

Repair, Recovery, and Restore



No computer is failure proof, but preventative measures and strategic planning can make a computer running Microsoft® Windows® 2000 more failure resistant. Developing plans and procedures for recovering from failures before they occur can also minimize damage and time lost. Maintaining records about your hardware and software configurations, and regularly backing up data and system configurations can help you recover from serious failures.

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Related Information in the Resource Kit

- For more information about planning before failures occur, see “Planning a Reliable Configuration” in this book.
- For more information about creating backups to use during recovery, see “Backup” in this book.
- For more information about common disk problems, see “Disk Concepts and Troubleshooting” in this book.

Repairing a Windows 2000 Installation

Windows 2000 provides you with the option of fixing problems by using either the Recovery Console or the Emergency Repair Process. During Setup you are asked if you want to set up Windows 2000, repair a Windows 2000 installation, or quit Setup. When you select the Repair option by pressing R, the following information is displayed on your screen:

Windows 2000 repair options:

To repair a Windows 2000 installation by using the recovery console, press C.

To repair a Windows 2000 installation by using the Emergency Repair Process, press R.

Using each of these options to repair a Windows 2000 installation is discussed in the following sections.

Important If the repair options do not work, it might be necessary to perform an in-place upgrade. For more information about this option, see “If the Emergency Repair Process Does Not Fix Your System” later in this chapter.

Using the Recovery Console

The Recovery Console is a text-mode command interpreter that is separate from the Windows 2000 command prompt and allows the system administrator to gain access to the hard disk of a computer running Windows 2000, regardless of the file format used, for basic troubleshooting and system maintenance. Since starting Windows 2000 is not a prerequisite for using the Recovery Console, it can help you recover when your Windows 2000-based computer does not start properly or at all. The Recovery Console allows you to obtain limited access to NTFS, file allocation table (FAT), (FAT16 and FAT32) volumes without starting the graphical interface. The Recovery Console allows administrators and Microsoft Product Support Services technicians to start and stop services, and repair the system in a very granular way. It can also be used to repair the master boot record (MBR) and boot sector and to format volumes. The Recovery Console prevents unauthorized access to volumes by requiring the user to enter the system administrator password.

Note If you are using software mirroring or if you are running the Recovery Console using a Remote Install Server, see the Microsoft Knowledge Base link on the Web Resources page at <http://windows.microsoft.com/windows2000/reskit/webresources>.

Starting the Recovery Console

To start the Recovery Console, start the computer from the Windows 2000 Setup CD or the Windows 2000 Setup floppy disks. If you do not have Setup floppy disks and your computer cannot start from the Windows 2000 Setup CD, use another Windows 2000–based computer to create the Setup floppy disks. For more information about creating the Windows 2000 Setup floppy disks, see “Planning a Reliable Configuration” in this book or Windows 2000 Server Help.

If the Recovery Console was installed on the local hard disk, it can also be accessed from the Windows 2000 startup menu. However, if the MBR or the system volume boot sector has been damaged, you need to start the computer using either the Windows 2000 Setup floppy disks or the Windows 2000 Setup CD to access the Recovery Console.

To add the Recovery Console to existing installations of Windows 2000, on the **Start** menu, click **Run**, and then type:

```
F:\I386\Winnt32.exe /cmdcons
```

where **F** is the CD-ROM drive letter.

This installation requires approximately 7 megabytes (MB) of disk space on your system partition.

Important You cannot preinstall the Recovery Console on a computer that contains a mirrored volume. First break the mirror, then install the Recovery Console. After the Recovery Console is installed, you can re-establish the mirrored volume. For more information, see the Microsoft Knowledge Base link on the Web Resources page at <http://windows.microsoft.com/windows2000/reskit/webresources>.

Start the computer and enter Windows 2000 Setup. Press ENTER at the “Setup Notification” screen. Press R to repair a Windows 2000 installation, and then press C to use the Recovery Console.

When the Recovery Console is started, the following information is displayed:

```
Microsoft Windows 2000(TM) Recovery Console.
```

```
The Recovery Console provides system repair and recovery  
functionality.
```

```
Type EXIT to quit the Recovery Console and restart the computer.
```

```
1: C:\WINNT
```

```
Which Windows 2000 installation would you like to log onto  
(To cancel, press ENTER)?
```

Important If there is more than one installation of Windows 2000 or Microsoft® Windows NT® 4.0 or earlier, they are also shown in the Recovery Console startup menu.

Mirrored volumes appear twice in the Recovery Console startup menu, but each entry has the same drive letter so they are actually the same drive.

Changes made in the Recovery Console to mirrored volumes are mirrored.

To access the disk by using the Recovery Console, press the number key representing the Windows 2000 installation that you want to repair, and then press ENTER. The Recovery Console then prompts you for the administrator password. If you press ENTER without typing a number, the Recovery Console exits and restarts the computer.

Note To use the Recovery Console, you must know the password for the local Administrator account. If you do not have the correct password, Recovery Console does not allow access to the computer. If an incorrect password is entered three times, the Recovery Console quits and restarts the computer. However, you can use either the Group Policy snap-in or the Security Configuration and Analysis snap-in to specify automatic administrative logon.

Once the password has been validated, you have full access to the Recovery Console, but limited access to the hard disk. You can only access the following folders on your computer:

- %SystemRoot%. If you have multiple Windows installations, this is on the partition that contains Boot.ini and other Windows files required to start the system.

- %Windir% and subfolders of the Windows 2000 installation that you are currently logged on to.
- %SystemRoot%\Cmdcons and its subfolders.

Note With the **set** command enabled, you can copy files to removable media and access all paths on the system. The **set** command is an optional Recovery Console command that can be enabled by either the Group Policy snap-in or the Security Configuration and Analysis snap-in. For more information about the **set** command, see “Supported Commands” later in this chapter.

The Recovery Console prevents access to other folders such as Program Files or Documents and Settings, as well as to folders containing other installations of Windows 2000. However, you can use the **logon** command to access an alternate installation. Alternatively, you can gain access to other installation folders by restarting the Recovery Console, choosing the number representing that installation, and then entering the administrator password for that installation. You cannot copy a file from the local hard disk to a floppy disk, but you can copy a file from a floppy disk or a CD-ROM to any hard disk, and from a hard disk to another hard disk. However, with the **set** command enabled, you can copy files to a floppy disk. The Recovery Console displays an “Access is denied” error message when it detects invalid commands.

Important The **set** command makes use of Recovery Console environment variables to enable, among other options, disk write access to floppy disks. To enable the user to modify the restricted default Recovery Console environment variables, a policy setting must be made. For more information about enabling the **set** command in Recovery Console, see the procedure later in this section.

The Recovery Console buffers previously entered commands and makes them available to the user with the up and down arrow keys. To edit a previously entered command, use **backspace** to move the cursor to the point of the edit and retype the remainder of the command. At any point, you can quit the Recovery Console and restart the computer by typing **exit** at the command prompt.

Important The Recovery Console might not map disk volumes with the same drive letters that they have in Windows 2000. If you are having trouble copying files from one location to another, use the **map** command from the Recovery Console to make sure that the drive mappings for both the source and the target locations are correct.

Several of the Recovery Console commands are not fully functional to users who have converted to dynamic disks. For more information about dynamic disks, see the chapter “Disk Concepts and Troubleshooting” in this book.

Supported Commands

Table 13.1 lists the commands that are supported by the Recovery Console. You can use the **help** command to list the commands supported by the Recovery Console.

Note The switch `/?` works with every Recovery Console command to display a help screen offering a description of the command, its syntax, definitions of its parameters, and other useful information.

Table 13.1 Available Recovery Console Commands

Command	Explanation
attrib	<p>Changes attributes on one file or directory.</p> <pre>ATTRIB -R +R -S +S -H +H -C +C filename</pre> <p>+ Sets an attribute. - Clears an attribute. R Read-only file attribute. S System file attribute. H Hidden file attribute. C Compressed file attribute.</p> <p>More than one attribute can be set or cleared at a time. To view attributes, use the dir command.</p>
batch	<p>Executes commands specified in a text file.</p> <pre>BATCH Inputfile [Outputfile]</pre> <p>Inputfile Specifies the text file that contains the list of commands to be executed. Outputfile If specified, contains the output of the specified commands. If not specified, the output is displayed on the screen.</p>

Batch cannot be one of the commands included in the Inputfile.

continued

Table 13.1 Available Recovery Console Commands *(continued)*

Command	Explanation
cd/chdir	<p>Displays the name of the current directory, or switches to a new directory.</p> <pre>CHDIR [path] CHDIR [..] CHDIR [drive:] CD [path] CD [..] CD [drive:] CD .. Specifies that you want to change to the parent directory.</pre> <p>Type CD [drive:] to display the current directory in the specified drive. Type CD without parameters to display the current drive and directory.</p> <p>The chdir command treats spaces as delimiters. Use quotation marks around a directory name containing spaces. For Example:</p> <p>cd “\winnt\profiles\username\programs\start menu”</p> <p>Chdir operates only within the system directories of the current Windows installation, removable media, the root directory of any hard disk partition, or the local installation sources.</p>
chkdsk	<p>Checks a disk and displays a status report,</p> <pre>chkdsk [drive:] [/p] [/r]</pre> <p>[drive:] Specifies the drive to check.</p> <p>/p Check even if the drive is not flagged dirty. bad.</p> <p>/r Locates bad sectors and recovers readable information (implies /p).</p> <p>Chkdsk may be used without any parameters, in which case the current drive is checked with no switches. You can specify the listed switches.</p> <p>Chkdsk requires the Autochk.exe file. Chkdsk automatically locates Autochk.exe in the startup (boot) directory. If it cannot be found in the startup directory, chkdsk attempts to locate the Windows 2000 Setup CD. If the installation CD cannot be found, chkdsk prompts for the location of Autochk.exe.</p>
cls	Clears the screen.

continued

Table 13.1 Available Recovery Console Commands (*continued*)

Command	Explanation																
copy	<p>Copies a single file to another location.</p> <pre>copy source [destination]</pre> <p>source Specifies the file to be copied. Destination Specifies the directory and/or file name for the new file.</p> <p>The source might be removable media, any directory within the system directories of the current Windows installation, the root of any drive, the local installation sources, or the cmdcons directory.</p> <p>The destination might be any directory within the system directories of the current Windows installation, the root of any drive, the local installation sources, or the cdirectory. The destination cannot be removable media. If a destination is not specified, it defaults to the current directory. Copy does not support replaceable parameters (wild cards). Copy prompts if the destination file already exists. A compressed file from the Windows 2000 Setup CD is automatically decompressed as it is copied.</p>																
del/delete	<p>Deletes one file.</p> <pre>del [drive:][path]filename delete [drive:][path]filename</pre> <p>[drive:][path]filename Specifies the file to delete.</p> <p>Delete only operates within the system directories of the current Windows installation, removable media, the root directory of any hard disk partition, or the local installation sources.</p> <p>Del and delete do not support replaceable parameters (wild cards).</p>																
dir	<p>Displays a list of files and subdirectories in a directory.</p> <pre>dir [drive:][path][filename]</pre> <p>[drive:][path][filename] Specifies drive, directory, and/or files to list.</p> <p>Dir lists all files, including hidden and system files.</p> <p>Files might have the following attributes:</p> <table> <tbody> <tr> <td>a</td> <td>Files ready for archiving</td> <td>h</td> <td>Hidden</td> </tr> <tr> <td>c</td> <td>Compressed</td> <td>p</td> <td>Reparse Point</td> </tr> <tr> <td>d</td> <td>Directory</td> <td>r</td> <td>Read-only</td> </tr> <tr> <td>e</td> <td>Encrypted</td> <td>s</td> <td>System file</td> </tr> </tbody> </table>	a	Files ready for archiving	h	Hidden	c	Compressed	p	Reparse Point	d	Directory	r	Read-only	e	Encrypted	s	System file
a	Files ready for archiving	h	Hidden														
c	Compressed	p	Reparse Point														
d	Directory	r	Read-only														
e	Encrypted	s	System file														

continued

Table 13.1 Available Recovery Console Commands (*continued*)

Command	Explanation
disable	<p>Disables a Windows system service or driver.</p> <pre>disable servicename</pre> <p>servicename The name of the service or driver to be disabled.</p> <p>Disable prints the old start_type of the service before resetting it to SERVICE_DISABLED. You should make a note of the old start_type, in case you need to enable the service again.</p> <p>The start_type values that the disable command displays are:</p> <pre>SERVICE_DISABLED SERVICE_BOOT_START SERVICE_SYSTEM_START SERVICE_AUTO_START SERVICE_DEMAND_START</pre>
diskpart	<p>Manages the partitions on your hard disk volumes.</p> <pre>diskpart[/add /delete] [device-name drive-name partition-name] [size]</pre> <p>/add Create a new partition /delete Delete an existing partition</p> <p>device-name Device name for creating a new partition (such as \Device\HardDisk0)</p> <p>drive-name Drive-letter based name for deleting an existing partition (such as D:)</p> <p>partition-name Partition-based name for deleting an existing partition and can be used in place of the drive-name argument (such as \Device\HardDisk0\Partition1)</p> <p>size Size of the new partition, in megabytes</p> <p>If no arguments are used, a user interface for managing your partitions appears.</p> <p>Warning</p> <p>This command can damage your partition table if the disk has been upgraded to dynamic disk. Always use Disk Management to modify the structure of dynamic disks.</p>

continued

Table 13.1 Available Recovery Console Commands (*continued*)

Command	Explanation
enable	<p>Enables a Windows system service or driver.</p> <pre>enable servicename [start_type]</pre> <p>servicename Name of the service or driver to be enabled. start_type How the service or driver is scheduled to be started. Valid start-type values are:</p> <pre>SERVICE_BOOT_START SERVICE_SYSTEM_START SERVICE_AUTO_START SERVICE_DEMAND_START</pre> <p>Enable prints the old <code>start_type</code> of the service before resetting it to the new value. Note the old value, in case it is necessary to restore the <code>start_type</code> of the service. If you do not specify a new <code>start_type</code>, enable prints the old <code>start_type</code>.</p>
exit	Quits the Recovery Console and restarts your computer.
expand	<p>Expands a compressed file.</p> <pre>EXPAND source [/F:filespec] [destination] [/Y] EXPAND source [/F:filespec] /D</pre> <p>source Specifies the file to be expanded. May not include wildcard (* and ?) characters. Destination Specifies the directory for the new file. Default is the current directory. /y Do not prompt before overwriting an existing file. /f:filespec If the source contains more than one file, this parameter is required to identify the specific file(s) to be expanded. May include wildcards. /d Do not expand; only display a directory of the files which are contained in the source.</p>

The destination might be any directory within the system directories of the current Windows installation, the root of any drive, the local installation sources, or the `Cmdcons` directory. The destination cannot be removable media. The destination file cannot be read-only. Use the **attrib** command to remove the read-only attribute. **Expand** prompts if the destination file already exists unless **/Y** is used.

continued

Table 13.1 Available Recovery Console Commands (*continued*)

Command	Explanation
fixboot	Writes a new boot sector onto the system partition. <code>fixboot [drive:]</code> drive: Specifies the drive to which a boot sector will be written, overriding the default choice of the system boot partition.
fixmbr	Repairs the master boot code of the boot partition. <code>fixmbr [device-name]</code> device-name Optional name that specifies the device that needs a new MBR. If this is left blank then the boot device is used. If fixmbr detects an invalid or nonstandard partition table signature, it prompts you before rewriting the MBR. Warning This command can damage your partition table if a virus is present or a hardware problem exists and causes partitions to become inaccessible. It is recommended that you run antivirus software before using this command. Windows 2000 includes the antivirus software AvBoot. For more information about AvBoot, see “Troubleshooting Strategies” in this book.
format	Formats a disk for use with Windows 2000. <code>format [drive:] [/q] [/fs:file-system]</code> [drive:] Specifies the drive to format. /q Performs a quick format. /fs:file-system Specifies the file system to use (FAT, FAT32, or NTFS)
help	Displays information about commands supported by the Recovery Console. <code>help [command]</code> command Any Recovery Console command. If command is not specified, all of the commands supported by the Recovery Console are listed. The command parameter is used to see the help for a specific command.
listsvc	Lists all available services and drivers on the computer.
logon	Lists the detected installations of Windows 2000, and requests the local administrator password for those installations.

continued

Table 13.1 Available Recovery Console Commands (*continued*)

Command	Explanation
map	Lists the drive letter to physical device mappings that are currently active. map [arc] arc Tells MAP to use ARC paths instead of Windows 2000 device paths.
md/mkdir	Creates a directory. md [drive:]path mkdir [drive:]path Mkdir only operates within the system directories of the current Windows installation, removable media, the root directory of any hard disk partition, or the local installation sources.
more/type	Displays a text file to the screen. more [filename] type [filename] More or type displays a text file.
rd/rmdir	Removes (deletes) a directory. rd [drive:]path rmdir [drive:]path Rmdir only operates within the system directories of the current Windows installation, removable media, the root directory of any hard disk partition, or the local installation sources.
ren/rename	Renames a single file. ren [drive:][path]filename1 filename2 rename [drive:][path]filename1 filename2 You cannot specify a new drive or path for your destination file. Rename only operates within the system directories of the current Windows installation, removable media, the root directory of any hard disk partition, or the local installation sources.

continued

Table 13.1 Available Recovery Console Commands (*continued*)

Command	Explanation								
set	<p>Displays and sets Recovery Console environment variables.</p> <pre>set variable = parameter set AllowWildCards = TRUE</pre> <p>The following environment variables are supported:</p> <table> <tr> <td>AllowWildCards</td> <td>Enable wildcard support for some commands, such as DEL, that do not otherwise support them.</td> </tr> <tr> <td>AllowAllPaths</td> <td>Allow access to all files and folders on the computer.</td> </tr> <tr> <td>AllowRemovableMedia</td> <td>Allow files to be copied to removable media, such as floppy disks.</td> </tr> <tr> <td>NoCopyPrompt</td> <td>Do not prompt when overwriting file.</td> </tr> </table> <p>To display the list of current environment variable settings, type set without parameters.</p> <p>The set command is an optional Recovery Console command that can be enabled by using either the Group Policy snap-in or the Security Configuration and Analysis snap-in.</p>	AllowWildCards	Enable wildcard support for some commands, such as DEL, that do not otherwise support them.	AllowAllPaths	Allow access to all files and folders on the computer.	AllowRemovableMedia	Allow files to be copied to removable media, such as floppy disks.	NoCopyPrompt	Do not prompt when overwriting file.
AllowWildCards	Enable wildcard support for some commands, such as DEL, that do not otherwise support them.								
AllowAllPaths	Allow access to all files and folders on the computer.								
AllowRemovableMedia	Allow files to be copied to removable media, such as floppy disks.								
NoCopyPrompt	Do not prompt when overwriting file.								
systemroot	Sets the current directory to %SystemRoot%.								

Often it is useful to enable the **set** command to make full use of the Recovery Console. To do this, a local policy must be enabled.

- **To enable full functionality of the set command using Group Policy**

Note If Group Policy has already been added to your MMC, skip to step 8.

1. From the **Start**, click **Run**, and then type **mmc**
2. Press **ENTER**.
3. In the **Console1** dialog box, click **Console**, select **Add/Remove Snap-in**, and then click **Add**.
4. Select **Group Policy**, and then click **Add**.
5. In the **Select Group Policy Object** list box, choose **Local Computer**, and then click **Finish**.
6. In the **Add Standalone Snap-in** dialog box, click **Close**.
7. In the **Add/Remove Snap-in** dialog box, click **OK**.
8. Expand **Local Computer Policy**, **Computer Configuration**, **Windows Settings**, **Security Settings**, and then **Local Policies**. Click **Security Options**.

9. Double-click the policy **Recovery Console: Allow floppy copy and access to all drives and folders**.
 10. In the **Local Security Policy Setting** dialog box, select **Enabled**, and then click **OK**.
- **To enable full functionality of the set command using the Security Configuration and Analysis snap-in**

Note If Security Configuration and Analysis snap-in has already been added to your MMC, skip to step 7.

1. From the **Start**, click **Run**, and then type
mmc
2. Press **ENTER**.
3. In the **Console1** dialog box, click **Console**, select **Add/Remove Snap-in**, and then click **Add**
4. Select **Security Configuration and Analysis**, click **Add**, and then click **Close**. In the **Add/Remove Snap-in** dialog box, click **OK**.
5. In the **Console1** dialog box, double click **Security Configuration and Analysis**. Follow the instruction to either open an existing database or create a new database.
6. In the **Console1** dialog box, follow the instructions to configure your computer and analyze your computer security settings.
7. In the **Security Configuration and Analysis** snap-in, double click **Security Configuration and Analysis**.
8. Expand **Local Policies**, and then click **Security Options**.
9. Double-click the policy **Recovery Console: Allow floppy copy and access to all drives and folders**.
10. In the **Analyzed Security Policy Setting** dialog box, select **Enabled**, and then click **OK**.

Note You can also use the Group Policy snap-in and the Security Configuration and Analysis snap-in to select the policy **Recovery Console: Allow automatic administrative logon**.

Replacing the Registry Using the Recovery Console

If you are having problems with the registry, you can use the **copy** command to replace individual registry files by copying them from either the %SystemRoot%\Repair folder or the %SystemRoot%\Repair\RegBack folder.

Important If you copied the files from %SystemRoot%\Repair\RegBack, your registry settings reflect those that were in effect when you selected the **System State** option during Backup operations.

If you copied the files from %SystemRoot%\Repair, your registry settings reflect those that were in effect when you installed Windows 2000.

Recreating Boot.ini Using the Recovery Console

You can use the Emergency Repair Process to replace a missing or corrupted Boot.ini file. Alternatively, you can use the **map** command to determine the location of the disks. With this information, you can create a Boot.ini file on another computer, and then use a floppy disk to transfer the Boot.ini file to the original computer.

Using the Emergency Repair Disk

If your system does not start, and using safe mode or the Recovery Console has not helped, you can try using the Emergency Repair Disk (ERD) option of Backup. Backup includes a wizard to help you create an ERD. If a system failure occurs, you can start the system using the Windows 2000 Setup CD or the Windows 2000 Setup floppy disks which can be created by running Makeboot.exe from the Bootdisk folder on the Windows 2000 Setup CD. Then use the Emergency Repair Process to restore core system files.

Make sure to create an ERD when your computer is functioning well so that you are prepared if you need to repair system files. The ERD allows you to make only basic system repairs, such as to the system files, boot sector, and startup environment. The ERD does not back up data, programs, or the registry and is not a replacement for regular system backups.

Important The Windows 2000 ERD, unlike the ERD used with Windows NT, does not contain a copy of the registry files. The backup registry files are in the folder %SystemRoot%\Repair. However, these files are from the original installation of Windows 2000. In the event of a problem, they can be used to return your computer to a usable state.

When you back up system state data, a copy of your registry files is placed in the folder %SystemRoot%\Repair\Regback. If your registry files become corrupted or are accidentally erased, use the files in this folder to repair your registry without performing a full restore of the system state data. This method is recommended for advanced users only and can also be accomplished by using the Recovery Console commands.

Creating the Emergency Repair Disk

When the ERD is created, the files listed in Table 13.2 are copied from %SystemRoot%\Repair to a floppy disk.

Table 13.2 Contents of the Repair Directory Created by Windows 2000 Setup

File Name	Contents
Autoexec.nt	A copy of %SystemRoot%\System32\Autoexec.nt, which is used to initialize the MS-DOS environment.
Config.nt	A copy of %SystemRoot%\System32\Config.nt, which is used to initialize the MS-DOS environment.
Setup.log	A log of which files were installed files, and Cyclic Redundancy Check (CRC) information for use during the Emergency Repair Process. This file has the read-only, system, and hidden attributes, and it is not visible unless you have configured My Computer to show all files.

Create the ERD after Windows 2000 is installed. Recreate the ERD after each service pack, system date, or updated driver is installed. Be sure to make a copy of your current ERD and store it in a secure location, perhaps off-site.

Note The ERD is not a replacement for backups!

For more information about the %SystemRoot%\Repair and %SystemRoot%\System32\Config folders and the ERD, see the Knowledge Base link on the Web Resources page
<http://windows.microsoft.com/windows2000/reskit/webresources>.

Emergency Recovery Process

If you have prepared an ERD, you can use it to help repair system files after starting the computer using either the Windows 2000 Setup CD or the Windows 2000 Setup floppy disks. However, the Windows 2000 Setup CD is required for replacing any damaged files.

The ERD must include current configuration information. Make sure that you have an ERD for each installation of Windows 2000 on your computer, and never use an ERD from another computer.

Note You cannot repair all disk problems by using the ERD.

When you start the Emergency Repair Process, the following information is displayed on the screen:

This operation will attempt to repair your Windows 2000 system.

Depending on the type of damage present, this operation might or might not be successful. If the system is not successfully repaired, restart Setup and choose the option to recover a destroyed system or system disk.

Select one of the following repair options:

- **Manual Repair.** To choose from a list of repair options, press M.
- **Fast Repair.** To perform all repair options, press F.

If you select **Manual Repair**, the registry files are not checked. If you select **Fast Repair**, and if the folder %SystemRoot%\Repair is accessible, the registry files are checked. If the folder %SystemRoot%\Repair is inaccessible (for example, due to file system corruption) the registry files are not checked.

- **Manual Repair.** It is recommended that only advanced users or administrators choose this option. Using it, you can repair system files, boot sector problems, and startup environment problems.

- **Fast Repair.** This is the easier option to use, and does not require user input. If you choose this option, the Emergency Recovery Process attempts to repair problems related to system files, the boot sector on your system disk, and your startup environment (if your computer has more than one operating system installed). This option also checks and repairs the registry files by loading and unloading each registry key. If a key is not successfully checked, it is automatically copied from the repair directory to the folder %SystemRoot%\System32\Config.

If you choose Fast Repair, all repair options are performed. Manual Repair allows you to select from the following three options:

Inspect Startup Environment Inspect Startup Environment verifies that the Windows 2000 files in the system partition are correct. If any of the files that are needed to start Windows 2000 are missing or corrupted, Repair replaces them from the Windows 2000 Setup CD. These include NTLDR and Ntdetect.com. If Boot.ini is missing, it is recreated.

Verify Windows 2000 System Files Verify Windows 2000 System Files uses a checksum to verify that each installed file is good and that it matches the file that was installed from the Windows 2000 Setup CD. If the recovery process determines that a file on the disk does not match what was installed, it displays a message that identifies the file and asks if you want to replace it. The Emergency Repair Process also verifies that startup files, such as NTLDR and Ntoskrnl.exe, are present and valid.

Inspect Boot Sector Inspect Boot Sector verifies that the boot sector on the system partition still references NTLDR. The Emergency Repair Process can only replace the boot sector for the system partition on the first hard disk. The Emergency Repair Process can also repair the boot sector for the system partition on the startup disk.

If you choose Fast Repair, all repair options are performed.

If the Emergency Repair Process Does Not Fix Your System

If you have performed the Emergency Repair Process and the computer still does not operate normally, you can use the Windows 2000 Setup CD to perform an in-place upgrade over the existing installation. This is a last resort before reinstalling the operating system. Note that the time required to complete the following procedure is equal to the time it takes to reinstall the operating system.

- **To perform an in-place upgrade of Windows 2000**
 1. Mount the Windows 2000 Setup CD.
 2. Press **Enter** to install a copy of Windows 2000.
 3. When you are prompted to repair the existing Windows 2000 installation, press R.

Note Windows 2000 Setup performs an in-place upgrade of your existing installation. However, you might lose some customized settings of your system files.

Restoring System State Data

In Microsoft® Windows® 2000 Server, system state data comprises the registry, COM+ Class Registration database, system startup files, and the Certificate Services database (if the server is a certificate server). If the server is a domain controller, Active Directory™ directory services and the Sysvol directory are also contained in the system state data. If the server is running the Cluster service, the system state data also includes resource registry checkpoints and the quorum resource recovery log, which contains the most recent cluster database information.

When you restore the system state data, all system state data that is relevant to your computer is backed up or restored: you cannot back up or restore individual components of the system state data. This is due to dependencies among the system state components. However, you can restore the system state data to an alternate location, and only the registry files, Sysvol directory files, Cluster database information files, and system startup files are restored to the alternate location. The Active Directory database, Certificate Services database, and COM+ Class Registration database are not restored if you designate an alternate location when you restore the system state data.

Note You can only back up and restore the system state data on a local computer: you cannot back up and restore the system state data on a remote computer.

- **To restore system state data**
 1. Start Backup.
 2. Click the **Restore** tab, and then select the check box for any drive, folder, or file that you want to restore.

3. Click the box next to **System State** to restore the system state data along with any other data you have selected for the current restore operation.

Caution If you restore the system state data, and you do not designate an alternate location for the restored data, Backup erases the system state data that is currently on your computer and replaces it with the system state data you are restoring.

You must be an administrator or a backup operator to restore files and folders. For more information about restoring the system state data to a domain controller and about authoritative restores, see the *Microsoft® Windows® 2000 Server Resource Kit Distributed Systems Guide*.

Restoring the Registry

When you back up the system state data, a copy of your registry files is also saved in %SystemRoot%\Repair\Regback. If your registry files become corrupted or are accidentally erased, you can use these files to repair the registry without performing a full restore of the system state data. This method is recommended only for advanced users.

Note Backup does not allow you to restore only the registry files. If you use Backup to restore lost data to the registry, all system state data is replaced.

You can also use Backup to restore lost data to the registry. The system must be stable enough for you to open Backup. If your computer cannot start, you might be able to repair the operating system using an ERD. The **Fast Repair** option of the Emergency Repair Process checks and, if necessary, replaces each registry key by copying it from the repair directory to the folder %SystemRoot%\Config.

If you cannot fix the problem with the registry by performing the Emergency Repair Process or by selecting **Last Known Good Configuration** from the **Windows 2000 Advanced Options** menu, it might be necessary to reinstall the operating system and device drivers and to reconfigure the system before you can restore the data.

Restoring Data

If files, the registry, or directory services are not accessible, you need to restore them. Restore operations are only possible if you have used Backup or another program to backup the files on your computer. Backup allows you to restore the entire backup medium, one or more backup sets, or individual files. After the restore operation starts, you have the option of restoring the local registry and directory service as well. All catalog information is normally maintained on the corresponding medium for that backup set.

When you insert a backup medium to restore information, only information about the first backup set is displayed. To restore the entire medium, load the catalog first. Otherwise, when you select a medium, you are selecting only the displayed sets.

Restoring Files from Third-Party Backup Programs

You can use Backup to restore data from a tape that was backed up with a program other than Backup if the tape is in the Microsoft tape format (MTF). Although the tape might not have the full on-tape catalog (OTC) information that Backup produces, it should have equivalent information. Also, some older tape backup devices might not support creating full OTCs with Backup. Contact the vendor if you suspect that your tape backup device does not support creating a full OTC.

Restoring File Security Settings

Backup preserves permissions, ownership, and audit flags on files restored to NTFS volumes but not on files restored to FAT volumes. It is not possible to secure information on FAT volumes.

When you restore files to a new computer or hard disk, you do not have to restore security information. The files inherit the permissions of the directory in which they are placed. If the directory has no permissions, the file retains its previous permissions, including ownership.

Recovering Your Disk Configuration

In case of a disaster, you can recreate your disk structures and signatures by using the Disk Signature information displayed when you used the Dir command.

You can restore disk, partition, and volume configurations by using the results from the DumpConfig command-line tool (Dumpconfig.exe). For more information about DumpConfig, see the *Distributed Systems Guide*.

Recovering a Mirrored or RAID-5 Volume

The process of error detection and recovery for software fault-tolerant volumes is similar for both mirrored volumes and RAID-5 volumes. The Windows 2000 response to the problem depends on when the problem occurred. For recovery of a hardware fault-tolerant volume, see the documentation for the controller that you are using.

Note Marking a mirror as failed does not occur during a read, only during a write. The read cannot affect the data on the disks, so performing mirror error processing is not necessary.

The operating system usually continues to work normally. Users accessing resources over the network usually are not affected.

Be sure to back up important data immediately, because the volume is no longer fault tolerant. Use a new tape for backup, not an existing tape. Replace the failed disk and begin the recovery of the mirrored volume or RAID-5 volume as soon as possible. During system initialization, if the system cannot locate a partition in a mirrored volume or a RAID-5 volume, it logs a severe error in the event log, marks the volume as Failed Redundancy and uses the remaining portions of the mirrored volume or RAID-5 volume. The system continues to function by using the fault-tolerant capabilities inherent in such volumes. For more information about the status of volumes displayed in the Disk Management snap-in, see “Planning a Reliable Configuration” in this book.

Recovering a Mirrored Volume

A mirrored volume is provides fault tolerance by duplicating data on two disks. If one disk fails, the data on the failed disk becomes unavailable, but the system continues to operate using the unaffected disk.

If the failure of a mirrored volume did not cause any disruption in service, you can continue running in a non-fault-tolerant configuration and schedule a time to reconstruct the mirrored volume. This activity can occur during a normally scheduled maintenance period or during a less busy time. However, if you have a spare disk in the configuration, you can reconstruct the mirror immediately.

Note The failed disk can be replaced with any disk that is the same size or larger.

It is a good idea to use a disk as similar to the remaining disk as possible.

When you move or replace a disk that was at the end of a SCSI bus, be sure that you terminate only the disk that is now at the end of the bus.

When a member of a mirrored volume is orphaned, you need to break the mirrored volume to expose the remaining volume as a separate volume. The remaining member of the mirrored volume receives the drive letter that was assigned to the complete mirrored volume. The orphaned volume receives the next available drive letter or a new letter assigned to it.

You can then create a new mirrored volume from unused free space on another disk. When you restart the computer, the data from the working volume is copied to the new member of the mirrored volume.

Note In Windows NT 4.0 and earlier, mirrored volumes were known as mirror sets. Disk Management renames all mirror sets to Mirrored Volume. These mirrored volumes reside only on basic disks.

Repairing a Basic Mirrored Volume

When you follow the procedure to repair a basic mirrored volume, the status of the mirrored volume changes to Regenerating and then Healthy. If the volume does not return to the Healthy status, right-click the volume, and then click **Resynchronize Mirror**.

Note If a basic disk containing part of a mirrored volume is disconnected or fails, the status of the mirrored volume becomes Failed Redundancy and the disk status remains Online. If this happens, you can try to repair the volume.

When you repair a mirrored volume on a basic disk, Disk Management creates a new mirror on a healthy disk and then resynchronizes the new mirror.

Repairing a mirrored volume on a basic disk requires another basic disk with sufficient free space for the new mirror. If an additional disk is not available, the **Repair Volume** option is unavailable and you cannot repair the volume.

You must use a basic disk to repair a basic mirrored volume (mirror set). You cannot use a dynamic disk.

Replacing a Failed Mirror

If the disk containing part of the mirrored volume cannot be reactivated and the volume does not return to the Healthy status, replace the failed mirror with a new mirror on another disk.

- **To replace the failed mirror with a new mirror on another disk**
 1. Open Disk Management.
 2. Right-click the mirror on the missing or offline disk, and then click **Remove Mirror**. Follow the instructions on your screen.
 3. Right-click the volume to be remirrored, and then click **Add Mirror**. Follow the instructions on your screen.

To replace a mirror in the mirrored volume, you need a dynamic disk with unallocated space that is at least as large as the region to repair. If you don't have a dynamic disk with enough unallocated space, the Add Mirror command is unavailable.

Breaking a Mirrored Volume

Breaking the mirrored volume results in two independent partitions or logical drives. No information is deleted, but the data is no longer redundant. Back up the volume before breaking a mirrored volume.

Deleting Mirrored Volumes on a Basic Disk

Deleting a mirrored volume deletes all the data contained in the volume as well as the partitions that make up the volume. You can delete only entire mirrored volumes.

Resynchronizing Mirrored Volumes

Resynchronize a mirrored volume when data on one disk becomes stale. For example, if one disk of a mirrored volume is disconnected, data is written to the remaining disk, but the volume is no longer fault tolerant. If you reconnect the disk, the data on the reconnected disk is stale. To make the mirrored volume fault tolerant again, resynchronize the mirrored volume to update the information on the reconnected disk. In most cases, mirrored volumes on dynamic disks are resynchronized automatically. However, you need to use the Resynchronize Mirror command for mirrored volumes on basic disks.

Removing Mirrored Volumes

Once you remove a mirror from a mirrored volume, that mirror becomes unallocated space; the remaining mirror becomes a simple volume and is no longer fault tolerant. All data on the removed mirror is deleted.

Recovering a RAID-5 Volume

When a member of a mirrored or RAID-5 volume fails, it becomes an orphan. The operating system determines that it can no longer be used and directs reading and writing all new data to the remaining members of the fault-tolerant volume.

When a member of a RAID-5 volume fails, you can reconstruct the data for the failed member from the remaining members. In Disk Management, select a new area of free space that is the same size as or larger than the other members of the RAID-5 volume, and then regenerate the data. If you are required to restart the computer, the volume manager reads the information from the stripes on the other member disks and then reconstructs the data of the missing member and writes it to the new member.

To regenerate a RAID-5 volume, the volume must be locked by the operating system. All network connections to the volume are lost when a volume is regenerated.

Note Do not put your page file on a RAID-5 volume because it degrades performance. If you want your page file on a fault-tolerant volume, use a mirrored volume instead.

Replacing a Stripe in the RAID-5 Volume

To replace a stripe in the RAID-5 volume, you need a dynamic disk with unallocated space that is at least as large as the stripe to repair. If you don't have a dynamic disk with enough unallocated space, the **Repair Volume** command is unavailable.

When a member of a RAID-5 volume fails in a severe manner (such as a loss of power or a hard disk failure), it becomes an orphan. If this happens, you can regenerate the data for the orphaned member from the remaining members of the RAID-5 volume.

If the RAID-5 failure is due to a power or cabling failure on a single device, you can regenerate the data within the orphaned member of the RAID-5 volume once the hardware state is restored.

Note The RAID-5 volume does not display the Healthy status in Disk Management until regeneration is complete.

Deleting a RAID-5 Volume on a Basic Disk

Deleting a RAID-5 volume deletes all the data contained in the volume as well as the partitions that make up the RAID-5 volume. You can delete only entire RAID-5 volumes.

Note In Windows NT 4.0 and earlier, RAID-5 volumes were known as stripe sets with parity. Disk Management renames all stripe sets with parity to RAID-5 Volumes. In Windows 2000, you can delete RAID-5 volumes that were created in Windows NT 4.0 or earlier, but you cannot create RAID-5 volumes on basic disks.

Repairing a RAID-5 Volume on a Basic Disk

If a basic disk containing part of a RAID-5 volume is disconnected or fails, its status becomes Failed Redundancy and the disk status remains Online. If this happens, you can try to repair the volume. The RAID-5 status of the volume should change to Regenerating and then Healthy.

When you repair a RAID-5 volume on a basic disk, Disk Management relocates part of the RAID-5 volume to a healthy disk, regenerates the parity, and then returns the status to Healthy.

Repairing a RAID-5 volume on a basic disk requires an additional basic disk with sufficient free space for part of the RAID-5 volume. If an additional disk is not available, the **Repair Volume** option is not available and you cannot repair the volume. If the disk containing part of the RAID-5 volume cannot be reactivated and the volume does not return to the Healthy status, replace the failed stripe in the RAID-5 volume.

Note You must use a basic disk to repair a basic RAID-5 volume: you cannot use a dynamic disk.

Recovering Data in Remote Storage

Remote Storage maintains data critical for operation in three areas: the reparse data that exists on each managed file; the Remote Storage database files; and the Remote Storage media. If Remote Storage data becomes corrupted or is damaged by a virus, you need to implement recovery procedures.

Using Rstore.exe

Periodically, the Remote Storage engine makes a backup of the Jet databases. Each time a file is copied or migrated to tape, these databases are automatically backed up. If required, this data might be used to restore the Jet database. The Registry Restore utility Rstore.exe is provided with Remote Storage to recover the Jet database from the backup files.

Note This data cannot simply be copied from the EngDb.bak subdirectory to the EngDb subdirectory. The files need to be restored to the same system path, including drive letter and directory structure. For example, if the system path is D:\Winnt\System32\Remotestorage\Engdb before the recovery, then after the recovery the path is still D:\Winnt\System32\Remotestorage\Engdb. This is a requirement based on the Jet database recovery mechanisms, which only recovers the Jet database to the original path location.

- **To use Rstore**
 1. Using an MS-DOS window, change directories to the %SystemRoot%\System32\Remotestorage\Engdb subdirectory.
 2. Delete the contents of this subdirectory.
 3. Run Rstore.exe from the %SystemRoot%\System32\Remotestorage\Engdb subdirectory. Rstore.exe requires one parameter which identifies the location of the backup subdirectory. Typically, the following command is entered:
Rstore %SystemRoot%\System32\Remotestorage\Engdb.bak

Restoring the Remote Storage and Removable Storage Databases

There are two reasons for restoring the Remote Storage database, each with its own restore procedure. Use the appropriate method to restore the Remote Storage database in the following circumstances:

- After completely reinstalling Windows 2000, you need to restore the Remote Storage database files before you can recall files from offline storage.
- The Remote Storage database is damaged.

Note If you try to access a file in offline storage when the Remote Storage service is not installed, you might receive the following error message:

path and file name The file can not be accessed by the system.

If Remote Storage is installed but does not start you might receive the following error message:

Path and file name The remote storage service was not able to recall the file.

Restoring the Removable Storage Databases

After completely reinstalling Windows 2000, restore the Removable Storage databases before you restore the Remote Storage database. Each time Remote Storage migrates data to tape, these databases are automatically backed up to the media containing the migrated data. It is recommended that the databases on this media be used since they will contain the most recent copy of the Removable Storage database. Use the following procedure to restore the Removable Storage databases.

Note For the following procedure, you need to reinstall Windows 2000 into the same folder and drive previously used. If Windows 2000 is installed to a different folder, the restore operation cannot return the databases to their original location.

- **To restore the Removable Storage databases**

Caution This procedure can cause you to lose changes to the Removable Storage database made after Remote Storage was backed up and before it was restored.

1. Verify that your tape or storage device is online and functioning. Start the Computer Management snap-in by right-clicking **My Computer**. Click **Manage**, double-click the **Storage** branch to expand it, and then click **Removable Storage**.
2. Open the **Media** pools and look in the **Import** pool. Locate the most recent tape used to store the Remote Storage migrated files. The default name for Remote Storage media is "RS" appended with the computer name and an incremental number (for example, "RS-MachineX-1"). The media with the highest number contains the most recent database backup. If the Remote Storage media spans two or more tapes, catalog these tapes using Backup (temporarily move these tapes to the **NTBackup Media** pool) and check the dates of the Remote Storage databases. Use the one with the most recent date.
3. Move this media to the **NTbackup Media** pool. If the pool does not exist, start Backup, and it is created automatically.
4. Use Backup to catalog the tape to find the latest copy of the Removable Storage and Remote Storage databases. These databases are stored on tape in the folders %windir%\system32\Ntmsdata and %windir%\system32\RemoteStorage. Check the dates of the files to determine the most recent copies.
5. Select the most current versions of the NtmsData and RemoteStorage folders to be restored. Make sure that all files below these sub-folders are also selected.

6. In the **Restore files to** box, click **alternate location**, and then click the drive that contains the Windows folder.

Caution If the previous step is not performed, the databases are restored to the Remote Storage managed volume instead of the Windows 2000 operating system partition.

7. Click **Start Restore**, and then click **Advanced**. Click **Restore Removable Storage Database**, click **OK**, and then click **OK**.
8. After this process finishes, restart your computer.

Restoring the Remote Storage Database After Completely Reinstalling Windows 2000

Before restoring the Remote Storage database, reinstall Windows 2000 to the same drive and folder as the previous installation. During Setup, do not add the Remote Storage component. If this component was added accidentally or automatically, remove it, and then restart your computer.

Important The following procedure assumes that you have completely reinstalled Windows 2000; that volumes that contain Remote Storage managed data are still intact; and that you have already performed the procedure to restore the Removable Storage databases.

- **To restore the Remote Storage database after completely reinstalling Windows 2000**
 1. Start the Removable Storage snap-in and verify that the databases have been restored. You can do this by looking to see if all of your media pools are present and the media are in their appropriate pools.
 2. In Control Panel, use **Add/Remove Programs** to add Remote Storage .
 3. Restart your computer, log on, and then using the Computer Management snap-in, expand the **Services And Applications** branch, and then click **Services**. Verify that the following services are stopped:
 - Remote Storage Engine
 - Remote Storage File
 - Remote Storage Media
 - Remote Storage Notification
 4. At a command prompt, change to the %SystemRoot%\System32\RemoteStorage\Engdb folder, and then verify that this folder is empty by moving the files to another folder.

5. Use the **Rstore.exe** tool to run the following command from the Engdb folder.
Type:
Rstore %systemroot%\system32\RemoteStorage\engdb.bak
6. In the Computer Management snap-in, expand **Services And Applications**, and then click **Services**. Locate and start the following services:
 - Remote Storage Engine
 - Remote Storage File
 - Remote Storage Media
7. Open the Remote Storage snap-in and verify that your managed volumes appear and that all settings are correct. You may also want to test by recalling a few of the migrated files before putting the server back into production.

Restoring a Damaged Remote Storage Database

The following procedure assumes that the Removable Storage database is intact and that you are only restoring the Remote Storage database. For detailed information about restoring the Removable Storage database, see “Restoring the Removable Storage Databases” earlier in this chapter.

- **To restore a damaged Remote Storage database**
 1. In the Computer Management snap-in, expand **Services And Applications**, and then click **Services**. Verify that the following services are stopped:
 - Remote Storage Engine
 - Remote Storage File
 - Remote Storage Media
 - Remote Storage Notification
 2. Using Removable Storage, open the **Media** pools and view in the **Import** pool. Locate the most recent tape used to store the Remote Storage migrated files. The default name for Remote Storage media is "RS" appended with the computer name and an incremental number. For example, RS-MachineX-1. The media with the highest number contains the most recent backup of the databases.
 3. Move this media to the **NTbackup** media pool. If the pool does not exist, start Backup.

- Using Backup, catalog the tape to find the latest copy of the Remote Storage database on tape in the %Windir%\System32\RemoteStorage folder. Check the dates of the files to find the most recent copies.

Note If the Remote Storage media spans two or more tapes, catalog these tapes using Backup (temporarily move these tapes to the **NTBackup Media** pool). Check the dates of the Remote Storage databases and use the most recent one.

- Select the most current RemoteStorage folder to be restored, and make sure that all files under this folder are also selected.
- In the **Restore files to** dialog box, click **Alternate location**, and then click the drive that contains the Windows folder.

Caution If the previous step is not performed, the databases are restored to the Remote Storage managed volume instead of the Windows 2000 operating system partition.

- After the restoration finishes, at the command prompt, type:
%systemroot%\system32\RemoteStorage\engdb

Note Make sure that this folder is empty by moving any existing files to another folder.

- Use the **Rstore.exe** tool to run the following command from the Engdb folder. Type:
Rstore %systemroot%\system32\RemoteStorage\engdb.bak
- After this command finishes, place the Remote Storage media used during the restoration in the RemoteStorage media pool.
- In the Computer Management snap-in, expand **Services And Applications**, and then click **Services**. Locate and start the following services:
 - Remote Storage Engine
 - Remote Storage File
 - Remote Storage Media
- Open the Remote Storage snap-in and verify that your managed volumes appear and that all settings are correct. You might also want to test by recalling some migrated files before putting the server back into production.

Recovering Managed Files

Remote Storage data is stored in the MTF format. To recover managed files from the system backup, perform the same restore operations that you would use to restore files that are not managed by Remote Storage. Remote Storage detects when restore operations have occurred and schedules a validate job to run against the restored volume. The restore function on a Backup tape restores the reparse points and all files that are not managed by Remote Storage. By default, when Backup backs up files in Remote Storage, the reparse data (not the full file) is backed up. For this reason you still need the Remote Storage media with the Remote Storage databases to recall the files from the reparse point and fully recover a managed volume.

If the volume was destroyed and you have backups of the reparse point data, you can recover by either restoring the reparse point data from tape or restoring the Remote Storage and Removable Storage databases from the Remote Storage media. For more information, see “Restoring the Remote Storage Database” earlier in this chapter.

Caution As a last resort (for example, if remote storage recovery was not successful), use Backup to restore data from the Remote Storage media.

Using Backup to restore data from the Remote Storage media can cause problems under the following circumstances:

- More than one version of the file exists on the Remote Storage media. For example, if a file was migrated, recalled, modified, and then migrated again, the wrong version of the file might be restored.
 - A user has deleted a file that no longer needs to be archived. The file still resides on the tape even though the reparse point to it is severed.
-

- **To recover Remote Storage files**

Remote Storage does not recall files while they are being recovered.

1. Open the Removable Storage snap-in, and then locate the Remote Storage tapes in the import media pool or the Remote Storage pool.
2. Open Backup to create a media pool in Removable Storage.

3. Right-click the appropriate media, click **Copy**, right-click the Backup pool, and then click **Paste**.

–Or–

Highlight the media, and then drag it to the Backup pool.

Note Backup needs to have been opened before a pool can be created in Removable Storage. Backup then needs to be restarted before it can recognize the media that is pasted into its pool. This needs to be done with care, because this temporarily prevents recalls from occurring if Remote Storage is installed and running.

4. After recovering the needed files, cut and paste the media back into the Remote Storage media pool.

Use the Backup restore function to catalog and view the available directories and files to be restored. The tape contains the directory names and the date of the Remote Storage and Removable Storage database files.

Each set needs to be individually cataloged to produce a listing of all files on the tape. All files and directories that were managed are visible in the right pane after expanding the directory associated with the file. The restore function allows the restoration of files to the same directory as well as to alternative locations. If you want the file to be able to be recalled from the managed placeholder, restore it to an alternative location. The restore operation returns the file to the state that the file was in at time of management.

Recovering from Bad Media

Tape media can wear out, become unstable, or become unusable. If this happens, you can make a media copy and recover using the media copy set. This process ensures that the managed data is safe for a longer period of time. If you cannot make a media copy because only one drive is available or no tapes are available, set the write-protect tab on the medium. Only use this procedure if the medium is unstable or unusable. If a master medium becomes unusable, use the following procedure to recreate the master media for Remote Storage recall use.

- **To recreate the master media**
 - In the Remote Storage snap-in, on the individual media property page, submit a recreate master from the recovery page, using the latest media copy.

There is a potential for lost data because the copy was older than the master that was in place. This allows for the recovery of the data up to the point where the media copy was last updated. At this point, the original master is marked “bad” and all data is accessed through the recreated master.

Additional Resources

- For more information about using tools such as the ERD and the Recovery Console, see Windows 2000 Server Help.

