



Data General Corporation, Westboro, Massachusetts 01580

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Customer Documentation

# **Legato NetWorker User's Guide**

069-100496-01

**A V I I O N<sup>®</sup>**  
P R O D U C T L I N E



# Legato NetWorker

## User's Guide

069-100496-01

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# Preface

The *Legato NetWorker User's Guide* explains how to use NetWorker's backup and recover software from a client workstation. The *User's Guide* shows client users how to back up files and directories to the NetWorker server on an as-needed basis using the Backup window, and how to browse the on-line index to recover files using the Recover window. For information on server configuration and administration, refer to the *Legato NetWorker Administrator's Guide*.

## Audience

Those who will benefit most from this manual are end-users and system administrators who use NetWorker to back up and recover data from a client workstation.

## Conventions

This manual uses conventions to make information easy to access and understand. The following list describes the conventions:

- ❑ Command names are displayed in a bold typeface. For example:

To start NetWorker, use the **networker** command.

- ❑ Examples of what *you* type are displayed as a bold fixed-width typeface. For example:

```
mars% networker &
```

- ❑ Names of panels and buttons are displayed as a Helvetica typeface. For example:

Press the Dismiss button to close the Help window.

- ❑ Important pieces of information and cautionary notes that prevent you from making a mistake are marked with the tag "Important." For example:

**Important** ⇨

Remember that if you select a server other than the default one for backing up files, you must recover your files from that server.

- ❑ Tips or suggestions that you do not have to follow but are hints for using NetWorker are marked with the tag "Tip." For example:

**Tip** 🗨

Keep the Main window open during every backup or recovery to monitor the progress of the session.

- ❑ Directory *pathnames*, machine names, and new terms are displayed as an italic typeface. For example:

The NetWorker programs are located in */usr/opt/networker/bin*.

The *media pool* is the collection of backup media recognized and managed by NetWorker.

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End of Preface



<b>Preface</b> .....	v
Audience .....	v
Conventions .....	v
Contacting Data General .....	vi
Manuals .....	vii
Telephone Assistance .....	vii
Joining Our Users Group .....	vii
<b>Chapter 1 – Introduction</b> .....	13
Overview .....	13
<b>Chapter 2 – Getting Started</b> .....	15
Starting NetWorker .....	15
Using Help .....	19
Using NetWorker Windows .....	21
Menu Bar .....	23
On-line Help .....	24
Selection Panel .....	24
Directory and File Display Areas .....	24
Icons .....	25
Window Controls .....	26
Quick Tour .....	27
Backing up Your Directory .....	28
Open the Backup Window .....	28
Expanding the Current Directory .....	30
Marking a Directory .....	31
Unmarking a File .....	32

---

Starting the Backup.....	33
Checking for Media Requests in the Main Window.....	35
Recovering a File .....	37
Opening the Recover Window.....	37
Browsing the Index .....	39
Starting the Recovery .....	40
Quick Tour Review .....	43
<b>Chapter 3 – Browsing Filesystems .....</b>	<b>45</b>
Viewing Your Directories.....	45
Expanding to One Level .....	46
Expanding a Branch .....	47
Collapsing a Branch .....	48
Marking and Unmarking Files.....	49
Viewing File Details.....	50
Searching for Files.....	52
Changing a Selection.....	53
Exiting from a Window .....	53
<b>Chapter 4 – Backing up and Recovering Files .....</b>	<b>55</b>
Monitoring Your Backup and Recovery .....	55
Backing up Files .....	57
Changing the NetWorker Server.....	57
Starting a Backup .....	59
Choosing the Backup Options .....	60
Excluding Patterns .....	61
Monitoring the Backup Status .....	63

Using the Volume Management Window .....	64
Recovering Files .....	65
Choosing the Recover Server .....	65
Choosing the Recover Client.....	66
Selecting File Versions .....	67
Changing the Browse Time .....	70
Showing Marked Files.....	73
Relocating Files .....	74
Starting a Recovery.....	76
Renaming or Overwriting Recovered Files.....	77
Monitoring the Recover Status .....	79
<b>Appendix A – Error Messages</b> .....	<b>83</b>
Error Messages for Backup.....	83
Error Messages for Recover .....	84
Error Messages for both Backup and Recover.....	86
<b>Appendix B – Commands for Backup and Recovery</b> .....	<b>89</b>
Table of Backup and Recover Commands.....	89
<b>Appendix C – Requirements for NetWorker Clients</b> .....	<b>91</b>
<b>Glossary</b> .....	<b>93</b>
<b>Index</b> .....	<b>95</b>



# Chapter 1

## Introduction

Legato NetWorker is an easy-to-use network backup and recover product. Every user knows about accidental file loss and hard disk crashes. With NetWorker, you can easily protect your valuable files from loss by performing backups on an as-needed basis in addition to the automatic backups scheduled by your system administrator. And NetWorker's straightforward recovery lets you find and retrieve lost files easily and quickly.

NetWorker's fast file recovery means you do not have to waste time re-creating lost files. Just scroll through the window of previously backed-up files to find the files that were lost. NetWorker even shows you multiple versions of a file that were backed up over time and lets you select the ones you want to recover. NetWorker provides access to these powerful features through an intuitive graphical user interface.

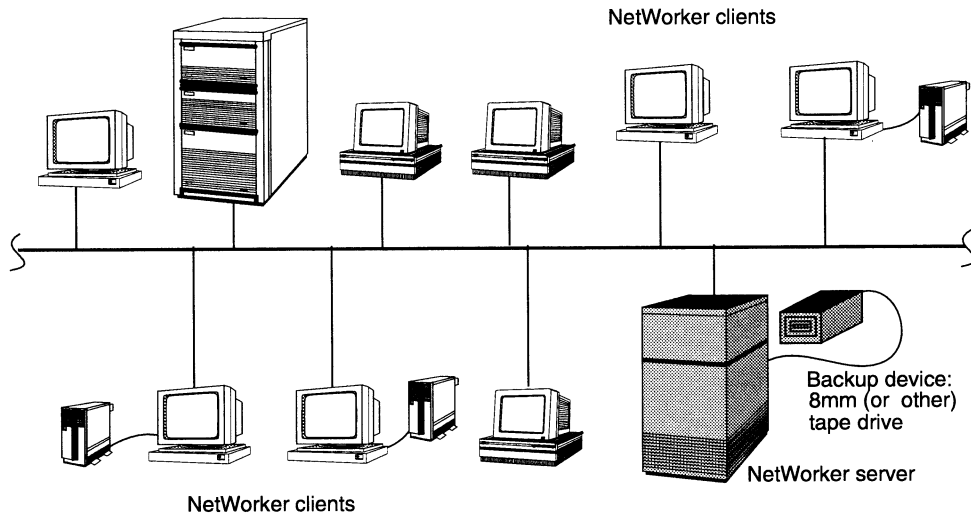
### Overview

The NetWorker *server* is a machine with a *backup device* that automatically backs up all the systems on a network. Once your system administrator installs NetWorker and configures the NetWorker server to recognize your system as a *client*, your files will automatically be backed up to the NetWorker server. However, you can request NetWorker to back up important files at any time on an as-needed basis.

When you use NetWorker to back up your files, you are saving them to *backup volumes* on the NetWorker server. The NetWorker server keeps an on-line *index* of the backed-up files for you to

1

browse when you want to recover a single file or a complete directory.



After the NetWorker client software is installed on your system, the system administrator will configure the NetWorker server so that you can use the backup and recover services.



# Chapter 2

## Getting Started

In this section you will back up and recover files from a client system using Legato NetWorker. Your system must be configured as a NetWorker client for you to use NetWorker. The requirements for NetWorker clients are listed in Appendix C of this manual.

If NetWorker is currently running on your system, you will see the NetWorker icon or Main window on your screen. Skip to the section entitled “Quick Tour” to back up and recover a file.

If you do not see either the icon or the Main window, you have to



start NetWorker on your system.

### Starting NetWorker

To invoke NetWorker, first change to your home directory or a local filesystem:

```
% cd your_home_directory
```

Then enter the **networker** command, followed by an ampersand (&) to run NetWorker in the background, at the system prompt:

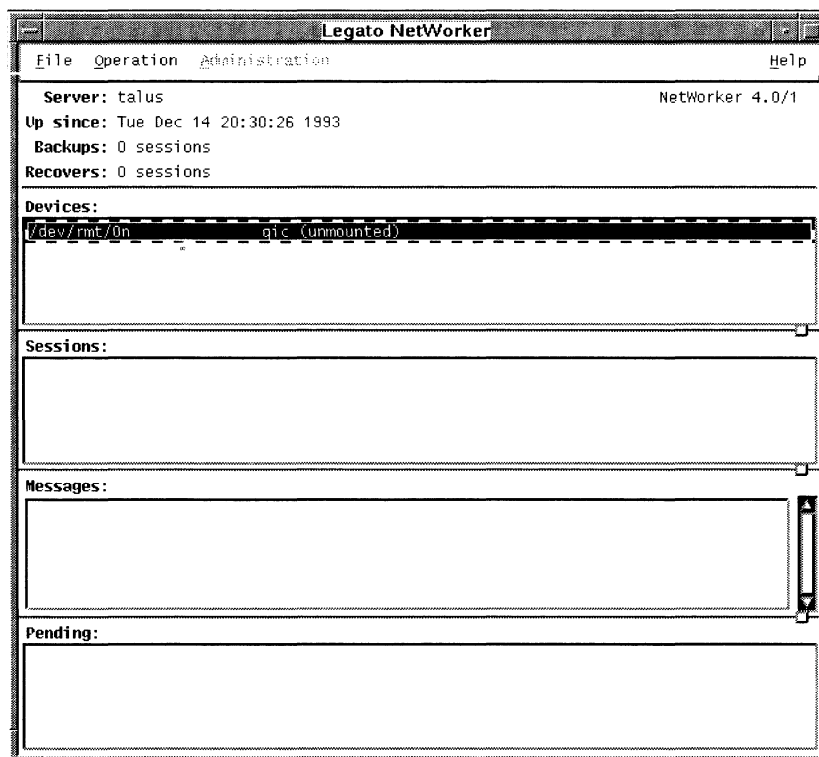
```
% networker &
```

**Tip** 

You can invoke NetWorker from any directory. The files in the directory you invoke NetWorker from are immediately available for backup.

If you receive an error message while invoking NetWorker, there may be problems with your network configuration. Refer to Appendix C, "Requirements for NetWorker Clients" to confirm that your system is configured correctly as a NetWorker client. If you need further help, contact your system administrator.

The NetWorker Main window is shown below:

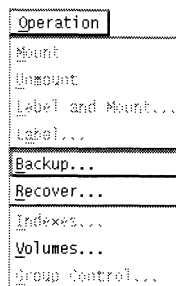


NetWorker uses windows, pull-down menus and dialog boxes to guide you in backing up and recovering files.

**NOTE:** The Administration pull-down menu is active only for authorized NetWorker administrators. For information on NetWorker system administration, see the *Legato NetWorker Administrator's Guide* or contact your system administrator.

The Operation pull-down menu contains the Backup, Recover, and Volumes commands. Use this menu to back up and recover your files. Use the Volumes command to display all the backup tapes tracked by NetWorker. The Volumes command is explained in more detail in Chapter 4, "Backing up and Recovering Files."

The Operation pull-down menu is shown below:

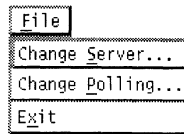


**Tip** 

The greyed-out commands in the Operation pull-down menu are available only to the system administrator.

The File pull-down menu contains the Change Server, Change Polling, and Exit commands. The Change Server command allows you to change your NetWorker backup server. Chapter 4 describes in detail how to change your backup server in the section "Changing the NetWorker Server." Use the Exit command to close out of the NetWorker program.

The File pull-down menu is shown below:



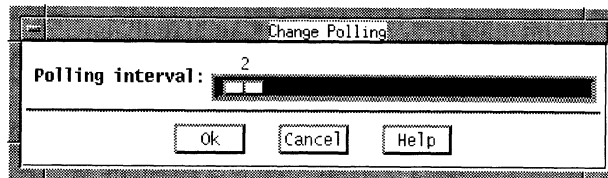
2

The Change Polling command allows you to change the polling interval. Polling controls how often, in seconds, the data in the Main window is updated.

To change the polling interval:

1. Select Change Polling from the File pull-down menu in the Main window.

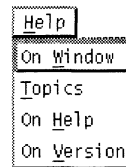
The Change Polling dialog box appears, as shown below.



2. Use the mouse to slide the Polling interval bar to the right or left to select the desired polling interval. Notice the number of interval seconds is displayed as you slide the bar.
3. Press Ok to apply the change.

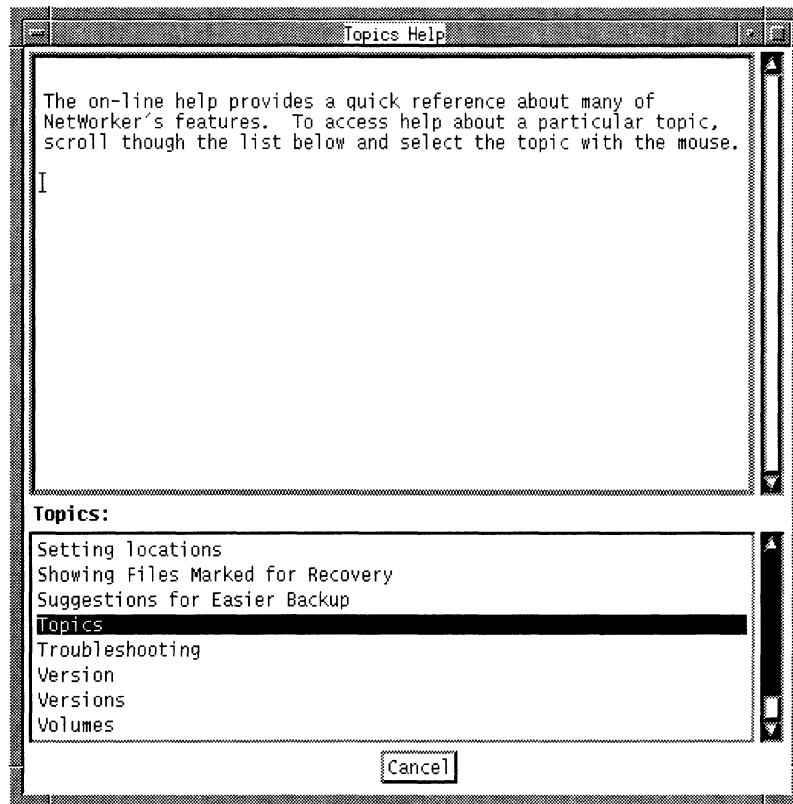
## Using Help

You can learn about NetWorker by using the Help windows. You can obtain on-line help on any menu item or window component. The Help pull-down menu provides you with help on the Main window, a list of help topics to browse, directions on using help, and information on the version of NetWorker you are using.



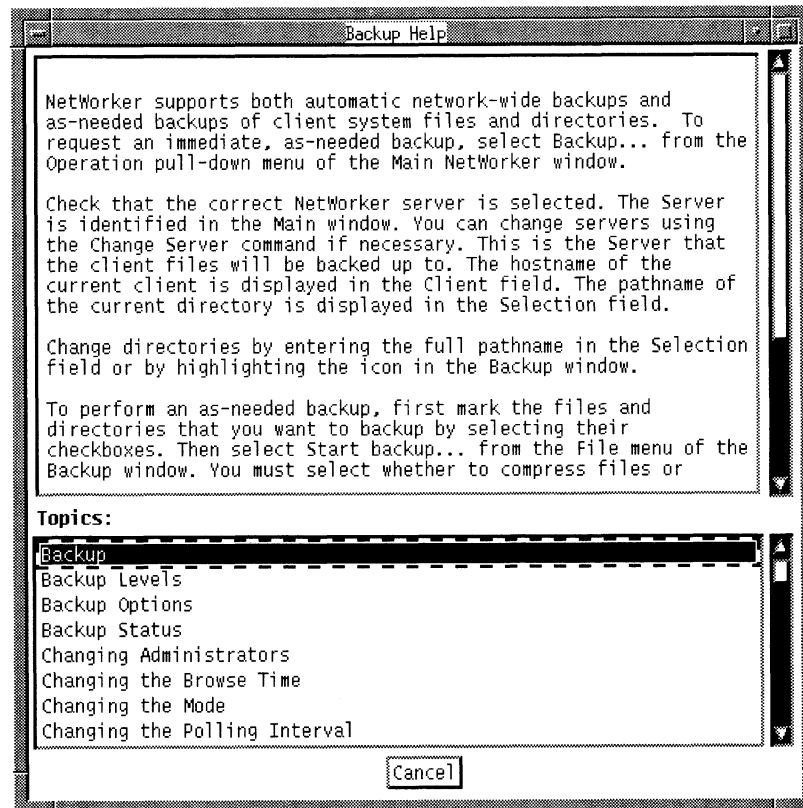
Select the Topic command the Help pull-down menu to open the Topics Help window, as shown below.

2



To see more information about a topic, select the title from the Topics scrolling list. The help text for the selected topic appears in the top window. The Topics scrolling list remains available in the bottom window for selecting other topics.

For example, selecting the topic Backup produces the following window:



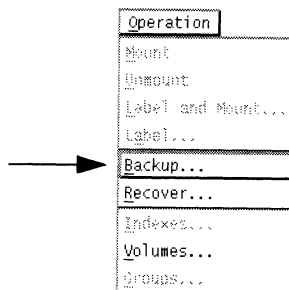
2

To return to the Main window, press the Cancel button.

## Using NetWorker Windows

NetWorker displays your files and directories using icons and windows. NetWorker windows provide an easy-to-use X Window System graphical user interface. This section shows you how to use NetWorker windows.

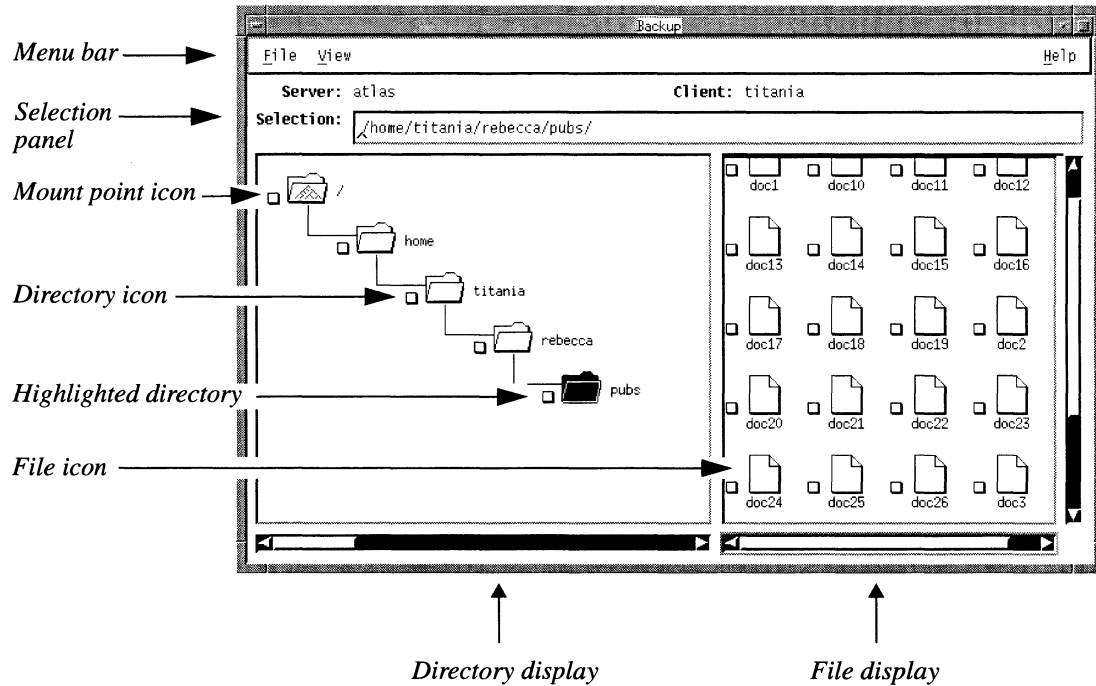
Open the Backup window by selecting the Backup from the Operation pull-down menu.

2

Position the cursor on the Operation pull-down menu and press either the left or right mouse button, (depending upon how your system is configured). When the pull-down menu appears, highlight Backup to open the Backup window.



The Backup window appears, as shown below.



**NOTE:** The following sections describe the components of the Backup window.

### Menu Bar

The menu bar contains the File, View, and the Help pull-down menus.

To use the File, View or Help pull-down menus, position the cursor over the desired menu and hold down the right (or left) mouse button to display the pull-down menus. By X Window System convention, the first command in the menu will always be chosen by default.

**Tip** 

The left and right mouse button actions used in this manual are the X Window System defaults. If you have problems using the mouse, your mouse buttons may have been re-programmed. See your system administrator for help.

2**On-line Help**

To use on-line help, select the Help pull-down menu of the window in question to read the on-line help message. You can obtain help on the current window, menu item, or dialog box.

**Selection Panel**

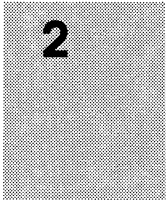
The selection panel in the Backup window indicates the current server and client. The Selection field indicates the full *pathname* of the current file or directory and allows you to enter text to select any *pathname* you choose.

**Directory and File Display Areas**

The window is divided into two display areas: a directory display on the left-hand side and a file display on the right-hand side. The size of the file display can be adjusted horizontally to make it easier to see your files. The entire window can be adjusted vertically. The display areas contain icons that represent the files and directories in your filesystem.

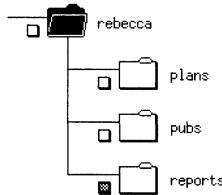
## Icons

The icons you see in the window are described below. Use the checkbox next to each icon to mark and unmark files and directories for backup or recovery. (Some of the icons represent UNIX terminology.)



rebecca

Folder icons represent directories.



rebecca

plans

pubs

reports

An open folder indicates that the tree structure of the directory, if any exists, appears in the directory display.

A grey checkbox for a directory indicates that a subdirectory has been marked for backup or recovery.



pubs

A highlighted folder indicates the current selection. The folder contents appear in the file display. A highlighted folder is selected for menu actions.



This icon represents mount points.



1 usr.doc

Sheet icons represent files.



1 usr.doc

A highlighted file is selected for menu actions.



lib

This icon represents symbolic links.



This icon represents block devices.

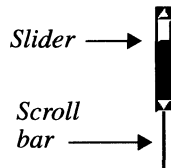


This icon represents character devices.



The cursor changes to a clock when NetWorker is performing a task.

## Window Controls

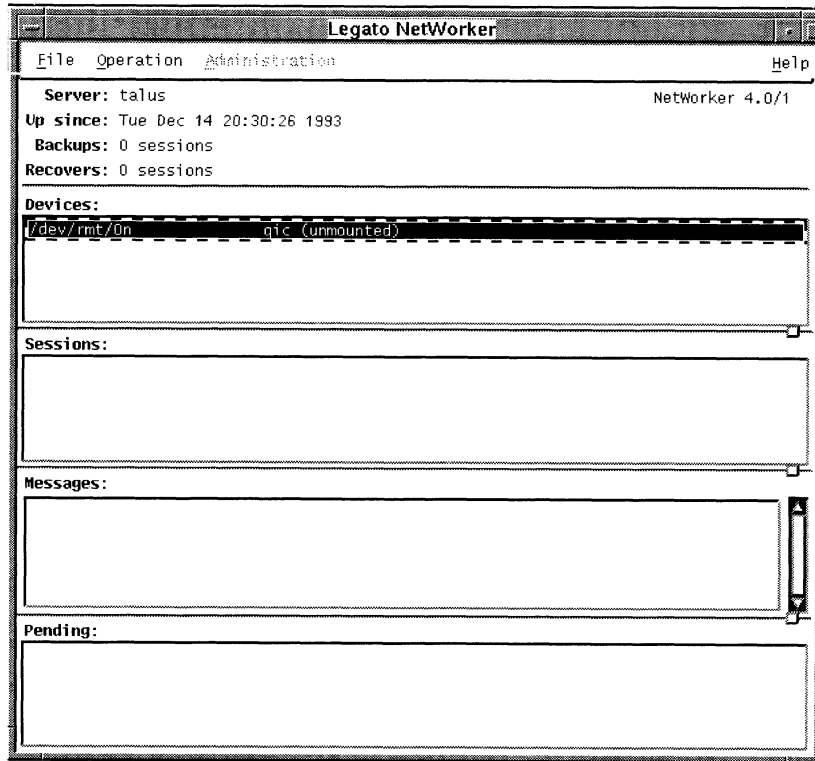
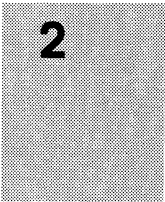


By selecting the scrollbar or the triangular endpoints, or by dragging the slider, you can navigate vertically or horizontally in the directory and file displays.

## Quick Tour

The "Quick Tour" shows you how to back up your current directory and how to recover a file using NetWorker. Follow the instructions in this section to become familiar with NetWorker. Chapters 3 and 4 have more detailed information on how to use NetWorker.

If the NetWorker icon is displayed on your screen, select it to display the NetWorker Main window, as shown below.



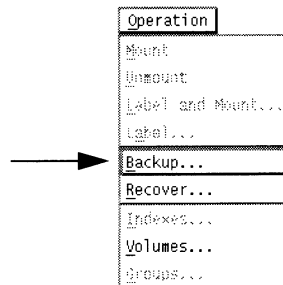
## Backing up Your Directory

To demonstrate NetWorker's functionality, you will first back up a directory to the NetWorker server. The Backup window lets you browse the filesystem to examine your directories. Then you can mark files for backup.

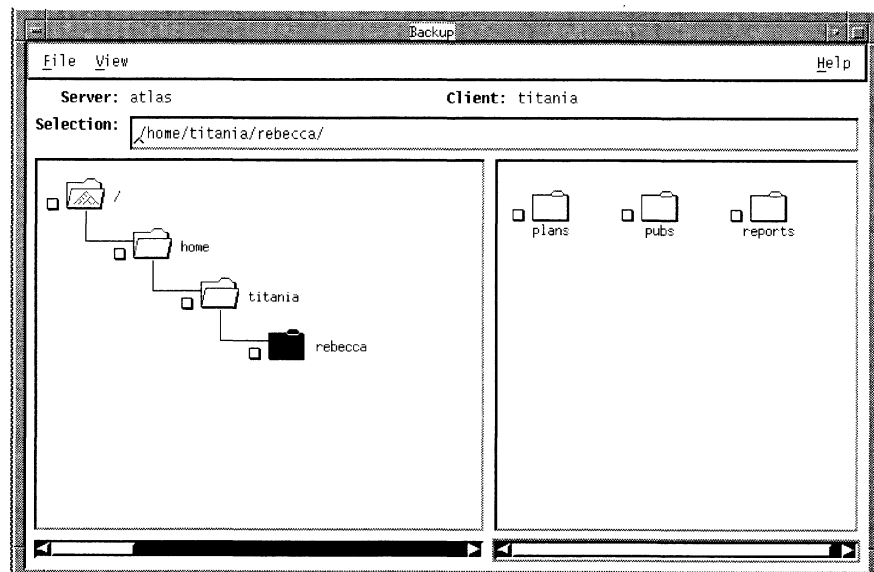
To learn about NetWorker, you will mark an entire directory for backup. Then you will unmark a file within that directory. Finally, you will start the backup.

### Open the Backup Window

Open the Backup window by selecting the Backup command from the Operation pull-down menu.



The Backup window appears, as shown below.



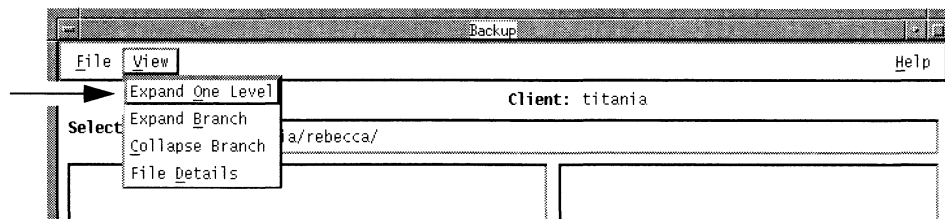
2

The *pathname* of the directory from which you invoked NetWorker is displayed in the Selection field. The directory display shows you a graphical representation of the path with the current directory highlighted. The file display shows you the contents of the current directory.

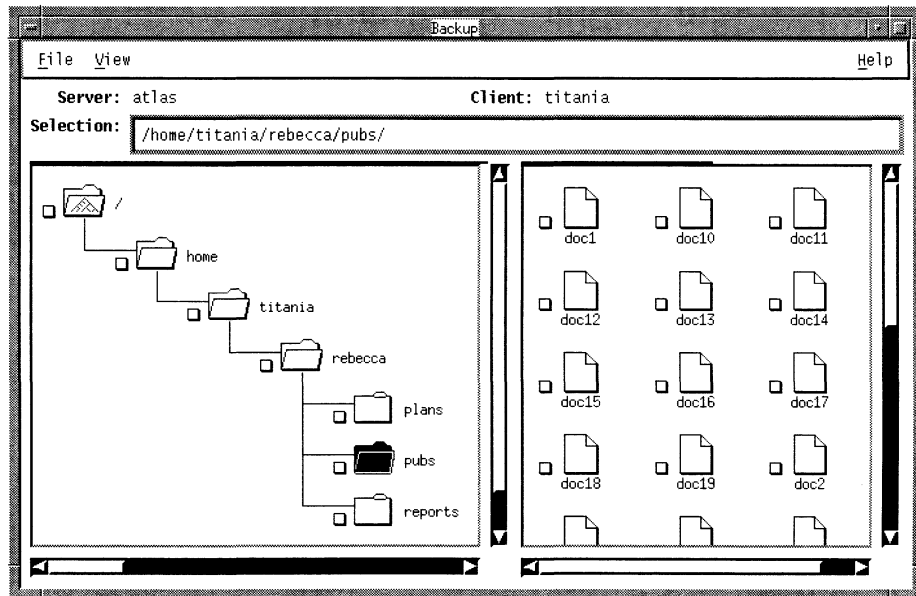
### Expanding the Current Directory

First, expand the current directory one level to find a lower-level directory to mark for backup. Select **Expand One Level** from the **View** pull-down menu.

2



The directory display shows the expanded directory.



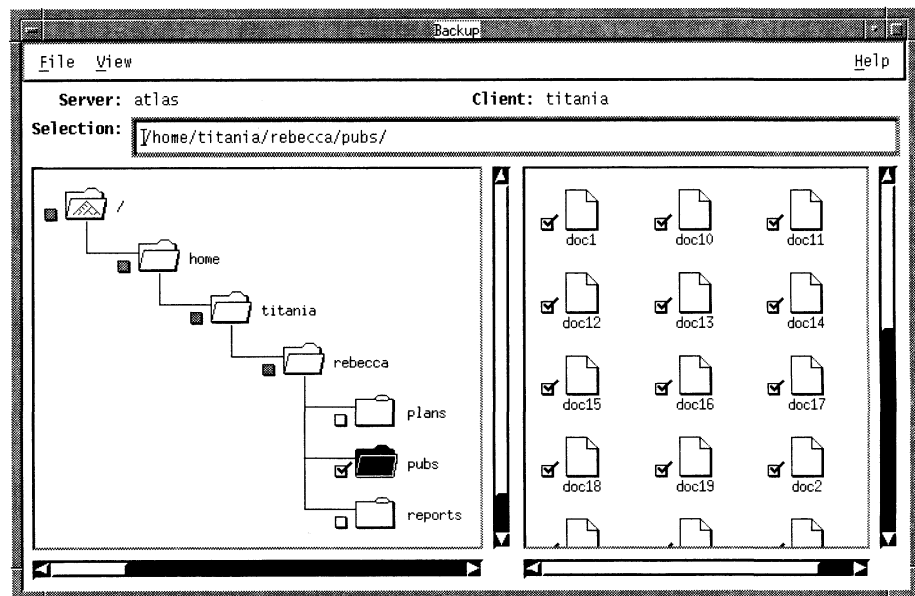


## Marking a Directory

To mark a directory for backup, use the mouse to select the checkbox next to the folder that represents the directory that you want to back up.



Notice that a checkmark (✓) appears in the checkbox. Highlight the folder to display its files. In the file display, notice that the files contained in the marked directory are also marked.



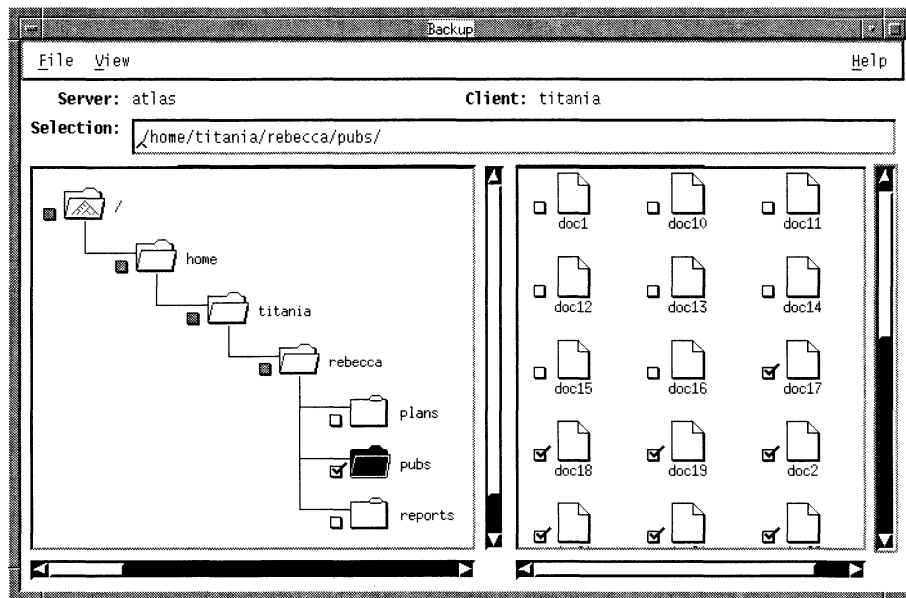
When you mark a directory, its nested files and subdirectories are marked as well. The checkboxes of the parent directories turn grey to indicate that a subdirectory has been marked. Mount points within a marked directory are not marked, since you can only mark files within one filesystem at a time.

**2****Tip**

You can also mark a directory by highlighting it and selecting Mark from the File pull-down menu. The effect is the same as selecting the checkbox.

### Unmarking a File

You can exclude a file from the backup by unmarking it. In the file display, select the checkmark next to a file to unmark it. The checkmark disappears and the file is excluded from the backup.

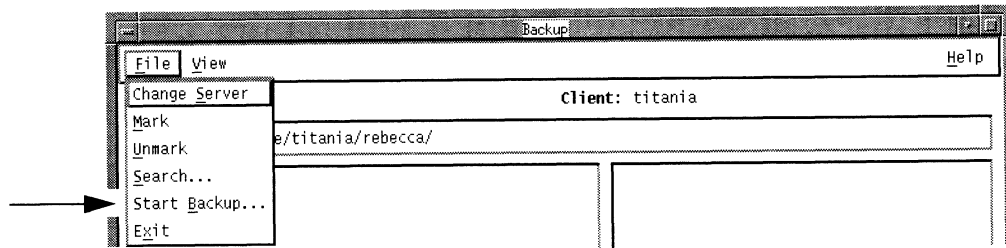
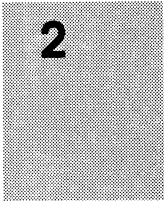


**Tip** 

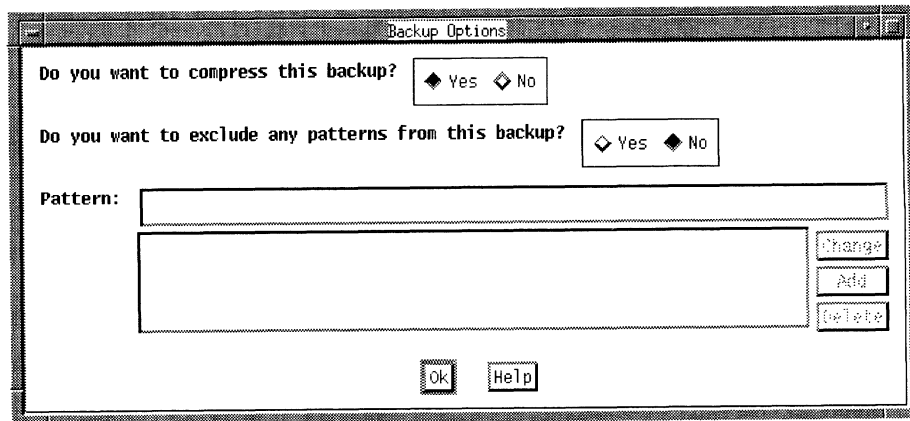
You can also unmark a file by highlighting it and selecting Unmark from the File menu. The effect is the same as selecting the checkmark.

**Starting the Backup**

After you have finished marking files, you are ready to start the backup. Select Start Backup from the File menu to start the backup.



Before the backup starts, the Backup Options dialog box appears.

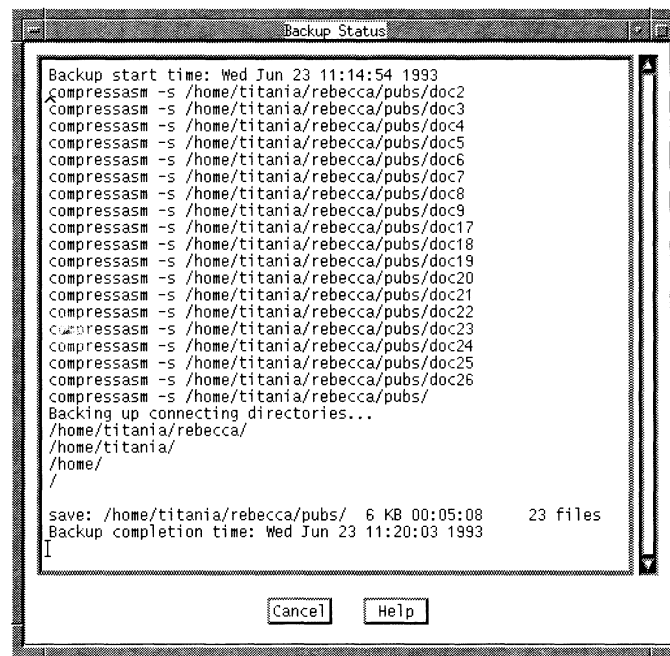


In the Backup Options dialog box, you tell NetWorker whether you want to compress your files during the backup. Compress the files for this backup.

Notice that Yes is highlighted after the question "Do you want to compress this backup?." This means it is the default choice, so press the Ok button to continue the backup with file compression.

**NOTE:** You can also exclude patterns in the Backup Options dialog box. For information on excluding patterns, see Chapter 4, "Backing up and Recovering Files."

The Backup Status window appears, where you can monitor the progress of your backup.



```

Backup Status
Backup start time: Wed Jun 23 11:14:54 1993
compressasm -s /home/titania/rebecca/pubs/doc2
compressasm -s /home/titania/rebecca/pubs/doc3
compressasm -s /home/titania/rebecca/pubs/doc4
compressasm -s /home/titania/rebecca/pubs/doc5
compressasm -s /home/titania/rebecca/pubs/doc6
compressasm -s /home/titania/rebecca/pubs/doc7
compressasm -s /home/titania/rebecca/pubs/doc8
compressasm -s /home/titania/rebecca/pubs/doc9
compressasm -s /home/titania/rebecca/pubs/doc17
compressasm -s /home/titania/rebecca/pubs/doc18
compressasm -s /home/titania/rebecca/pubs/doc19
compressasm -s /home/titania/rebecca/pubs/doc20
compressasm -s /home/titania/rebecca/pubs/doc21
compressasm -s /home/titania/rebecca/pubs/doc22
compressasm -s /home/titania/rebecca/pubs/doc23
compressasm -s /home/titania/rebecca/pubs/doc24
compressasm -s /home/titania/rebecca/pubs/doc25
compressasm -s /home/titania/rebecca/pubs/doc26
compressasm -s /home/titania/rebecca/pubs/
Backing up connecting directories...
/home/titania/rebecca/
/home/titania/
/home/
/

save: /home/titania/rebecca/pubs/ 6 KB 00:05:08 23 files
Backup completion time: Wed Jun 23 11:20:03 1993
|
Cancel Help
  
```

**Tip** 

If you do not see any files scrolling in the display, or if you see an error message, contact your system administrator. The server may be busy recovering, or it may have a configuration problem. Or, the backup volume may not be mounted in the device. You can check the Main window as described in the next section to see if the backup volume is mounted.

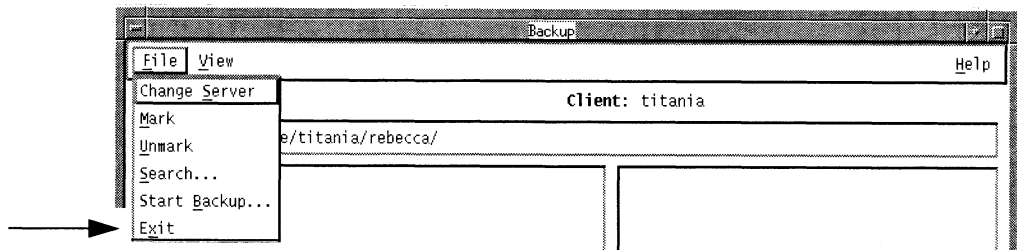
When your backup is complete, you will see a message similar to this in the Backup Status window:

```
Backup Completion Time: Wed Jun 23 11:20:03 1993
```

NetWorker backed up the files you marked to the volume mounted in the server device. It also created an index on the NetWorker server for your client machine. Any files that you back up in the future will have an entry in this index, so that you can find them for quick recovery.

Select the Cancel button to close the Backup Status window.

Close the Backup window by selecting Exit from the File menu.

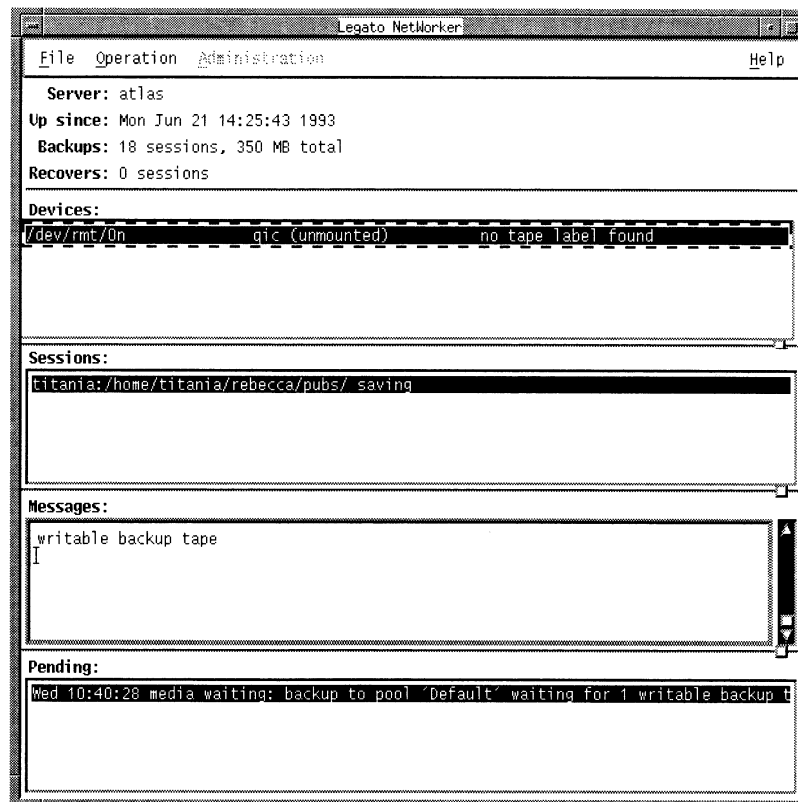


## Checking for Media Requests in the Main Window

If the scrolling list of your files does not appear in the Backup Status window, or if you see an error message during the backup, you can use the Main window to confirm that the backup volume is mounted by checking the Pending display.

The Pending display of the Main window shows media requests for backup volumes which are required for a backup or recover to proceed.

The Main window is shown below:



Notice the following message in the Pending display:

```
media waiting: backup to pool `Default` waiting for 1
writable backup tape
```

This message indicates that the backup volume is unmounted. If there is no message in the Pending display, then the backup volume is mounted and you can proceed with the backup.

To avoid this media alert, it is recommended that you contact your system administrator to mount a backup volume before starting a backup.

**Important** ⇔ The backup volume must be mounted before a backup will complete. For information on mounting backup volumes, refer to the *Legato NetWorker Administrator's Guide*.

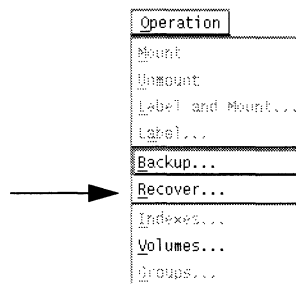
## Recovering a File

The index that is created on the NetWorker server when you back up files is displayed in the Recover window. The index looks similar to the filesystem that is pictured in the Backup window.

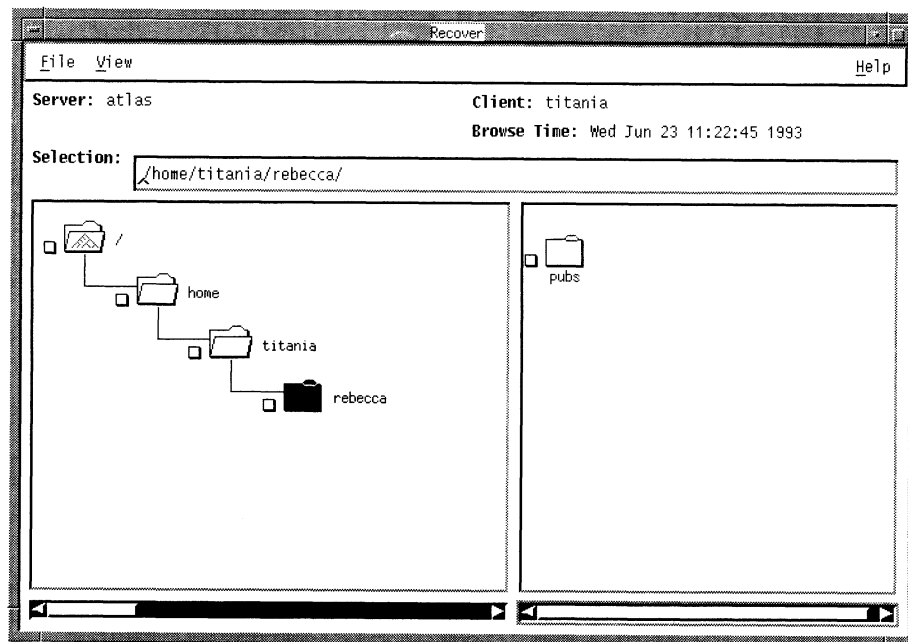
To recover a file, you browse the index for a directory and mark a file within that directory. Then you start the recovery.

### Opening the Recover Window

Open the Recover window by selecting Recover from the Operation pull-down menu.



The Recover window appears, as shown below.



**Tip** 

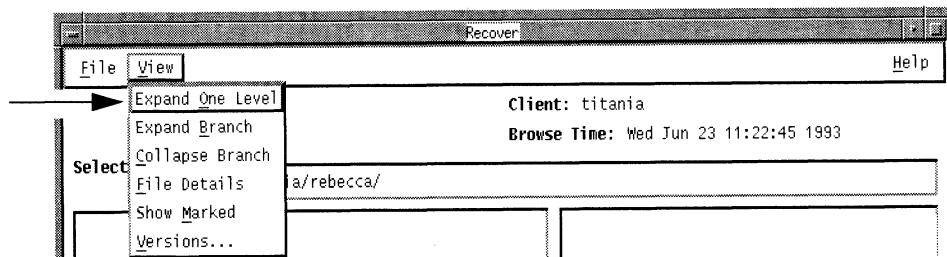
Remember that in the Recover window you are looking at the *index* for your files on the NetWorker server, not the filesystem on your system that is in the Backup window. The Recover window shows the entries for those files that have been backed up and are available for recovery. The entries are organized exactly like the actual filesystem, so it is easy for you to navigate around the directories.



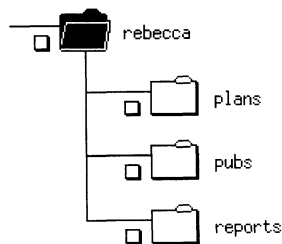
## Browsing the Index

You can browse the index to locate a file that you want to recover.

1. Notice that the current directory is highlighted.
2. Select **Expand One Level** from the **View** pull-down menu. The subdirectories are displayed in a tree structure in the directory display.

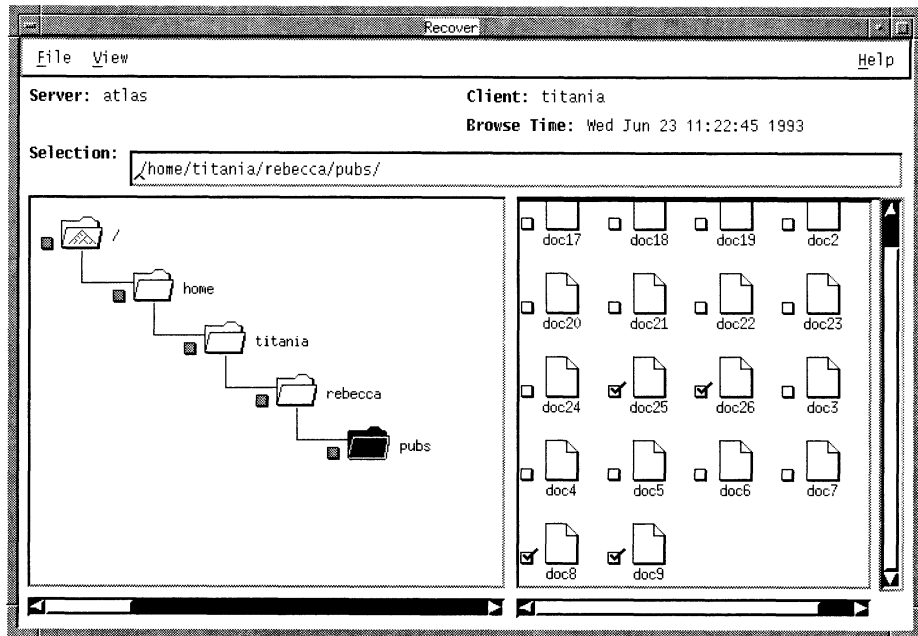
**2****Tip**

Selecting a closed directory folder twice will also expand it one level.



3. Highlight the directory folder that contains the desired file by selecting it. The file display shows the most recently backed-up version of the files contained in the directory.

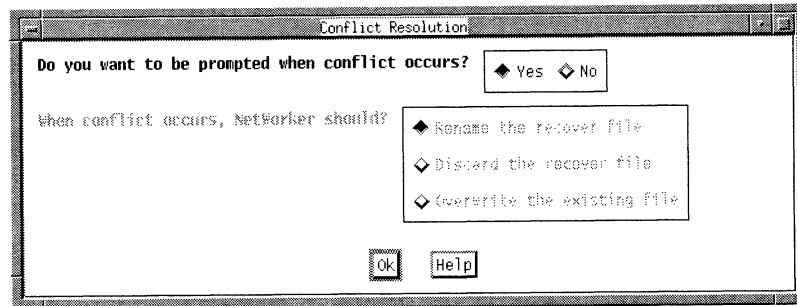
Mark the files you wish to recover by selecting their checkboxes in the file display.

**2**

### Starting the Recovery

So far you have browsed the index and marked files for recovery. You are now ready to start the recovery.

1. Select Start Recover from the File menu. The Conflict Resolution dialog box appears before the recovery starts.



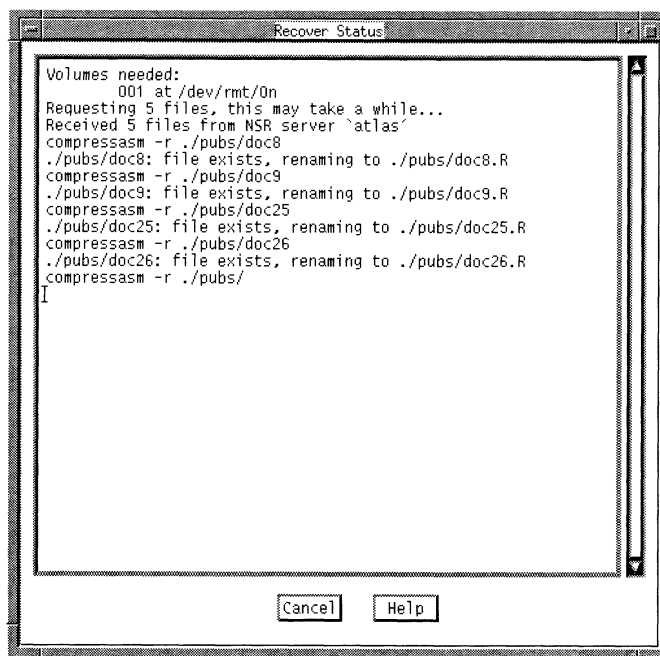
2

With the Conflict Resolution dialog box, you tell NetWorker what to do if a naming conflict is encountered during recovery. A naming conflict occurs when the file you are recovering has the same name as a file in the current directory.

2. Select No so that NetWorker does not prompt you for each naming conflict.
3. Rename the recover file is now highlighted as the default selection. Rename the recover file places a .R extension after the name of the recovered file when a naming conflict occurs with an existing file.
4. Select Ok to close the Conflict Resolution dialog box and continue the recovery.

The Recover Status window appears, as shown below. You can monitor the progress of the recovery in the Recover Status window.

2



The Recover Status window provides information about your recovery, including the name(s) of the backup volumes (volumes needed:) that are needed and their location, the directory that the files are being recovered into, and the number of files being recovered.

You may cancel the recovery by selecting the Cancel button in the Recover Status window.

The following message appears when the recovery is complete:

```
Received 5 files from NSR server `atlas`
```

To confirm its recovery, you can look for your file in the filesystem by listing the contents of the directory in a UNIX terminal window. The recovered file has a `.R` file extension because you told NetWorker to rename the file in the Conflict Resolution dialog box.

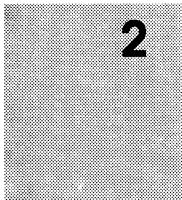
## Quick Tour Review

2

During the quick tour of NetWorker, you learned how to:

- Use NetWorker's graphical user interface.
- Use the Backup window to back up your directory to the NetWorker server.
- Monitor the status of your backup
- Use the Recover window to browse the index for your backed-up files.
- Mark a file for a recovery in the Recover window.
- Recover a file.
- Resolve a naming conflict during recovery.
- Monitor the status of the recovery.

The quick tour is meant to familiarize you with NetWorker's Backup and Recover windows. Chapters 3 and 4 provide detailed information on performing backups and recovers.



# Chapter 3

## Browsing Filesystems

NetWorker's graphical user interface allows you to browse your filesystems, including directories, subdirectories, and nested files. Since the filesystem appears iconically on the screen, it is easy to select files and directories for backup. When recovering files, the index of saved files is displayed graphically like the filesystem, making it convenient to select files for recovery.

NetWorker's browsing features allow you to view directories, mark and unmark files, search for files, view file details, and change the current directory. The following instructions for browsing filesystems apply to both the Backup and Recover windows.

### Viewing Your Directories

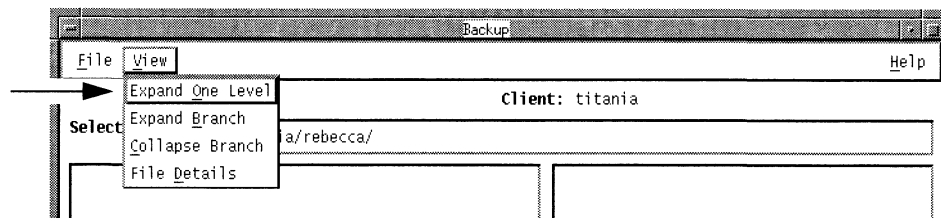
Use the View menu to select the level at which you wish to browse the directories in the filesystem in the Backup window or browse the index of directories in the Recover window.

**NOTE:** This section describes the features common to both windows that are used for viewing directories. The features specific to a window are described in Chapter 4, "Backing up and Recovering Files."

You can expand a directory to one level to view its subdirectories or you can view all levels of a directory by expanding a branch. This makes it easy to find files that are deeply embedded in your filesystem.

## Expanding to One Level

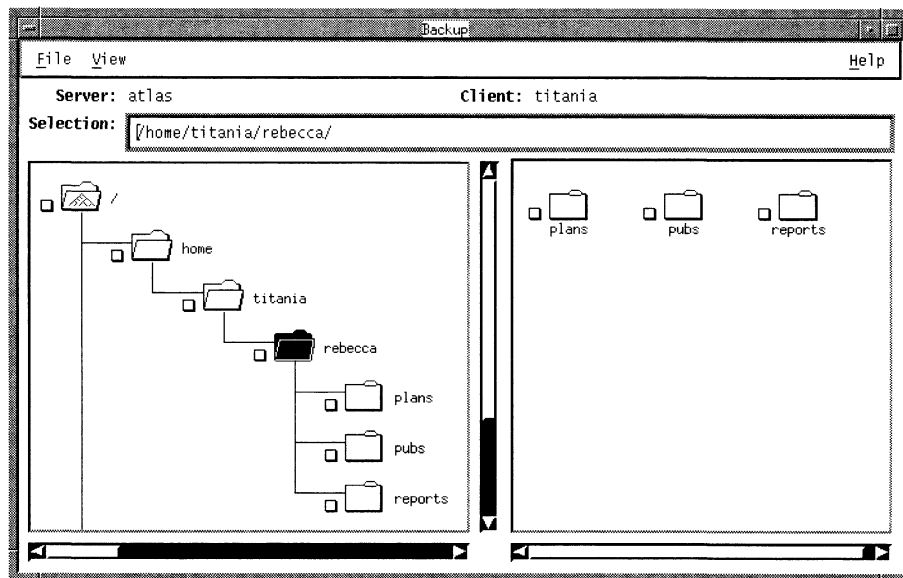
Expand One Level opens a directory to display the subdirectories one level below. The subdirectories are graphically displayed as a tree structure in the directory display. You can scroll in the directory display to find the subdirectory that contains the desired file.



3

To expand a directory to one level:

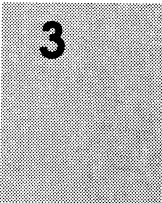
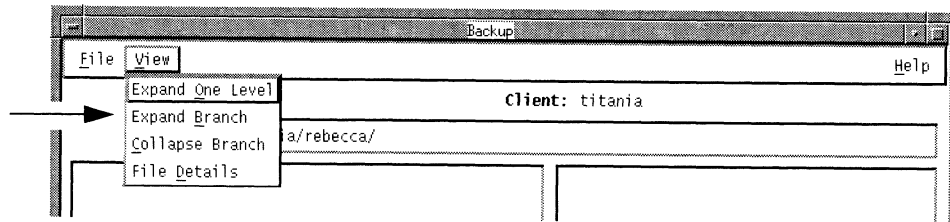
1. Highlight a directory folder in the directory display.
2. Select Expand One Level from the View pull-down menu.





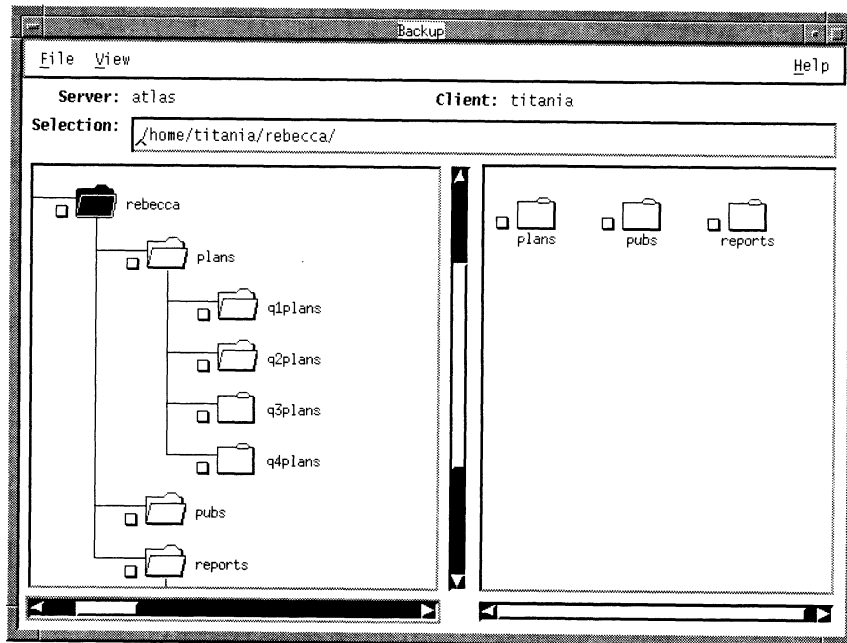
### Expanding a Branch

Expand Branch lets you view all the levels of subdirectories in a directory. Large directories may take a few minutes to expand.



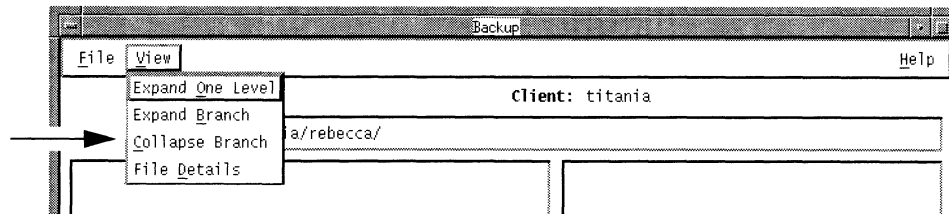
To expand a directory to view the branch:

1. Highlight a directory in the directory display.
2. Select Expand Branch from the View pull-down menu.



## Collapsing a Branch

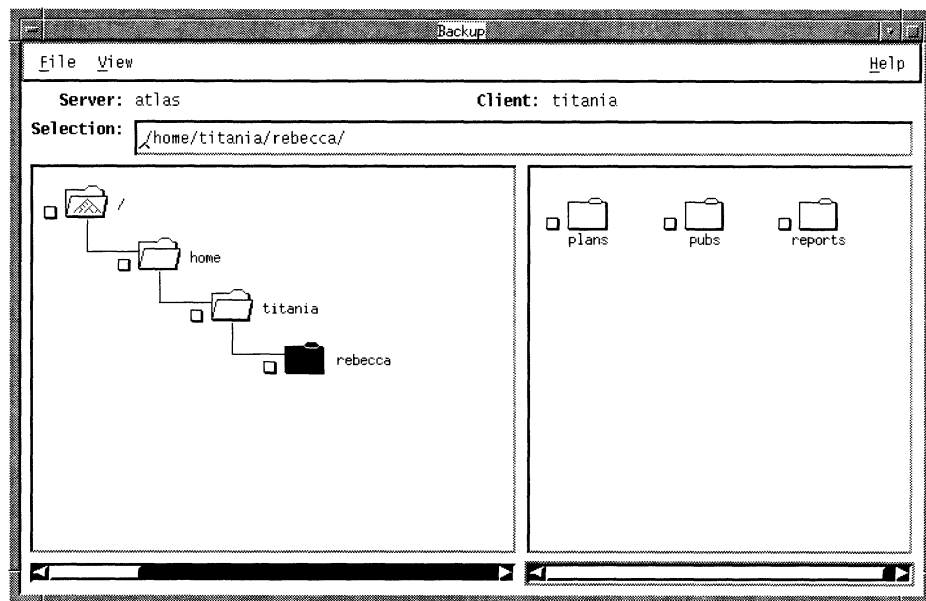
Collapse Branch closes all subdirectories and returns you to the level of the highlighted directory.



3

To collapse a branch:

1. Highlight an expanded directory in the directory display.
2. Select Collapse Branch from the View pull-down menu.

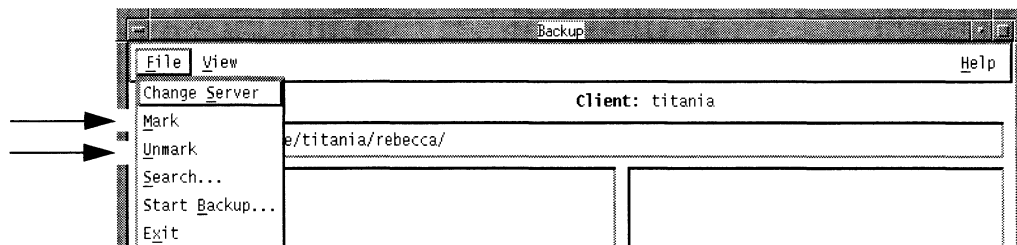


## Marking and Unmarking Files

You choose files and directories for backup and recovery by marking them. The icons have a checkbox beside them that displays a checkmark when the file is marked. You can mark or unmark files and directories by using either the File pull-down menu or the checkbox.

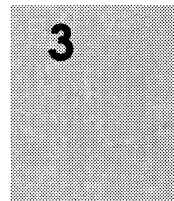
To mark a file or directory using the File menu:

1. Highlight a file or directory icon by selecting it with the mouse.
2. Select Mark from the File pull-down menu.



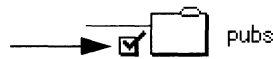
This places a checkmark in the checkbox beside the highlighted icon to mark it for backup or recovery.

3. If you decide that a file should not be included in the backup or recovery, highlight the icon and select Unmark from the File pull-down menu to remove the checkmark.



To mark a file using the checkbox:

1. Use the mouse to select the checkbox next to the file. This places a checkmark in the checkbox.
2. Select the checkmark to unmark the file.

**3****Tip**

When you mark a directory, all its subdirectories and nested files are also marked. The checkboxes of the parent directories turn grey to indicate that some or all of the directory contents are marked for backup or recovery.

## Viewing File Details

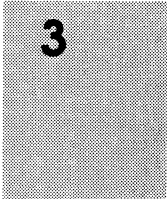
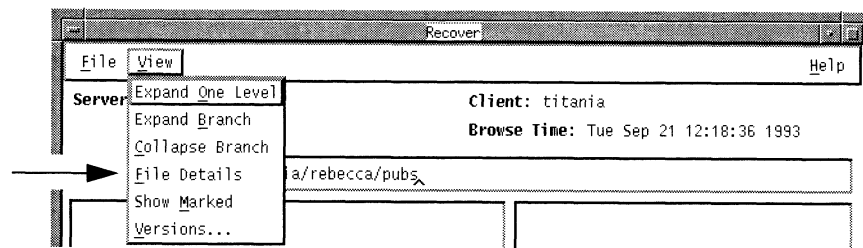
NetWorker lets you choose to view the file details or only the file names in the file display. File Names is the default selection. File Names lists the files in alphabetical order with only the filenames displayed. File Details displays the filename, number of blocks, permissions, number of links and where they point (only applies to symbolic links), owner, group, size, and date last modified for each file.

Backup File Details and Recover File Details are identical except for one difference. Recover File Details provides the backup time for each file to identify different backup versions of the same file.

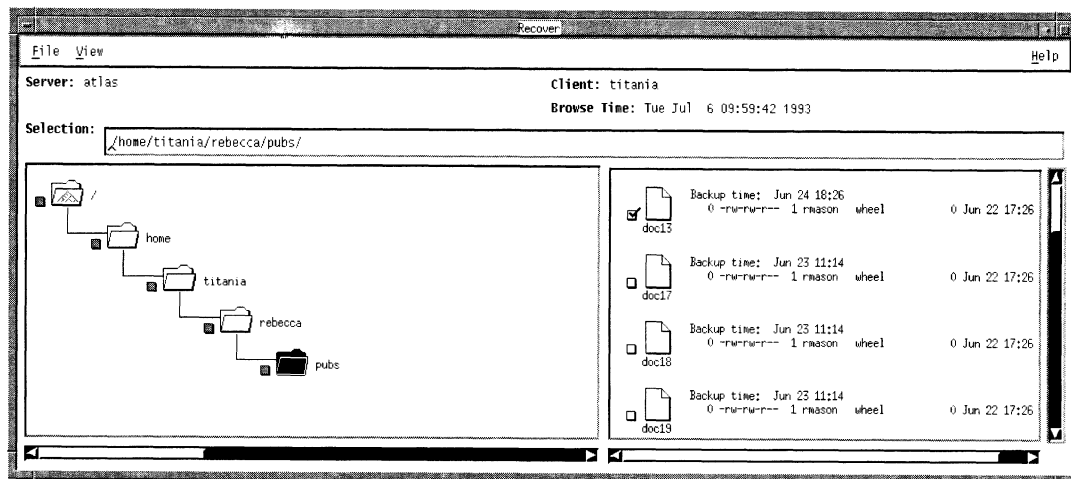
Use the View pull-down menu to select either the File Names or File Details in the file display. File Names/File Details is a toggle selection. When you are in File Names mode, the menu selection changes to File Details. When you are in File Details mode, the menu selection changes to File Names.

To display the file details:

1. Select File Details from the View pull-down menu.
2. Adjust the size of the window to display the full File Details.



The Recover File Details display is pictured below. Notice the backup time listed beside each icon.

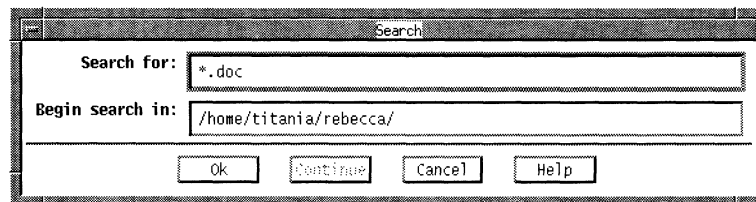


## Searching for Files

If you know the name or partial name of a file or directory, you can use the Search window to locate it in the filesystem or index. To search for files, you specify the filename or partial filename you are looking for and the directory name where you wish to begin the search. NetWorker begins searching in that directory and then searches through its subdirectories and nested files.

To search for files or directories by name:

1. Use the File menu to open the Search dialog box.
2. Enter the name of the file or directory in the Search for field. You can use standard UNIX shell pattern characters when specifying partial filenames.



3. Enter a valid *pathname* of the directory where you wish to begin the search in the Begin search in field. NetWorker searches through that directory and all nested subdirectories.
4. Select the Ok button. The *pathname* of the first match appears in the Selection field and is also highlighted in the file display.
5. Select the Continue button to highlight the next match. You can continue the search until the last match is found.

## Changing a Selection

The NetWorker windows display the full *pathname* of the current directory in the Selection field. If you know the path of a directory or file, you can go directly to it by entering the full *pathname* in the Selection field.

Selection:

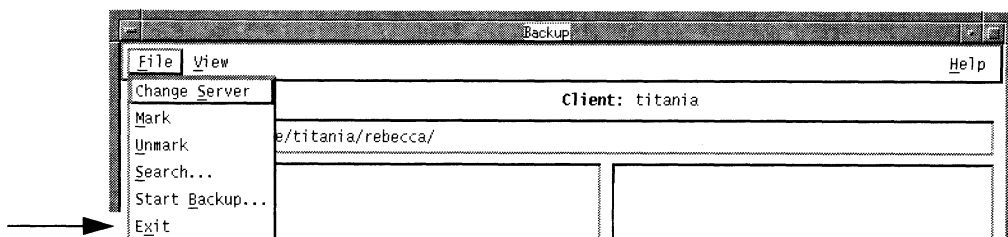
To change the current selection:

1. Enter the full *pathname* in the Selection field.
2. Press the [Return] key.

Both the directory and file displays change to show the new selection.

## Exiting from a Window

The Exit command is in the File menu of every window. Exit closes the current window without backing up or recovering files and returns you to the Main window.



Select Exit from the File menu to close the window.



**3**



# Chapter 4

## Backing up and Recovering Files

This chapter describes NetWorker's Main, Backup, and Recover windows. It includes the backup and recover functions that are unique to each of the windows. For information on using the functions that are common to the windows such as viewing and marking files, see Chapter 3, "Browsing Filesystems." For a quick tour of NetWorker's Backup and Recover windows, see Chapter 2, "Getting Started."

### Monitoring Your Backup and Recovery

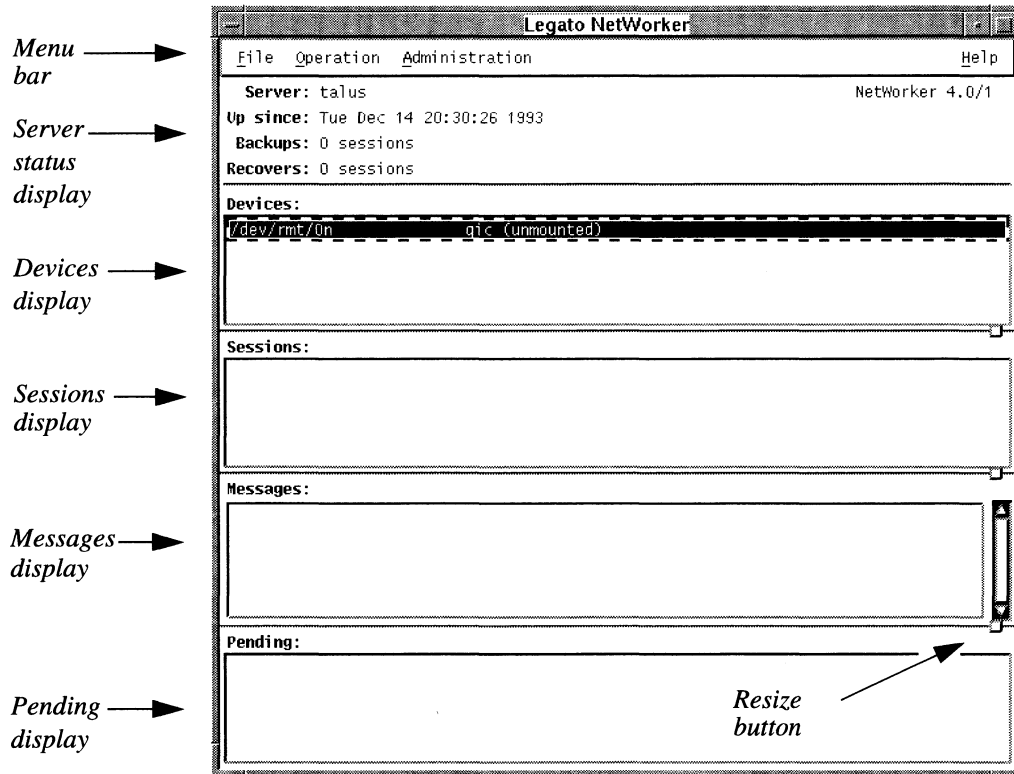
NetWorker's Main window monitors your backups and recovers. (It also provides pull-down menus for selecting the Backup and Recover windows.) The Main window provides valuable on-line information about server status, backup device status, client sessions, and pending requests.

The Main window appears when you invoke NetWorker.

**Tip** 

Keep the Main window open during every backup or recover to monitor the progress of the session.

The NetWorker Main window is shown below:



The Main window has a Menu bar and five displays:

- ❑ Menu bar – contains the File, Operation, Administration, and Help pull-down menus.
- ❑ Server status display – tells you how long the current server has been on-line, the number of backups and recovers the server has completed since it has been on-line, and the amount of data contained in the backups and recovers.
- ❑ Devices display – shows you the backup devices known to the server and which volume, if any, is mounted in the device.

- ❑ Sessions display – provides current information on which clients are backing up, browsing, or recovering files.
- ❑ Messages display – provides a history of the NetWorker server activity.
- ❑ Pending display – shows messages that may require operator attention.

A scroll bar appears to the right of the display area when there is more information to see. Use the resize buttons for resizing the display areas.

## Backing up Files

This section assumes you have already marked your files for backup. If you need to know how to view directories, mark files, search for

files, or view file details, see Chapter 3, "Browsing Filesystems."

4

## Changing the NetWorker Server

NetWorker clients are included in a scheduled backup determined by your system administrator.

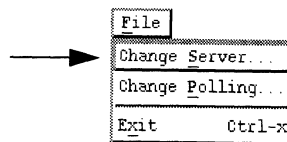
Generally only one NetWorker server is required to back up all the systems on a network. If you have more than one NetWorker server on the network you may have a choice of servers.

However, you must be listed as a client on the NetWorker server you choose for your backups. Check with your system administrator if you wish to back up to a server other than the server chosen for your scheduled backups.

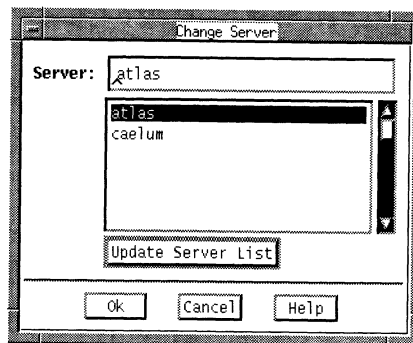
You may need to back up a file to a different server due to network difficulties or because your backup server is down.

To change NetWorker servers, follow these steps:

1. Select Change Server from the File pull-down menu.

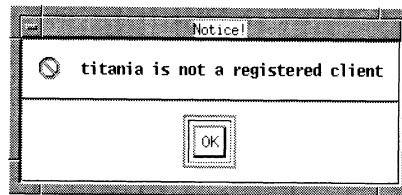


The Change Server dialog box appears, as shown below.



2. Select the Update Server List button to update the list of NetWorker servers on the network.
3. Highlight the *hostname* of a server, or enter a valid *hostname* in the Server field.
4. Press Ok to choose the new server.

**NOTE:** If you choose a NetWorker server that does not have your system listed as a client, you will receive an error message, as shown below.



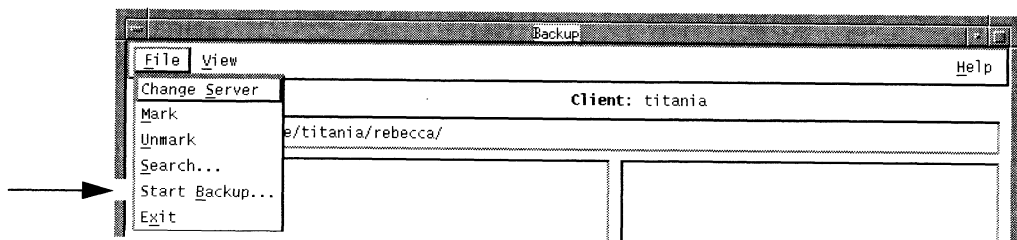
## Starting a Backup

Before starting a backup, complete the following steps:

- Mark the files that need to be backed up.
- Choose the NetWorker server (if necessary).

When these steps are complete, you may start the backup.

Select Start Backup from the File menu to start the backup.



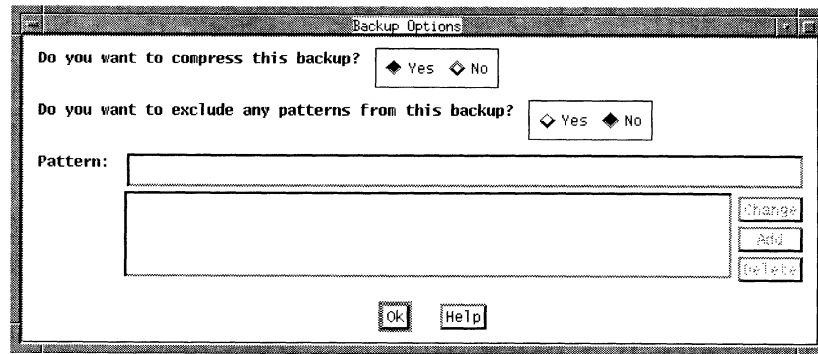
## Choosing the Backup Options

NetWorker displays the Backup Options dialog box before starting the backup. Backup Options gives you the option to compress files and exclude patterns before the backup starts.

### Compressing Files

To choose whether or not to compress the files you back up, answer the question "Do you want to compress this backup?" in the Backup Options dialog box. Notice that Yes is already highlighted as the default selection.

NetWorker requires that you choose whether or not you want to compress your files in the Backup Options dialog box, before you can back them up.

**4**

To continue the backup with file compression:

Since Yes is the default selection, you do not have to make a selection to continue the backup with file compression.

To continue the backup without file compression:

Press No to continue the backup without file compression.

**Tip** 

It is a good idea to compress all your backups to save space on the backup volumes and to reduce network traffic. However, backups may be slower due to compression.

If you do not need to exclude patterns from your backup, press Ok to continue the backup with your file compression choice.

### Excluding Patterns

Before starting a backup, you can exclude patterns in the Backup Options dialog box. To exclude patterns, you specify alphanumeric patterns that occur in the names of the files that you want to exclude from the backup. Any number of patterns may be specified using UNIX shell pattern characters.

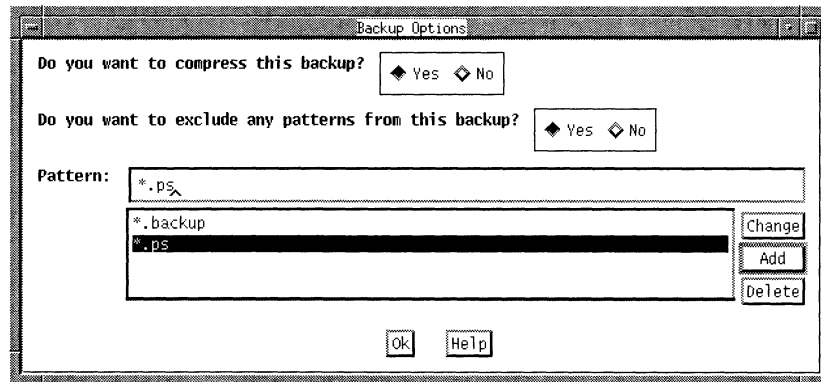
Excluding patterns is an optional shortcut for eliminating similar files from the backup.

Notice that No is highlighted as the default answer to the question "Do you want to exclude any patterns from this backup?." If you do not wish to exclude any patterns of filenames from the backup, select Ok to continue the backup with only your file compression choice.

To exclude patterns from the backup:

1. Select Yes to answer the question "Do you want to exclude any patterns from this backup?." This activates the exclude patterns portion of the Backup Options dialog box.
2. Enter the first pattern to be excluded in the Pattern field.

3. Select Add to add the pattern to the pattern list.



4. You may enter any number of patterns and add them to the pattern list.

If you wish to change a pattern, select it in the pattern list. The selected pattern appears in the Pattern field. Enter the new pattern and press Change. The new pattern replaces the old pattern in the pattern list.

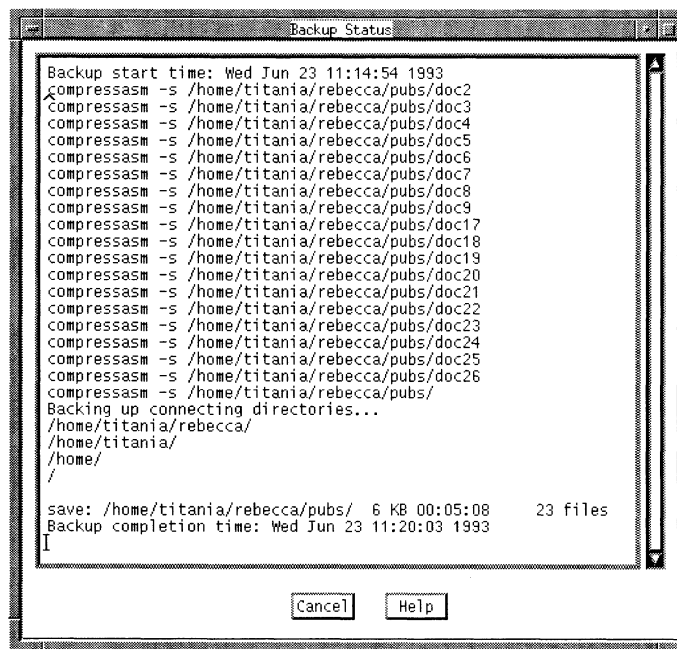
5. To delete a pattern, select it in the pattern list and press Delete.
6. Select Ok to continue the backup with the excluded patterns.

**4**



## Monitoring the Backup Status

After you press Ok to complete the Backup Options dialog box, the Backup Status window appears. Use the Backup Status window to monitor the progress of the backup.



4

The Backup Status window provides the Backup start time and the Backup completion time. The names of the files and directories scroll across the Backup Status window as the backup proceeds. The save message at the bottom of the window gives you information about the backup including the full *pathname* of the directory and the number of kilobytes and files being saved.

You can cancel the backup by pressing the Cancel button.

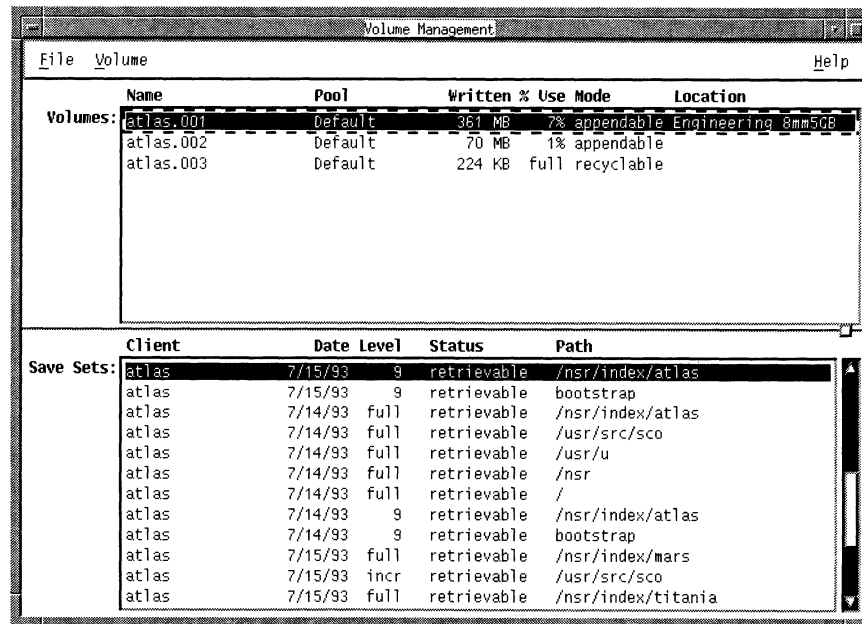
The following message appears in the Backup Status window when the backup is complete:

```
Backup completion time: Wed Jun 23 11:20:03 1993
```

## Using the Volume Management Window

You can verify that NetWorker has successfully backed up your files in the Volume Management window by selecting the Volumes command in the Operation pull-down menu. You can determine exactly to which volumes your files have been backed up. All of the volumes known to the NetWorker server are listed in the Volumes scrolling list, and the contents are listed in the Save Sets scrolling list.

4



The screenshot shows a window titled "Volume Management" with a menu bar containing "File", "Volume", and "Help". The window is divided into two main sections. The top section, labeled "Volumes:", contains a table with the following data:

Name	Pool	Written	% Use	Mode	Location
atlas.001	Default	361 MB	7%	appendable	Engineering 8mm50B
atlas.002	Default	70 MB	1%	appendable	
atlas.003	Default	224 KB	full	recyclable	

The bottom section, labeled "Save Sets:", contains a table with the following data:

Client	Date	Level	Status	Path
atlas	7/15/93	9	retrievable	/nsr/index/atlas
atlas	7/14/93	full	retrievable	bootstrap
atlas	7/14/93	full	retrievable	/nsr/index/atlas
atlas	7/14/93	full	retrievable	/usr/src/sco
atlas	7/14/93	full	retrievable	/usr/u
atlas	7/14/93	full	retrievable	/nsr
atlas	7/14/93	full	retrievable	/
atlas	7/14/93	9	retrievable	/nsr/index/atlas
atlas	7/14/93	9	retrievable	bootstrap
atlas	7/15/93	full	retrievable	/nsr/index/mars
atlas	7/15/93	incr	retrievable	/usr/src/sco
atlas	7/15/93	full	retrievable	/nsr/index/titania

When you select the name of a volume in the Volumes list, the Save Sets list displays the contents of that volume. In the example

above, the file `bootstrap` has been backed up on the volume `atlas.001`.

**NOTE:** The information listed in the Volume Management window is useful to the system administrator for managing NetWorker's backup volumes.

## Recovering Files

This section assumes you have already marked your files for recovery in the *Recover* window. If you need to know how to view directories, mark files, search for files, or view file details, see Chapter 3, "Browsing Filesystems."

The files listed in the *Recover* window are entries for the files that were backed up by NetWorker. When NetWorker backs up a file, it creates an entry for the file in the on-line index. You may then select a file that is listed in the index for recovery. NetWorker's powerful recover functions allow you to browse the index for previous backups, select various versions of the file to recover, view your marked files, relocate files upon recovery, and recover files from another authorized system. An "authorized system" is a client from which you have permission to recover data.

4

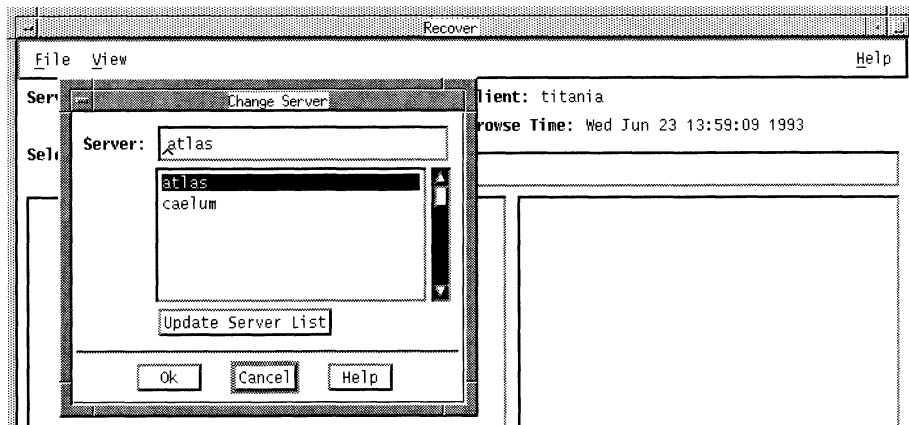
### Choosing the Recover Server

Normally you recover files from the NetWorker backup server chosen for you by your system administrator. If you have backed up files to a different server, you must also recover those files from that server. If you changed servers in the *Backup* window, select the same server in the *Recover* window.

The *Change Server* dialog box lists all the NetWorker servers on the network. You can only recover files from a server that lists your system as a client.

To choose a recover server:

1. If it is not already open, select Recover from the Operation pull-down menu to display the Recover window.
2. Select the File pull-down menu and then choose the Change Server command. The Change Server dialog box appears, as shown below.



Use the Update Server List button to update the list of NetWorker servers on the network. Choose the server that has the files you need to recover. The Server field changes to reflect the current selection. The directory and file displays are refreshed to show the index for the current server.

3. Press the Ok button after you have selected a server.

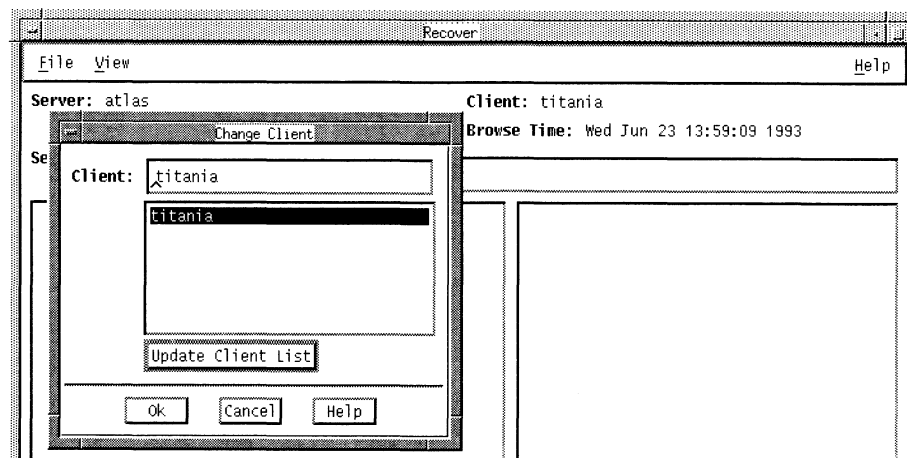
### Choosing the Recover Client

If you need to recover files from a client other than the system you are currently using, use the Change Client command in the File pull-down menu. The Change Client command opens a dialog box

which lists all of the NetWorker clients. Check with your system administrator if you wish to recover files other than your own. You may not be authorized to recover files for other client systems.

To choose a recover client:

1. Choose the Change Client command from the File pull-down menu in the Recover window. The Change Client dialog box appears, as shown below.



4

You can update the list of NetWorker clients by selecting the Update Client List button.

2. Choose a client from which you are authorized to recover files. The Client field changes to reflect the current selection.

## Selecting File Versions

The Versions window lists all the versions of a file or directory that have been backed up by the backup server. It also lists the

location of the versions. Use *Versions* to view the backup history of a file and to mark a version for recovery.

Versions of a directory may be listed in the *Versions* window, but directories cannot be marked for recovery in the *Versions* window. Only versions of files may be marked for recovery in the *Versions* window.

The *Versions* window provides the following information about each version: number of blocks, mode, permissions, number of links, owner, group, size in bytes, last modified time, and filename.

It also provides the backup time and location of the version. The backup time is used to identify different versions of a file.

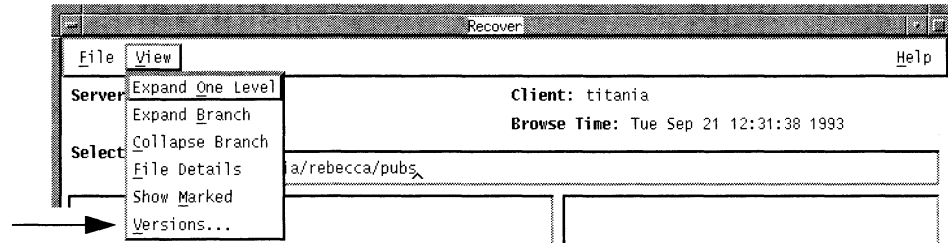
The location includes the name of the backup volume, the device where the volume is mounted, if any, or the location of the backup volume (for example, an off-site storage place). If no device is listed, it means that the backup volume must be mounted before recovery of the file is possible.

The information in the *Versions* window is retrieved from the index that is created by NetWorker when you perform a backup.

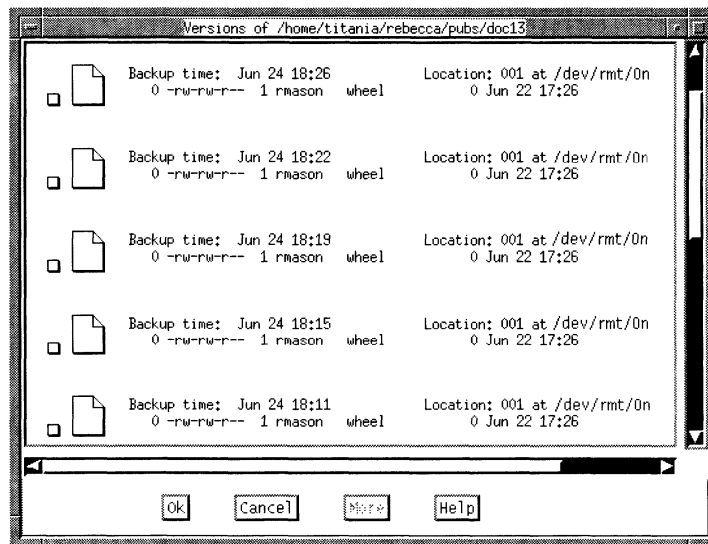
To view the backup history of a file or directory:

1. Open the *Recover* window and highlight a file or directory in the file display.

2. Select Versions from the View pull-down menu.



NetWorker retrieves ten versions of the highlighted file or directory from the index and lists them by backup time, beginning with the most recent. Use the scroll bar to view the backup history.



3. Press More to retrieve ten more versions from the index. The More button turns to grey when all versions have been retrieved.

**Important** ⇨ Remember, you cannot mark directories for recovery in the Versions window. Use the Change browse time command in the File pull-down menu to mark a past version of a directory for recovery.

To select a version of a file for recovery:

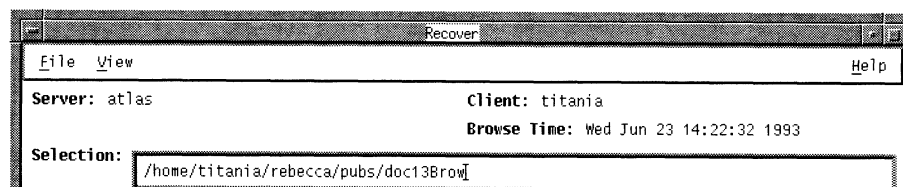
1. Select the checkbox of the version that you want to recover.
2. Select Ok to place the checkmarked versions in the file display.

**Tip** ⓘ When you mark a past version of a file in the Versions window, this version appears in the Recover window file display with the same name as the recent version. You will then have more than one version of a file in the file display. If you are confused as to which version to mark, use File Details to display the backup times.

4

## Changing the Browse Time

The Browse Time field displays the current date unless you change it to a date in the past. The currently selected browse time is indicated in the Browse Time field in the Recover window.



In the Recover window you are viewing the index entries for previously backed-up files. Changing the browse time displays the index entries for files backed up at that time.



**Tip** 

If files were not backed up at the time entered in the Browse Time field, NetWorker displays files that were backed up closest to the selected browse time.

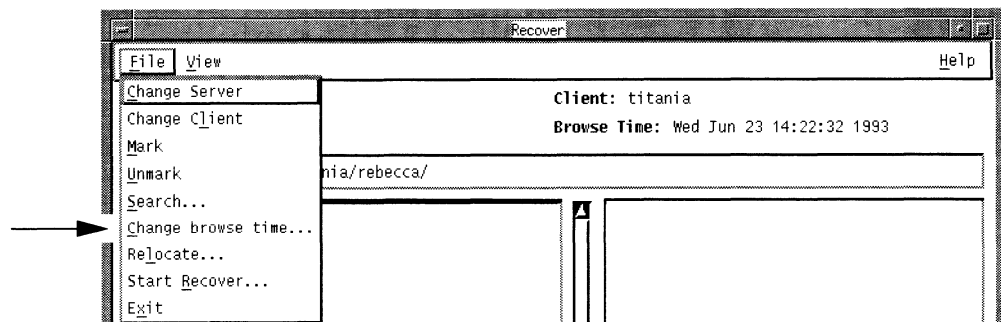
Changing the browse time lets you view your files as of some time in the past. This is useful if you do not remember the name or location of the files you want to recover, but you remember they existed at some time in the past. Change browse time also helps you find files that have been deleted and thus do not appear in the Versions window. You can recover deleted files by changing the browse time to locate past versions of the files in the index.

**Important** 

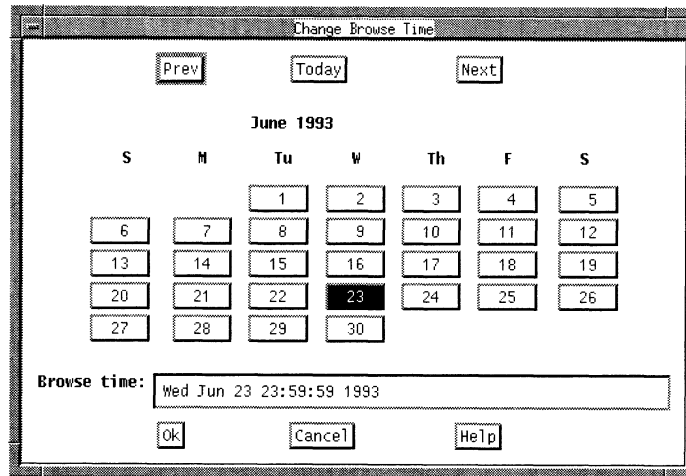
You can mark directories for recovery in the Recover window by using the Change browse time command rather than the Versions command.

To change the browse time to recover a past version of a file:

1. Open the Recover window and select Change browse time from the File menu.



- The Change Browse Time dialog box appears. The Prev, Today, and Next buttons control the month shown in the calendar. When the desired month is displayed, select the browse time by selecting a day in the calendar.



- You can also enter the date and time in the Browse time field and press [Return] to change the browse time. The following formats are valid for browse time:

hh:mm:ss (24 hour clock) or hh:mm (am,pm)(PDT)

mm/dd/(yy) or monthname dd (yy)

last Friday, next Friday, third Friday

+ or - 3 seconds, minutes, hours, weeks, months, years

- Press Ok to display the files that were backed up at the new browse time. The Browse time field in the Recover window changes to reflect the new browse time. Both the file display and the directory display of the Recover window show the files that were backed up at that time. You may now mark past versions of files for recovery.

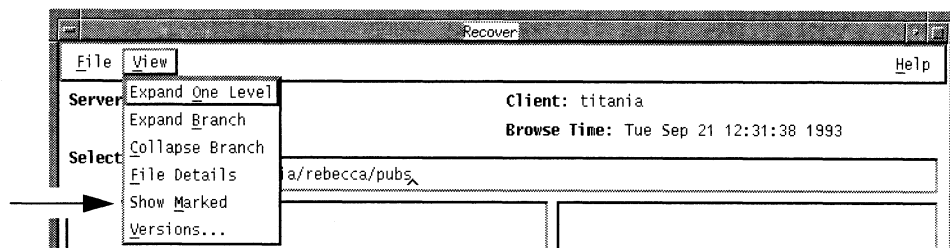
**NOTE:** Any files or directories that you have marked for recovery prior to changing the browse time will remain marked.

## Showing Marked Files

You can list the files you have marked for recovery by selecting Show Marked. Use Show Marked to check which files you have marked for recovery before performing the actual recover. The Files Marked for Recovery window lists the *pathnames* and backup time of files that you have marked for recovery.

To show the files that you have marked for recovery:

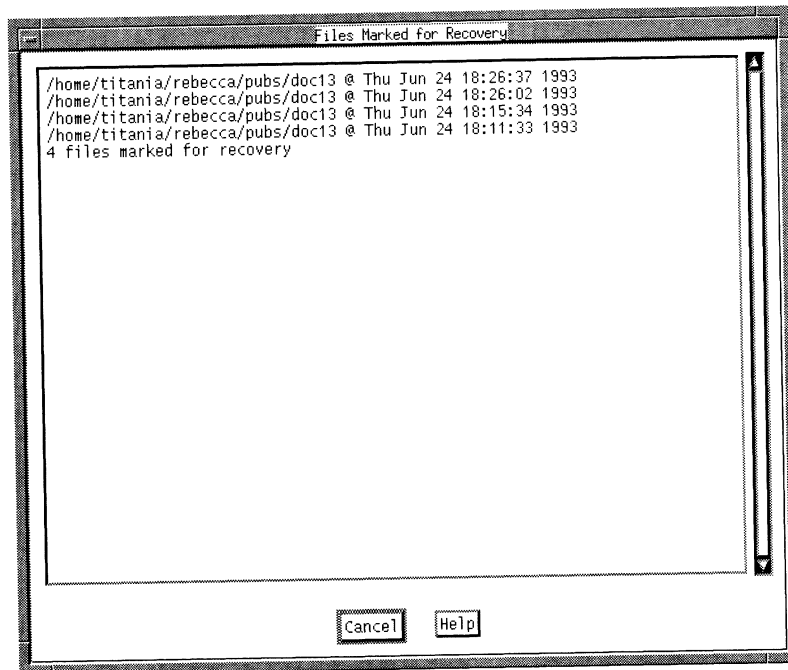
1. Select Show Marked from the View menu of the Recover window.



4

The Files Marked for Recovery window appears, listing the *pathnames* and backup time of all marked files.

2. Press Cancel to close the window.



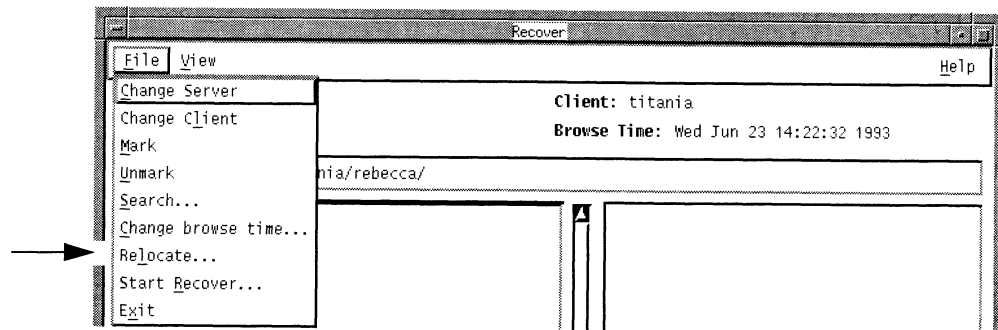
4

## Relocating Files

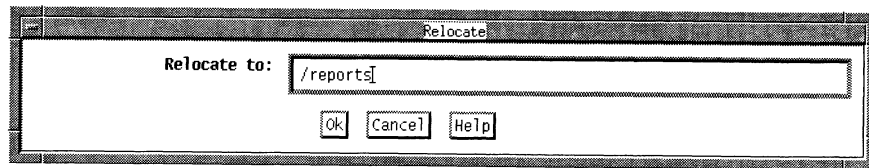
Use the optional Relocate command before you start a recovery to place your files in a directory other than the original one. Relocate first creates the directory if it does not already exist and then stores the recovered files in the new directory. You may also relocate files to an existing directory by entering the complete *pathname*.

To relocate recovered files into a new or existing directory:

1. Open the Recover window and select Relocate from the File menu.



2. Enter the name of the directory where the recovered files will be stored in the Relocate to field. You can relocate files to a new directory or to an existing directory. Be sure to include the complete *pathname*.



3. Select Ok to relocate files into the new directory.

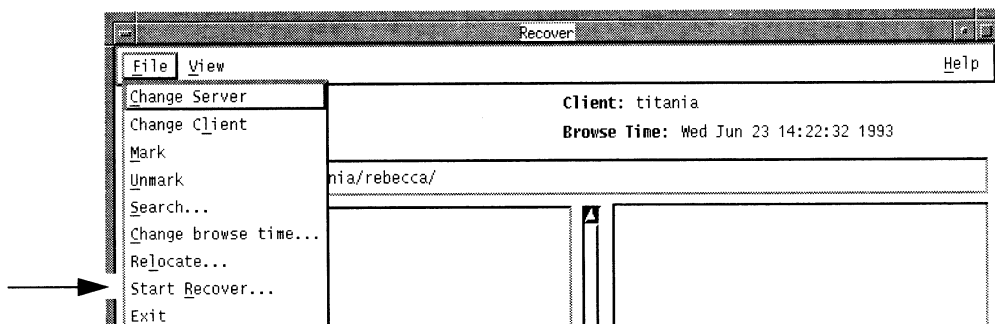
## Starting a Recovery

Before starting a recovery, complete the following steps:

- ❑ Choose a server and an authorized client, if necessary.
- ❑ Mark files and directories for recovery.
- ❑ Select a past version of a file by name and location if desired.
- ❑ Select a past version of a file by browse time if desired.
- ❑ Show your marked files if desired.
- ❑ Relocate recovered files to a new directory if desired.

Usually, you can complete a recovery in two steps: mark the files and start the recovery.

To start a recovery, select **Start Recover** from the **File** pull-down menu in the **Recover** window.

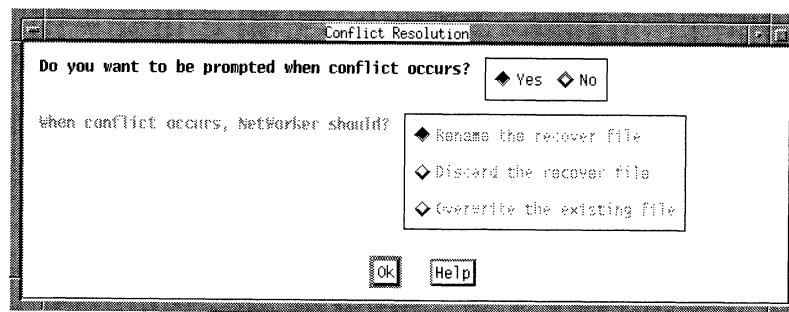


Before actually starting the recover process, NetWorker prompts you for instructions on how to resolve naming conflicts by displaying the Conflict Resolution dialog box.

## Renaming or Overwriting Recovered Files

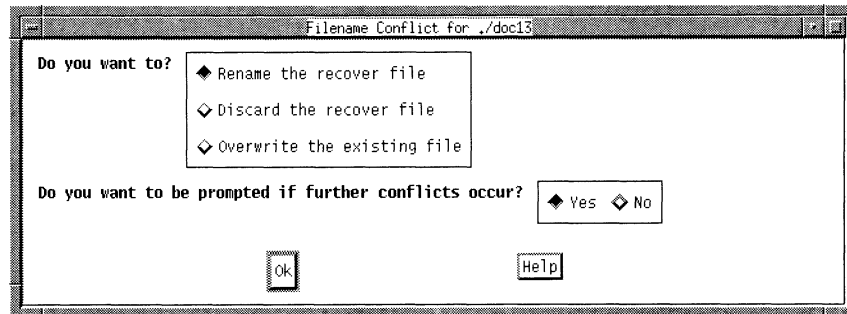
With the Conflict Resolution dialog box, you tell NetWorker whether to rename recovered files or overwrite existing files when a naming conflict occurs. A conflict occurs when a file you are recovering already exists or has the same name as one in the current directory. The Conflict Resolution dialog box has two questions for you to answer concerning conflicts between recover files and existing files.

1. To resolve the conflict, first answer the question, "Do you want to be prompted when conflict occurs?." If you select No, then you specify a global resolution for renaming or overwriting files, in the Conflict Resolution dialog box, shown below.



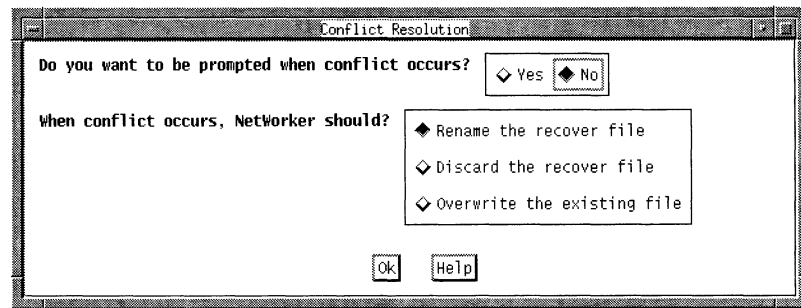
2. If you select Yes, the default selection, NetWorker will prompt you for instructions in the Filename Conflict dialog box every time it encounters a conflict between a recovered file and an existing file. For each recovered file that is in conflict with an existing file, you tell NetWorker whether to rename the recovered file, discard the recovered file, or overwrite the existing file. This allows you to resolve conflicts on a file-by-file basis.

The Filename Conflict dialog box is shown below:



3. If you select No, then you must answer the question “When conflict occurs, NetWorker should?.” Answering this question allows you to resolve conflicts on a global basis per recover session without being prompted for each individual file.

4



Select one of the following to solve conflicts:

**Rename the recover file** – When a conflict occurs, NetWorker renames the recover file with a .R extension. If the .R file exists, NetWorker adds another .R.

**Discard the recover file** – NetWorker discards the recover file. The existing file remains current.

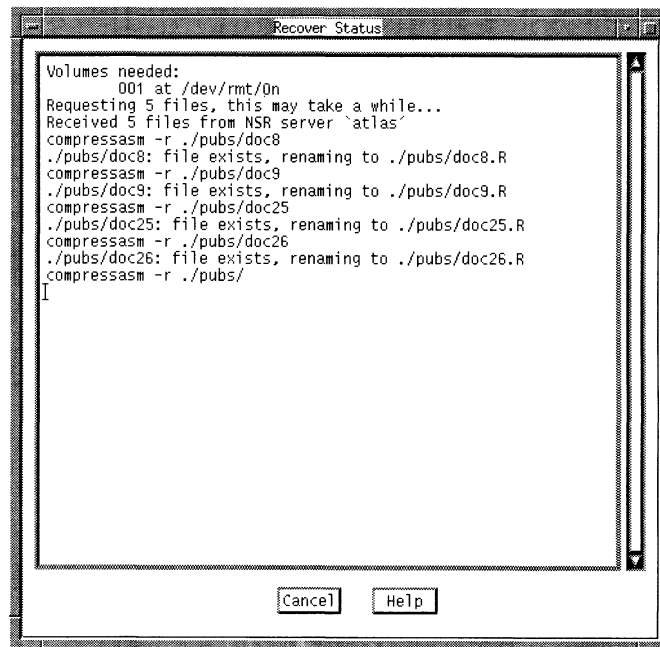


Overwrite the existing file – NetWorker replaces the existing file with the recovered file. The existing file is lost and the recovered file becomes current.

4. After completing the Conflict Resolution dialog box, select Ok to continue the recovery.

### Monitoring the Recover Status

After the Conflict Resolution dialog box closes, the Recover Status window re-appears as the recovery continues.



4

The Recover Status window provides you with the following information about your recover session:

- ❑ The name of the required backup volume and its location.

```
Volumes needed:  
.001 at /dev/nrStp0
```

- ❑ The *pathnames* of the files being recovered and the *pathname* of the directory where they will be stored.

```
/home/titania/Rebecca/pubs/ is being recovered into its  
original location
```

If you specified a directory in the Relocate dialog box, it will be listed after "...is being recovered into..."

If you chose to rename the recover files, the new filenames are listed.

- ❑ The number of files it is recovering.

```
Requesting X files, this may take a while...
```

- ❑ As the recovery proceeds, the *pathnames* of the files scroll across the Recover Status window.

When the recovery is complete, the following message appears:

```
Received X files from...
```

Press Cancel to cancel the recovery.

Press Cancel to close the Recover Status window.

Chapter 4 has given you a thorough overview about how to back up and recover your NetWorker files. You have learned how to:

- ❑ Back up files
- ❑ Monitor the backup status
- ❑ Use the Volume Management window
- ❑ Recover files
- ❑ Monitor the recover status

For more information about configuring the NetWorker server, refer to the *Legato NetWorker Administrator's Guide* or ask your system administrator.



4

# Appendix A

## Error Messages

NetWorker provides user-friendly error messages that have easy to understand explanations. This appendix provides you with further information and solutions to assist you with your backups and recovers.

### Error Messages for Backup

NetWorker displays an error message if a backup cannot be successfully completed. NetWorker backup error messages are shown below:

---

Message: Nothing marked for backup

Problem: Starting backup without marking any files.

Solution: Mark at least one file before starting the backup.

---

Message: Unable to start backup

Problem: Error starting the backup (could not execute the **Save** command).

Solution: Contact the system administrator. There is a problem with the NetWorker software or there is a problem with the configuration (for example, an incorrect path name).

- 
- Message:** Your system is not a registered client.
- Problem:** The server you have chosen to do your backups does not have your system configured as a NetWorker client.
- Solution:** Contact the system administrator. Your system needs to be added to the server's list of recognized clients.

## Error Messages for Recover

An error message is displayed when NetWorker is unable to successfully recover a file. NetWorker recover error messages are shown below:

- 
- Message:** There are files marked for recovery.  
Continue to ignore the marked files,  
Cancel to stay with this client.
- Problem:** Changing clients when files are marked.
- Solution:** You have the option to continue changing clients.  
In this case, the marked files will not be recovered.  
Or you can cancel to stay with the current client and retain your marked files.
- 
- Message:** (For root user) Only 10 KBytes available to non-superusers (15 KBytes free) in /home/*server\_name*.  
Filesystem will be greater than 100% full after recover is complete.  
Proceed with recover command at this time? [n]
- (For a non-root user) No disk space available to non-superusers (15 KBytes free) in /home/*server\_name*.  
The estimated recover size of 10 KBytes will not fit

A

on this filesystem.

Proceed with recover command at this time? [n]

**Problem:** There is not enough free space in the filesystem to recover the requested files.

**Solution:** Reduce the number of kilobytes in the recovery by reducing the number of marked files. Relocate the recovery into another directory with more space. If you are recovering over existing directories, you may be able to proceed with the recovery since files will be overwritten.

---

**Message:** Invalid time format

**Problem:** The time specified in the change browse time field was invalid.

**Solution:** Enter the browse time using a valid format.

Examples of valid time formats are:

hh:mm:ss using the 24 hour clock

hhmm (am, pm) (PDT)

mm/dd/yy or monthname dd yy

last Monday, next Monday, 1st - 12th Monday

now, yesterday,

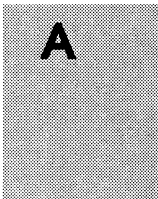
+ or - 3 seconds, minutes, hours, weeks, months,

years

---

**Message:** Nothing in index at this time

**Problem:** There are no entries in the index for the browse time that was specified. No backups were performed at that time.



**Solution:** Enter another browse time close to this one until you find the index entries you are looking for.

---

**Message:** Unable to relocate to /usr/tmp/root

**Problem:** NetWorker was unable to relocate to the specified path.

**Solution:** Enter a valid *pathname* in the Relocate dialog box and start the recovery again. You must have write permission for the directory you wish to use.

## Error Messages for both Backup and Recover

Some of NetWorker's error messages are the same for both an unsuccessful backup or recover. The error messages used for both backups and recovers are shown below:

---

**Message:** You cannot mark files from different filesystems. /home/quattro/rebecca/docs/1usr.doc is on a different filesystem from files you have already marked. You must either Backup or Recover the files you have marked or unmark them before you can mark this file.

**Problem:** NetWorker does not allow you to mark files across filesystems.

**Solution:** Complete the backup or recovery for one filesystem at a time.

---

**Message:** There are files marked for backup or recovery. Continue to ignore the marked files or Cancel to stay with server.



A



**Problem:** You cannot change servers after you have marked files.

**Solution:** You have the option to continue changing servers. If you change servers, the marked files will not be backed up or recovered. You can cancel to stay with the current server and retain your marked files.

---

**Message:** Bad start path

**Problem:** Specifying an invalid starting path for a search.

**Solution:** Enter a valid *pathname* as a starting point in the search dialog box.

---

**Message:** No match

**Problem:** Nothing matched on this search command.

**Solution:** Enter a different pattern or a different starting path.

---

**Message:** Bad search pattern

**Problem:** The search pattern specified is not valid.

**Solution:** You may use the UNIX shell pattern characters to specify a search pattern.

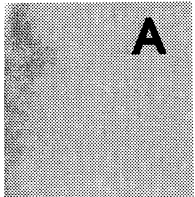
---

**Message:** Unable to expand path

**Problem:** The path specified in the selection field does not correspond to anything in the index or filesystem.

**Solution:** Enter a valid *pathname* in the selection field.

A



# Appendix B

## Commands for Backup and Recovery

In addition to a graphical user interface, NetWorker has UNIX-like commands for performing backups and recovers. These commands are entered from a UNIX shell. To use the NetWorker commands from a UNIX shell, the NetWorker software must be installed on the NetWorker server and your system must be configured as a NetWorker client by the system administrator.

### Table of Backup and Recover Commands

Use the **save** command to back up data. The backup and recover commands are listed below. Except for **nsrwatch**, **recover -c**, and **save**, you can use these commands after entering **recover** at the system prompt.

Command	Description
<b>add</b> <i>filename</i>	add <i>filename</i> to the recover list
<b>cd</b> <i>dir</i>	change directory to <i>dir</i>
<b>changetime</b>	change the browse time of on-line index
<b>delete</b> <i>filename</i>	delete <i>filename</i> from the recover list
<b>dest</b>	verify destination directory for recovered files
<b>force</b>	overwrite existing files
<b>help</b> or <b>'?</b>	display list of recover program commands
<b>list</b>	list the files in the recover list
<b>ls -F</b> <i>filename</i>	list <i>filename</i> with file type information
<b>ls -l</b> <i>filename</i>	list <i>filename</i> using long format
<b>ls</b> <i>filename</i>	list <i>filename</i>
<b>noforce</b>	do not overwrite existing files
<b>nsrwatch</b>	monitor NetWorker server activity

Command	Description
<b>pwd</b>	display name of current directory
<b>quit</b>	exit the recover program
<b>recover</b>	start the recover program when entered at the system prompt; start the recovery when entered at the <code>recover&gt;</code> prompt
<b>recover -c</b>	
<i>client_name</i>	browse the index and recover files for the specified client
<b>relocate</b> <i>dir</i>	specify new directory location for recovered files
<b>save</b> <i>pathname</i>	starts a backup of the current directory, or enter <i>pathname</i>
<b>verbose</b>	toggle verbose or quiet mode for recover status messages
<b>versions</b> <i>filename</i>	display backup history of file <i>filename</i> <i>filename</i> can be either a file or a directory
<b>volumes</b> <i>filename</i>	list volumes needed to recover marked files <i>filename</i> can be either a file or a directory


**B**

# Appendix C

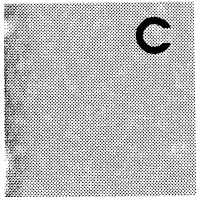
## Requirements for NetWorker Clients

Your system administrator is responsible for setting up the requirements for NetWorker clients.

The following three conditions must be met for a workstation to qualify as a NetWorker client:

- ❑ The NetWorker software must either be NFS-mounted from each client, or installed on a local disk. For directions on how to install NetWorker, see the NetWorker release notice and *Managing the DG/UX System* (093-701088).
- ❑ The daemon **nsrexecd**, used by **savegroup** to start saves, must be running on each NetWorker client.
- ❑ The NetWorker server must be configured to recognize each of its clients, as explained in *Legato NetWorker Administrator's Guide*.

If any one of the above conditions is not met, you will be unable to use NetWorker. Contact your system administrator for a remedy.



## Glossary

This glossary contains terms and definitions found in this manual. Most of the terms are specific to the Legato NetWorker product.

back up	The storing of the directories and files on your workstation onto tape.
backup media	Any type of storage media that your server can back up to: magnetic tape, floppy disk, or optical disk.
collapse	Changing the view to display only the top level of a highlighted directory in a window.
index	A database on the NetWorker server that contains an entry for every file backed up.
expand	Changing the view to display all the levels of a directory in a window.
media device	The device that is attached to the NetWorker server for transferring and recovering data that has been saved.
NetWorker client	All the systems on a network that back up and recover their data using NetWorker.

NetWorker server	The system that backs up all the other systems on a network according to a schedule and maintains an on-line index of everything it backs up.
recover	Replace a lost file with a copy of it from the NetWorker server.
selection	The name of the volume, directory, or file highlighted in any window.
tree structure	A view that displays the contents in a window in a hierarchical form.



**A**

Administration pull-down menu 17

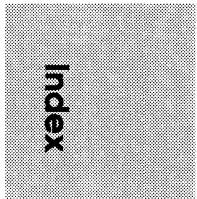
**B**

backup  
 excluding files 32  
 history 68  
 marking directories 28, 31  
 marking files 28  
 monitoring 55  
 starting 28, 59  
 unmarking files 28  
 Backup command 22  
 Backup completion message 35, 64  
 Backup completion time 63  
 backup device status 55  
 Backup File Details 50  
 backup media  
     location 68  
     mounted 68  
 Backup Options dialog box 33, 60  
 Backup start time 63  
 Backup Status window 34  
 backup times 51  
 Backup window 23, 29  
 block device icons 26  
 browse time 70  
 browsing  
     filesystem 28, 45  
     index 37, 39  
     selecting level of 45  
 button  
     More 69  
     Next 72  
     Prev 72

resize 57  
 Today 72  
 Update Server List 58

**C**

calendar for Change browse time 72  
 canceling  
     a backup 63  
     a recover 42, 80  
 Change browse time command 71  
 Change Browse Time dialog box 72  
 Change browse time field 72  
 Change Client dialog box 67  
 Change Polling dialog box 18  
 Change Server command 58  
 Change Server dialog box 58  
 changing a selection 53  
 changing the browse time 70  
 changing the NetWorker server 57  
 character device icons 26  
 checkbox 49  
     for marking files 50  
     for unmarking files 50  
     selecting 31  
     versions 70  
 choosing a recover client 65  
 choosing a recover server 65  
 client configuration 16  
 Client pull-down menu 66  
 client sessions 57  
 clock cursor icon 26  
 closing a window 53  
 Collapse Branch command 48  
 command  
     Backup 22  
     Change browse time 71



- Change Server 58
  - Collapse Branch 48
  - Expand Branch 47
  - Expand One Level 30, 46
  - File Details 50
  - Mark 32, 49
  - networker** 15
  - nsrexecd** 91
  - Recover 37
  - Relocate 75
  - save** 83, 90
  - Search 52
  - Show Marked 73
  - Start Backup 59
  - Start Recover 41, 76
  - Topic 19
  - Unmark 33, 49
  - Volumes 64
  - command table 89
  - compressing files 33, 60
  - Conflict Resolution dialog box 41, 77
  - current directory 53
- D**
- Devices display 56
  - dialog box
    - Backup Options 33, 60
    - Change Browse Time 72
    - Change Client 67
    - Change Polling 18
    - Change Server 58
    - Conflict Resolution 41, 77
    - Filename Conflict 77
    - Search 52
  - directory display 24, 29
  - display
    - Devices 56
    - directory 24, 66
    - file 24, 66
    - Messages 57
    - Pending 35, 57
    - Server status 56
    - Sessions 57
- E**
- error messages
    - backup 83
    - backup and recover 86
    - recover 84
  - exiting from a window 53
  - Expand Branch command 47
  - Expand One Level command 30, 39, 46
  - expanding directories 30
- F**
- field
    - Change browse time 72
    - Pattern 61
    - Selection 24, 53
    - Server 58
  - file compression 60
  - File Details command 50
  - file display 24
  - File pull-down menu 17, 23
  - Filename Conflict dialog box 77
  - files
    - compressing 33
    - marking 49
    - recovering deleted files 71
    - searching for 52
    - unmarking 49
    - view past files 71

Files Marked for Recovery window 74  
 filesystem  
   marking files across 86  
   sufficient space for recover 85  
 folder icons 25

## H

Help button 24  
 Help pull-down menu 19  
 highlighted file icons 25  
 highlighted folder icon 25

## I

icons  
   graphical 25  
   NetWorker 15  
 index 35, 37, 65  
 invoking networker  
   errors while 16  
   pathname of directory 29

## M

Main window 16, 27, 36, 56  
 Mark command 32, 49  
 marking  
   directories 28, 31, 49  
   files 28, 49  
   files for recovery 37  
   subdirectories 32  
 media  
   unmounted 36  
   volumes needed 42  
 Menu bar (of Backup window) 23  
 Menu bar (of Main window) 56  
 Messages display 57

monitoring  
   a backup 34, 55, 63  
   a recover 42, 79  
   recovers 55  
 More button 69  
 mount point icons 25  
 mount points 32

## N

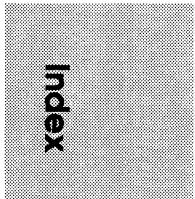
naming conflict 41  
 NetWorker server  
   changing 57  
   *defined* 13  
   icons 15  
   update 58  
 NFS-mounted directory 91  
**nsrexecd** command 91

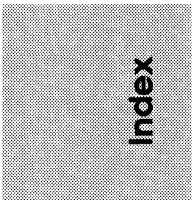
## O

open folder icon 25  
 Operation pull-down menu 17

## P

Pattern field 61  
 patterns  
   changing 62  
   deleting 62  
   excluding from a backup 61, 62  
 Pending display 35, 57  
 pending requests 55  
 pull-down menus  
   Administration 17  
   Client 66  
   File 17, 23  
   Help 19





how to use 23  
 Operation 17  
 Server 65  
 View 23, 30

**Q**

quick tour  
 backup 27  
 recovery 27  
 review 43

**R**

recover  
 files, deleted 71  
 monitoring a 55  
 preparing to 65  
 Recover command 37  
 recover commands  
 add 89  
 cd 89  
 changetime 89  
 delete 89  
 dest 89  
 force 89  
 help 89  
 list 89  
 ls 89  
 ls-F 89  
 ls-l 89  
 noforce 89  
 nswatch 89  
 pwd 90  
 quit 90  
 recover 90  
 relocate 90  
 verbose 90

**versions** 90  
**volumes** 90

Recover File Details 50, 51  
 Recover Status window 42, 79  
 Recover window 65  
 reducing networker traffic 61  
 Relocate command 75  
 renaming or overwriting recovered files 77  
 resize button 57

**S**

Save Sets scrolling list 64  
 scrollbar 26  
 scrolling list  
 Save Sets 64  
 Topics 20  
 Volumes 64  
 Search command 52  
 Search dialog box 52  
 searching for files 52  
 selecting versions of directories 71  
 selecting versions of files 67, 70  
 Selection field 24, 53  
 Server field 58  
 Server pull-down menu 65  
 Server status display 56  
 Sessions display 57  
 sheet icons 25  
 Show Marked command 73  
 Start Backup command 59  
 Start Recover command 41, 76  
 starting  
 backup 28  
 recovery 40  
 symbolic link icons 25

## T

- Topic command 19
- Topics Help window 19
- Topics scrolling list 20
- tree structure 39, 46
- Recover Status 42, 79
- Topics Help 19
- using NetWorker windows 21
- Versions 67, 71

## U

### UNIX

- backup and recover commands 89
- shell pattern characters 52, 61
- shell tool 43
- Unmark command 33, 49
- unmarking files 28, 32, 49
- Update Server List button 58

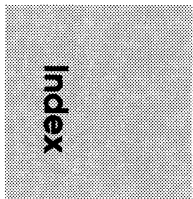
## V

- valid formats (browse time) 72
- valid time formats 85
- Versions window 67, 70, 71
- View pull-down menu 23, 30
- viewing directories 45
- viewing files in the past 71
- Volumes command 64
- Volumes scrolling list 64

## W

### windows

- Backup 23, 29
- Backup Status 34, 63
- controls 26
- Files Marked for Recovery 74
- Main 16, 27, 36, 56
- Recover 38, 65



A square icon with a grey halftone background. The word "Index" is written vertically in the center of the square.

Index

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  - a) MAIL ORDER - Use the order form on the opposite page and fill in all requested information. Be sure to include shipping charges and local sales tax. If applicable, write in your tax exempt number in the space provided on the order form.

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Data General Corporation  
ATTN: Educational Services/TIPS G155  
4400 Computer Drive  
Westboro, MA 01581-9973

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