (atime)		Backed up	Backed up
	File creation time		Not Backed up	Backed up
	Data size		Backed up	Backed up
	File type		Backed up	Backed up
	Link path name		Backed up	Backed up
ACL information	Access ACL	Access permission	Backed up	Backed up
		Inherited attributes	Backed up	Backed up
	Default ACL	Access permission	Backed up	Backed up
		Inherited attributes	Backed up	Backed up
File attribute	Read attribute		Backed up	Backed up

B.2 Data Restored from Media for Each Revision

When backup data is restored from media, the data at the time of backup is restored to the file system. However, the directory file attributes that are set during restoration differ depending upon the revised version of NAS Backup Restore that is used. To return the data, which you restore, to the backed-up state, the data must be restored to the file system that has the same settings as the backed-up settings. For details, see section 3.12.

The restoration of backup data to previous versions and revised versions is not supported.

Acronyms and Abbreviations

ACL	Access Control List
AMS	Adaptable Modular Storage
ASCII	American Standard Code for Information Interchange
CCI	Command Control Interface
CCI/LIB	Command Control Interface/Library
CIFS	Common Internet File System
CLI	Command Line Interface
CPU	Central Processing Unit
DAR	Direct Access Recovery
FC	Fiber channel
FTP	File Transfer protocol
GPL	General Public License
GUI	Graphical User Interface
HTML	Hyper Text markup Language
I/O	Input / Output
IP	Internet Protocol
LAN	Local Area Network
LDEV	Logical Device
LU	Logical Unit
LUN	Logical Unit Number
LVI	Logical Volume Image
LVM	Logical Volume Manager
NAS	Network Attached Storage
NDMP	Network Data Management Protocol
NFS	Network File System
NIC	Network Interface Card
NIS	Network Information Service
NNC	NAS Node Controller
OS LU	Operating System Logical Unit
P-VOL	Primary Volume
PC	personal computer
RAID	Redundant Arrays of Inexpensive Disks
RAS	Reliability Availability Scalability
SAN	Storage Area Network
SATA	Serial Advanced Technology Attachment

SSH	Secure Shell
SVP	Service Processor
URL	Uniform Resource Locator
WMS	Workplace Modular Storage
WWW	World Wide Web

Glossary

account administrator	An account administrator is a user who oversees system administrators in a NAS modular system. An account administrator is permitted to register and delete system administrators.
ACL	Access Processing List data set for resources, such as access permissions for Windows users on the network, and accessible servers and files. This is used for managing usage permissions for devices and information on the network.
backup server	A backup server is one that controls backup and restore operations over a LAN.
CIFS	CIFS is a Common Internet File System protocol that provides file-sharing services to Windows users.
cluster	A redundant configuration that enables a service to continue when an error occurs or maintenance work is performed. In a NAS Modular system, each cluster consists of two NAS Units. When an error occurs in one NAS Unit, the other NAS Unit in the cluster inherits the services (failover functionality), and failover enables continuous operation of the NFS and CIFS file-sharing services provided by the NAS Modular system.
command device	A control device in the NAS Modular subsystem for accepting commands used to control the NAS Modular subsystem.
differential-data snapshot	A virtual volume that reproduces the conditions of past file systems in NAS Sync Image, using file system data and data saved in the differential-data snapshot storage device.
data LAN port	The ports (gbe1 to gbe4) on a NAS Unit used to connect to the data LAN.
device file	An area created by dividing a RAID group.
dump LU	A logical unit that contains information held in memory when a fatal error occurs in a NAS Modular system. One dump LU is assigned to each NAS Unit.
end user	A user who accesses file systems in the disk array, using the file-sharing services provided by the NAS Modular system. End users can use the NAS Manager GUI to view file share and quota information set for file systems.
error information LU	A logical unit that is used when the data in a dump LU is converted to a format that the user can view. This LU is shared by all the NAS Units in the NAS Modular subsystem.
failback	The migration of a failed-over resource group back to the original

	node in the cluster after error recovery or maintenance of a NAS Unit is completed.
failover	The relocation of a resource group to the other node in a cluster when an error occurs in a NAS Unit or when maintenance is required. Failover enables continuous operation of the NFS and CIFS file-sharing services provided by the NAS Modular system.
fixed IP address	An IP address set for a specific interface in a NAS Unit.
incremental backup	Incremental backup is a backup method that targets only data that is changed after the previous backup is performed. There are two types of incremental backup: differential backup, which backs up all data changed after the previous successful full backup, and incremental-data backup, which backs up data changed after the previous successful differential backup, incremental-data backup or full backup. Note that in NetBackup, differential backup is called Cumulative Incremental Backup and incremental-data backup is called Differential Incremental Backup.
link	A link denotes a connection between devices. Trunking (combining links) is a technology used to create a group of ports as a virtual network interface. The NAS Modular system allows you to configure a network by using a virtual network interface whose setup is based on trunking.
logical volume	An area created by dividing a volume group into one or more areas using a volume manager. On NAS Modular systems, this corresponds to file systems, differential-data storage devices, and differential-data snapshots created using the volume manager. In a NAS Modular system, 4,096 logical volumes can be created for one node.
LUN Expansion	Functionality for expanding the capacity of a LU by integrating multiple LUs into one.
LVM	A type of volume manager. See volume manager for more information.
maintenance personnel	Hitachi engineers who maintain NAS Modular systems.
mng1	The port (mng1) is a management LAN port on a NAS Unit used to connect to the management LUN.
media	Recording media, such as magnetic tape, for storing backed up data. Backup media is connected externally to the disk array.
media server	A media server is a server used for controlling a tape device installed outside the disk array.
NAS Backup Restore	A program used for backing up data shared by users in a NAS

	Modular system. NAS Backup Restore is an optional program of NAS Manager.
NAS Cluster Management LU	A logical unit (LU) that stores settings information for NAS Modular system, such as cluster configuration information and file system information.
NAS Data Control Modular	One of the programs incorporated in the NAS OS. NAS Data Control is a required program of a NAS Modular system.
NAS File Sharing Modular	One of the programs incorporated in the NAS OS. NAS File Sharing is a required program of a NAS Modular system.
NAS Manager	A program that enables efficient setup, operation, and management of a NAS Modular system. NAS Manager is a required program of a NAS Modular system.
NAS Modular subsystem	A subsystem in which a NAS Unit is connected to a disk array of the TagmaStore AMS/WMS series for use as a NAS server.
NAS Modular system	A NAS system that uses a NAS Modular subsystem to provide file-sharing services.
NAS OS	The operating system that provides Network Attached Storage (NAS) functionality in a NAS Modular system. The NAS OS consists of NAS Data Control Modular and NAS File Sharing Modular.
NAS OS LU	A logical unit that contains the NAS OS and the programs that run on the NAS OS.
NAS Sync Image	A program used to create differential-data snapshot of shared user data in a NAS Modular system. NAS Sync Image is an optional program of NAS Manager.
NAS system LU	A logical unit that contains configuration and management information about a NAS Modular system, such as NAS OS LUs and a NAS Cluster Management LU.
NAS Unit	A device connected to a disk array of the TagmaStore AMS/WMS series to create a NAS Modular subsystem that is used as a NAS server. A Gigabit Ethernet adapter and a CPU are mounted on a NAS Unit.
NetBackup	Backup control software from VERITAS. Links with NAS Backup Restore; used to backup file system data to media, and restore to a file system data backed-up to media.
NNC	NAS Node Controller
NFS	NFS refers to a Network File System protocol that provides file-sharing services to UNIX users.
node	A cluster component. In a NAS Modular system, each cluster

	consists of two NAS Units. One NAS Unit corresponds to one component of a cluster.
option	An option (option button), also called a radial button, is a round checkbox which provides an opportunity to make a particular selection on a graphical user interface (GUI).
quota	The maximum block space and maximum number of i-nodes available to a user. In the NAS Modular system, the limits can be applied for each file system, or each directory immediately below the mount point.
RAID 5	RAID 5 protects against a single hard disk failure.
RAID 6	RAID 6 dual parity scheme provides protection against a dual drive failure within a RAID group.
resource	The smallest unit of information available in a resource group, including NFS share settings, CIFS share settings, file system information, and service IP address information.
resource group	A management unit that manages, as a group, multiple resources such as NFS share settings, CIFS share settings, file system information, and service IP address information. A service can be started and stopped for each resource group. If an error occurs, failover occurs for each resource group.
service IP address	An IP address used by a user when connecting to a service running in a resource group. Using a service IP address, the user can continue to use the service if an error occurs on a node and the resource group has fails over to the other normally running node.
ShadowImage	ShadowImage is a program for replicating user data within the TagmaStore AMS/WMS series disk array, bypassing the host system.
subtree quota	The quota set for a directory residing immediately under the mount point directory. Subtree quotas are used to control the amount of block usage and i-node usage for each directory. Subtree quotas can also be set for users and groups.
system administrator	A user who manages a NAS Modular system by using NAS Manager. The system administrator sets up a NAS Modular system and monitors the system operation and error information.
tape device	Device for storing multiple units of media.
user LU	A logical unit that contains user data of file systems.
volume group	An area that is made up of one or more device files by a volume manager. In a NAS Modular system, 128 volume groups can be created for one node. In NAS Manager, a volume group is made up

	of a file system. In NAS Sync Image a volume group is made up of a file system, differential-data snapshot storage device, and differential-data snapshot.
volume manager	Functionality for volume management. In the NAS Modular system, LVM is used as the volume manager. This functionality enables you to create volume groups combining device files and to create logical volumes out of volume groups.

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