

DiskWarrior™



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Chapter 1

Introduction

Welcome to DiskWarrior

Alsoft, The Utility Company

At Alsoft, we have been writing software for Mac OS computers since 1984. Our expertise is in providing powerful, useful, and safe utilities that enhance the Mac OS user experience while maintaining the ease-of-use that Macintosh owners expect. Some of these utilities include DiskExpress®, MasterJuggler®, PlusMaker™, and PlusOptimizer™.

When we introduced DiskExpress in 1986, it was the first and only disk optimizer for the Macintosh. It has always been the safest, most reliable, and most powerful disk optimization package available for Mac OS computers. Our MasterJuggler Pro is the most comprehensive font management utility package on the market today. In January 1998 Apple introduced their new disk format, known as Mac OS Extended format or HFS Plus, for Mac OS computers with the release of Mac OS 8.1. Simultaneously, Alsoft introduced PlusMaker to let you effortlessly convert your older HFS disks to the new format. Later that year when Alsoft shipped PlusOptimizer, it was the first disk optimizer compatible with Mac OS 8.1 and HFS Plus. You can expect to find the safest and most powerful disk directory damage prevention and elimination utility for Mac OS computers only from Alsoft.

What is DiskWarrior?

DiskWarrior is a utility designed from the ground up with a totally different approach to preventing and resolving directory damage. DiskWarrior's exclusive DiskShield™ prevents disk damage by checking the validity of any data being written to the directory to prevent errant programs from destroying your directory. It also checks the validity of any directory data read from your disks to alert you of any existing directory damage and to prevent the damage from escalating. Furthermore, DiskShield keeps the directories on your disks updated so that a crash or loss of power won't cause a loss of data. With DiskWarrior's nonstop disk protection, you may never experience disk damage again.

DiskWarrior resolves existing disk damage by rebuilding your disk directory using data recovered from the original directory, thereby recovering files and folders that you thought were lost. The directories DiskWarrior creates are also optimized for maximum directory performance. DiskWarrior is not a disk repair program in the conventional sense. It does not attempt to solve all of the possible problems that can occur with a disk. It specializes in eliminating directory errors. Directory errors are the most common problems Mac OS users have with their disks. DiskWarrior rebuilds your disk directories making them error-free, eliminating any problems the errors would have caused, and recovering lost files. It fixes any problem with master directory

blocks and alternate master directory blocks (HFS), volume headers and alternate volume headers (HFS Plus), volume bit maps, catalog trees, and extents trees.

This approach has a significant advantage that the others overlook. Other products attempt to repair your directory one step at a time, ignoring the big picture of what is truly wrong with your directory, and risking file information that could be saved. Too often, they will incorrectly begin to “repair” your directory, and then give up when they realize that they have modified the directory to an irreparable state. At Alsoft, we know that the most important thing when you are attempting to repair your disks is getting your data back. That’s why the first thing DiskWarrior checks is your directory data, and that’s what it uses to create a replacement directory. DiskWarrior continues its rebuild operations unless no directory data can be found.

What is the Directory?

The directory is an area of a disk used by the Mac OS to “map” all the information stored on the disk. Some of what is stored in the directory is the numbers, names, locations, types, and sizes of files and folders saved on the disk. When any software wants information from a disk, the Mac OS must go to the directory to find out where the information is located. Also, when any software wants to save information to a disk, the Mac OS must go to the directory to find out where the information can be placed. All the necessary information about where the data was saved is then recorded in the directory.

The directory consists of two parts, the structure and the data. The directory data is the information such as the numbers, names, locations, and sizes of files and folders saved on the disk. The directory structure is the organization of this data in the directory (the directory structure is not the folder organization you see on your disk, nor is it organized as such). The Mac OS uses the structure to quickly access the data and thus find out where in the directory the data is located. This structure can be thought of as analogous to a telephone directory, where the data are the names and phone numbers, and the structure can vary depending upon which method for finding the data is more convenient. The names and numbers can be organized alphabetically or can be organized by category (automotive, computers, physicians, etc.).

What Is Directory Damage and How Does It Affect Me?

When any of the information about the numbers, names, locations or sizes of files and folders in a directory (the directory data) or the structure of the directory is either incorrectly updated or not updated at all, that directory is considered damaged. This damage is normally limited to only a specific area of the directory. So, it’s quite common for directory damage to remain undetected

until long after the damage actually occurred. Also, if any portion of the directory is overwritten by an errant program that inadvertently writes its own data, the directory is damaged.

When the Mac OS attempts to use the incorrect directory information to read or write information on a disk, an error will occur. This error may be very minor and go unnoticed. It might cause an instantaneous System bomb or crash. Or, worst of all, the entire contents of your disk could become inaccessible!



Note: Many people mistakenly think that the invisible desktop files are a part of the directory. They are not. The truth is that the desktop files are maintained by the Finder. They contain a list of your applications and the folders in which they are located (for quick opening), and the icons and “Get Info” comments of all files. DiskWarrior does not “check” or rebuild the contents of the desktop files. Rebuilding the desktop files will not repair any directory damage.

How Does Directory Damage Occur?

The continued accuracy of information in the directory depends on the ability of the Mac OS to perform ALL of its update and maintenance operations without any unexpected interruptions. Also, to help speed up many Mac OS computer operations, important pieces of information are temporarily cached in memory instead of being immediately saved to the disk.

Common types of unexpected interruptions are System bombs and crashes, power loss (lights flicker), turning your Mac OS computer off without using the proper “Shut Down” procedure, and pressing the “RESET” button. Depending upon the exact moment of the interruption, you stand a good chance that your directory was either not updated correctly and/or some information had not been saved to the disk. You now have directory damage and/or information loss.

Another way that your directory can be damaged is if an errant program inadvertently writes its own data to the portion of the disk that is reserved for the directory. If this occurs, then your directory data has been overwritten and may be permanently lost.

How Does DiskWarrior Prevent Disk Damage?

DiskWarrior’s exclusive and innovative DiskShield provides nonstop protection for your disks. It makes sure that your directories are both updated and error-free.

DiskShield checks the validity of any data being written to the directory to prevent errant programs from destroying your directory. It also checks the validity of any directory data read from your disks to alert you of any existing directory damage and to prevent the damage from escalat-

ing. Furthermore, DiskShield keeps the directories on your disks updated so that a crash or loss of power won't cause a loss of data during a disk operation. With DiskWarrior's nonstop disk protection, you may never experience disk damage again.

When Should I Rebuild My Directory with DiskWarrior?

Obviously, you should run DiskWarrior when you suspect that there is directory damage on one of your disks. Directory damage can result in the disk not mounting (not appearing on the desktop when the computer is started), missing files or folders, or crashes when files are used. You will also find DiskWarrior useful when another program such as DiskExpress Pro or PlusOptimizer reports directory damage.

But the best use of DiskWarrior is for preventative maintenance of your disks. Many forms of directory damage do not manifest themselves until long after the damage has actually occurred. You can prevent this damage from escalating by running DiskWarrior on your disks regularly. DiskWarrior will rebuild your disk directory, eliminating all existing directory damage. The directory DiskWarrior creates is also optimized for maximum directory performance, and this will speed up the performance of your disk. You will find doing this regular maintenance of your directories more useful than rebuilding your desktop.

What is Directory Optimization?

In a directory, there is a logical order and a physical order of the file and folder information that is stored. The logical order is based on the name of the files and the creation order of folders. The physical order depends upon the available free space on the disk and space within the directory made available as files are deleted and added. Creating and deleting files makes the physical order less like the logical order as files and folders are added to the directory where space is available. Directory searches are performed using the logical order of the directory. As the physical order becomes less like the logical order, the drive mechanism must move more to follow the logical order.

Nearly everything uses a search based upon logical order to find files, including Find File/Sherlock, the Finder, applications that search for their preference files, applications that build font menus, and open dialogs (whether Standard File or Navigation Services). DiskWarrior optimizes the directory, improving the speed of all of these activities and many more. Other programs don't provide the true directory optimization provided by DiskWarrior.

Why Alsoft DiskWarrior is the Only Answer

Only DiskWarrior includes its exclusive DiskShield to provide nonstop protection for your disks, keeping your directories updated and error-free. No other product helps to *prevent* directory damage before it ever occurs.

When you use DiskWarrior to rebuild your directory, it focuses on what you care most about on your disk—your data as it is stored in your files. DiskWarrior rebuilds your directory based upon the data it finds in the original directory. It uses this information to build an entirely new replacement directory structure. This approach is similar to that taken by FileMaker with its databases and the Finder with desktop files. If you crash or otherwise close a FileMaker database improperly, the next time you open that database, the first thing FileMaker does is rebuild the database indexes (the database structure) using the data in the database. When you rebuild your desktop, you are rebuilding the structure of the desktop database. DiskWarrior takes these processes a step further. When directory data is severely damaged, DiskWarrior scavenges the directory, finding all the salvageable data. It then uses this data to build a new error-free replacement directory, recovering lost files and folders as well as making it possible for the disk to appear on the desktop.

When other utilities attempt to repair your directory, they attempt to do so by “patching” the directory structure. This method can result in sections of the directory being patched over and deleted. Since whole sections of the directory can be deleted, this attempt at repair can cause loss of directory data and thus loss of access to your files. This is why you should always use DiskWarrior first when you suspect directory damage on your disk. Otherwise, you risk losing directory data (and thus access to your files). Successful directory rebuilding, repair, and recovery by DiskWarrior is based on the quality of the directory data present.

If you have used another utility to repair your directory and you now have a directory with no errors but missing data, you can make DiskWarrior scavenge the directory to find the lost data. Note that this is the same scavenge procedure DiskWarrior uses to recover your data when it finds directory errors, but it normally skips the scavenge procedure when the directory has no major errors.

With DiskWarrior, there is never a risk of losing directory data and thus never a risk of losing access to your files. DiskWarrior uniquely verifies the replacement directory before it can be written to disk to ensure that it is completely error-free. This also ensures that the disk will have no problems when rebuilding is complete.

DiskWarrior compares the original directory with the replacement directory and determines if there have been any changes to the number or contents of your files and folders. It then lists any

differences found in the DiskWarrior Report. You'll know right away what files and folders are affected by directory damage. You can use this information to see what items you need to test or inspect in the preview (see below).

DiskWarrior's patent pending preview feature lets you examine your disk in the Finder as it will appear after the directory is rebuilt, allowing you to test files, folders, and applications before any directory changes are written to disk. You can use the results of the comparison shown in the DiskWarrior Report to find out which files and folders you should inspect first because they may have been affected by directory damage. This assures you that you will get the expected results before any changes are made permanent.

Even though they are not part of the directory, DiskWarrior also will repair damaged boot blocks and rebless the system folder if it is necessary to do so on your disk. This ensures that your disk will properly start your Mac OS computer once the rebuilding is complete. DiskWarrior also checks System and Finder files for damage, eliminates a common cause of system crashes by checking custom icon files for corruption, and repairs the wrapper System file damage recently disclosed by Apple, allowing Macs with these disks to start up.

We put the state-of-the-art technologies you expect from Alsoft in DiskWarrior.

- Prevents disk damage with nonstop disk protection
- Verification of replacement directory ensures data integrity
- Comparison of original directory with replacement directory tells you what files and folders may have been affected by directory damage
- Preview feature to view what the disk will look like after the directory is rebuilt, allowing you to test files, folders, and applications before any directory changes are written to disk
- Repairs damaged boot blocks and blesses system folder to ensure that the computer will start from the repaired disk
- Checks System and Finder files for damage
- Checks custom icon files for corruption, eliminating a common cause of system crashes
- Repairs problems with wrapper volume System files caused when HFS Plus disks are initialized under Mac OS 9 - 9.0.4
- Uses directory data to quickly rebuild the directory structure
- Eliminates risk of losing access to files – other disk “repair” utilities attempt to fix the directory by patching the directory structure and risk deleting sections of the directory
- Scavenges directory to find all salvageable file and folder data, even data contained in damaged nodes

- Eliminates unseen directory errors, preventing minor directory errors from escalating into major problems
- Recovers lost files and folders
- Optimizes directory for maximum directory performance, speeding up overall disk performance
- Safely permits interruptions of any kind, including power outages
- Advanced “Verify Reads and Writes” technology protects your data
- Supports bad block sparing software
- Rebuilds directories on disks as large as 2,000 gigabytes (2 terabytes)
- Safely rebuilds directories on Mac OS X Extended disks
- Accelerated for Power Macintosh

Basic Terms You Need To Know

This section explains some terms and concepts that are used throughout this manual.

Application

An application is a tool your computer uses to manipulate information and perform a useful function for you. Applications include such products as AppleWorks.

Block

The physical surface of a disk is comprised of many 512 byte storage areas called physical blocks. The larger the disk, the greater the number of physical blocks on the disk. An allocation block is a group of one or more physical blocks treated as a single storage area by the Mac OS. The older Mac OS Standard format, or HFS, can only keep track of 65,535 allocation blocks per disk. Therefore, the larger the size of a disk, the greater the number of physical blocks in each allocation block, so that the total number of storage areas on the disk does not exceed the maximum of 65,535. The newer Mac OS Extended format, or HFS Plus, can keep track of over 4 billion allocation blocks per disk. HFS Plus uses allocation blocks sizes ranging from 0.5 KB to 4 KB. The Macintosh filing system stores files by breaking them into allocation block-size pieces and writing them into unused allocation blocks wherever they are available.

Directory

The directory of a disk is a group of allocation blocks set aside by the Mac OS to store the number, name, location (which allocation blocks), and size of each file and folder stored on the volume.

Directory Data

The directory data includes the information about the numbers, names, locations, types, and sizes of files and folders saved on the disk.

Directory Structure

The directory structure is how the directory data is organized within the directory. The Mac OS uses the directory structure to quickly access the directory data. Its structure is an indexed database, similar to that used by the Finder in the desktop database, as well as by FileMaker with its databases.

Disk

A disk is the medium on which information is stored. There are many types of disks including floppy disks, hard disks (like the one that is probably inside your Mac OS computer), and removable disks. A disk must be initialized before it can be used.

Document

A document is a type of file that you create with an application. Documents include the information you enter, modify, view, or save to a disk.

Driver

This is the software that translates requests from the Mac OS into the commands that the disk hardware itself understands. It is usually supplied by the vendor of the disk drive mechanism. In the case of the internal disk that was supplied with your Macintosh, Apple provides the driver.

Eligible Disk

To be eligible to be rebuilt by DiskWarrior, a disk must have been formatted as a Mac OS Standard (HFS) or Mac OS Extended (HFS Plus) disk. In addition, an eligible disk must be locally attached to a computer on which DiskWarrior is running, and it must not be write protected. The disk must have a valid partition map and disk driver. Also, an eligible disk cannot be a disk that is shared (see definition below) between Classic and Mac OS X.

Note: A copy of DiskWarrior running on your computer will not rebuild any disk that you must access via a network. These disks are only eligible to another copy of DiskWarrior running on the computer to which they are locally connected.



File

A file is a collection of information stored on a disk. Files can be system files, application files or document files.

File Server

A file server is an application designed to allow many users to share common files via a network. Examples of AppleTalk network file server applications are AppleShare and File Share.

Free Space

The free space encompasses all the unused allocation blocks on a disk. As free space, these blocks are available to be allocated to files or to the directory. Once a file is deleted, the blocks previously occupied by the file will be returned to the free space.

Mac OS X System Disk

A disk that contains the files and information necessary to run Mac OS X.

Partition

Many disks come with management utilities which allow you to divide a disk into additional disks called partitions. There is also independent system software, such as MultiDisk™ from Alsoft, which allows you to partition a disk.

Partition Map

The partition map is a section of the disk that contains the information for each partition on the disk. Most Mac OS disks are set up as one partition, but if you set up your disk as multiple partitions, each partition will behave as a separate disk (each partition can be unmounted individually, and files dragged between partitions will be copied instead of moved).

Root level

The root level of a disk is the lowest level of the disk. When you double-click a disk icon on the desktop, the window that opens shows you all of the files and folders at the root level of that disk.

Shared Disk

A shared disk is one that can act as a file server and can be seen, or “shared,” by multiple computers. Under Mac OS X, disks are shared between Mac OS X’s Classic environment and Mac OS X to allow access by applications running under each.

Startup Disk

The startup disk is the disk which contains a group of special files stored in the System Folder. Your computer cannot operate without the information in these files. The startup disk icon appears at the top-right corner of the desktop.

Wrapper Volume

An HFS Plus volume may be contained within an HFS volume (wrapper volume) in a way that makes the volume look like an HFS volume to systems without HFS Plus support. Embedding an HFS Plus volume within an HFS volume also allows a Mac OS computer to start up from an HFS Plus volume if it has built-in support for HFS but not HFS Plus.



Chapter 2

Using DiskWarrior

Installation of DiskWarrior

Requirements

To rebuild the directory on a Mac OS Standard (HFS) disk, DiskWarrior requires a 68020, 68030, 68040, or PowerPC based Mac OS computer running Mac OS 7.1 through Mac OS 9.x. To rebuild the directory on a Mac OS Extended (HFS Plus) disk, DiskWarrior requires a 68040 or PowerPC based Mac OS computer running Mac OS 8.1 through Mac OS 9.x. If you plan to rebuild the directory on your startup disk, you need another disk from which you can startup (such as the DiskWarrior CD or a Mac OS system CD; refer to *Rebuilding Your Startup Disk* on page 38 in this chapter). The disk to be rebuilt must be locally connected, must not be write protected, and must have a valid partition map and driver.

To build a graph for the directory of a disk, all of the following must be true.

- 1) The disk must appear on the desktop.
- 2) The disk must be an HFS (Mac OS Standard) or HFS Plus disk (Mac OS Extended).
- 3) The disk must be locally attached.
- 4) There must not be any detected hardware problems with the disk.
- 5) If the disk is an HFS Plus (Mac OS Extended) disk, you must be running Mac OS 8.1 through Mac OS 9.x.



Note: DiskWarrior cannot graph or rebuild a shared disk. Since all disks in Mac OS X's Classic environment are shared with Mac OS X and DiskWarrior is a Classic application, you will not be able to rebuild disks while running under Mac OS X. You will need to restart under Mac OS 9.x in order to rebuild Mac OS X Extended disks with DiskWarrior.

In order to load the DiskWarrior Extension and use the DiskShield technology incorporated within it, you must be running Mac OS 8.1 through Mac OS 9.x. The DiskWarrior Extension will load in Mac OS X's Classic environment, but it will not protect any disks that are shared between Classic and Mac OS X.

Copyright Notice

As stated in the copyright notice in this manual, each Mac OS computer that will or could run DiskWarrior will require a separately purchased copy of DiskWarrior.

Before You Install

First make a backup

DiskWarrior is not copy protected, so the Finder can be used to create a backup of the DiskWarrior package that you received.

Be sure to register your purchase

If you received DiskWarrior electronically, then you have already registered your purchase with us. If you received DiskWarrior on a CD-ROM, then you should perform the following steps:

- 1) Note your DiskWarrior serial number on the CD packaging or the CD itself.
- 2) Completely fill out the product registration card and mail it to Alsoft. Be sure to include the serial number. You can also register your product on the Web at <http://www.Alsoft.com/registrationform.html>.

Note: Your DiskWarrior serial number is required for proper registration of your purchase so that you may receive Technical Support, updates, and future product special offers.

If You Received DiskWarrior Electronically

It is recommended that you put the folder containing the DiskWarrior application and the other files on another hard disk, a floppy disk, or a third-party removable media disk so that you have a copy of DiskWarrior available even if you cannot access your startup disk. You can also put this folder on a RAM disk; refer to *Rebuilding Your Startup Disk Using One Removable Media Disk* on page 39 in this chapter.

Record the serial number you received in the e-mail that confirmed your purchase of DiskWarrior. You will need this serial number the first time you run DiskWarrior.

If You Received DiskWarrior on a CD-ROM

DiskWarrior can be run directly from the DiskWarrior CD, and your Mac OS computer can be started from this CD-ROM. This will allow you to rebuild the directories on any HFS or HFS Plus disks that DiskWarrior can rebuild as described in this chapter, including your normal startup disk.

Installing DiskWarrior

Follow these steps to install DiskWarrior.



Note: If you suspect that there is directory damage on your disk, then you should proceed to *Running DiskWarrior* on page 30 in this chapter before installing DiskWarrior on your disk. Also recommends that you run DiskWarrior on your disk before installing DiskWarrior.

- 1) **Double-click to open the Install DiskWarrior® icon that came with the DiskWarrior software that you received.**

The Installer window will appear.



Figure 2-1

The DiskWarrior Installer Window

- 2) **Make sure that the Destination Folder indicated in the Installer window is the one in which you want to install the DiskWarrior application and its support files.**

If the wrong folder is indicated, click the Select Folder button to select the folder in which you wish to install the DiskWarrior application and support files. The DiskWarrior Extension will be installed in your Extensions folder. No other changes will be made to your System Folder.

3) Choose Easy or Custom Install

To Easy Install

- Choose Easy Install from the Installer pop-up menu.
- Click the Install button. The complete DiskWarrior package will be installed.

To Custom Install

- Choose Custom Install from the Installer pop-up menu.
- The Custom Install screen appears, showing a list of installation options.
- Select the DiskWarrior components that you wish to install.
- Click the Help button for additional Installer assistance.
- Click the Install button to install the selected DiskWarrior components.

4) Choose Restart from the Special menu to allow the DiskWarrior Extension to load into memory.

Look for one of the DiskWarrior icons in Figure 2-2 below to be displayed momentarily in the lower portion of the screen during startup.



Figure 2-2

DiskWarrior icons displayed at startup

5) Make a complete backup of your disks.

Before using a new utility for the first time it is a good idea to back up your disks to safeguard against any unforeseen incompatibilities with other programs running on your Mac OS computer.

6) Turn on DiskShield.

To enable DiskWarrior's default DiskShield protection, open the DiskWarrior application, switch to the DiskShield tab, and click the On radio button near the top of the window.



If the Loaded, On Icon Appears

As your computer restarts, DiskWarrior should display the Loaded, On icon shown to the left. If so, the installation is successful. You can then proceed with the rest of this chapter knowing that DiskWarrior will now perform the following operations on all eligible disks.

DiskWarrior Will Now Perform:

1) Directory Validity Checking

DiskWarrior will automatically validate the data being written to and read from each eligible disk, and notify you of any errors. This prevents errant programs from destroying your directory as well as preventing existing damage from escalating.

2) Directory Updating

DiskWarrior makes sure that the copy of the directory on the disk is updated immediately when the copy of the directory the Mac OS caches in memory is updated. This prevents a crash or loss of power from causing a loss of data.



Loaded, Protection Turned Off

If, when your computer restarts, DiskWarrior displays the Loaded, Off icon shown to the left, then the DiskWarrior Extension loaded correctly but protection is currently turned off for all of your disks. To enable DiskWarrior's default DiskShield protection, open the DiskWarrior application, switch to the DiskShield tab, and click the On radio button near the top of the window.



Loading Problems, What Went Wrong

If the Not Loaded icon (solid X) is displayed, try the following:

- 1) **Make sure that System Software version you are running is Mac OS 8.1 or later.**
- 2) **Make sure that you do not have more than one DiskWarrior Extension file in your System Folder.**
- 3) **Reinstall DiskWarrior.**
- 4) **Restart your computer.**

If the Error is still displayed at startup, refer to *Troubleshooting* on page 54, "Chapter 3: Troubleshooting and Error Messages."

If none of the icons are displayed at startup, then the installation was not successful and you must repeat steps 1 through 4 of the Installation section. The DiskWarrior Extension icon was not installed in the active System Folder. The System Folder is the folder that contains the System file and the Finder file.

Deinstalling DiskWarrior

If you ever have a need to deinstall DiskWarrior, you can use the DiskWarrior Installer application and choose Custom Remove from the Installer pop-up menu or follow these easy steps:

- 1) **Drag the DiskWarrior Extension icon out of the Extensions folder of your startup disk (located within the System Folder) onto the Desktop. Do not drag the DiskWarrior Extension icon to the Trash.**
- 2) **Choose Restart from the Special menu.**

If desired, you may now drag the DiskWarrior Extension icon, the DiskWarrior icon and the contents of your DiskWarrior Folder to the trash.

Your deinstallation is now complete.



Flashing DiskWarrior Icon in the Menu Bar

A flashing DiskWarrior icon displayed at either end of the menu bar is an indication that DiskWarrior has a message to display. When you see this icon, you should open the DiskWarrior application to allow the message to be displayed.

Opening DiskWarrior

To open DiskWarrior double-click the DiskWarrior icon in the DiskWarrior folder that you installed in step 2 of the Installation section.

How To Get Even More Out Of DiskWarrior

At this point you could simply let DiskWarrior automatically take excellent care of your disks. But we highly recommend that you learn how to work with all the powerful yet easy-to-use features of DiskWarrior. To learn how to use these advanced features, continue reading.

Quitting DiskWarrior

To quit the DiskWarrior application choose Quit from the File menu. This closes the DiskWarrior application window but any automatic DiskWarrior features you have enabled will still take place.

Strategies for Rebuilding with DiskWarrior



Caution: If you suspect there is directory damage on your disk, it is recommended that you run DiskWarrior before other disk repair utilities. Other disk repair utilities may render the directory damage irreparable even to DiskWarrior. As you will see in the next section, DiskWarrior shows you your rebuilt disk before finalizing the repairs. This allows you to preview what your rebuilt disk will look like before you decide to finalize the rebuild. The other utilities may perform actions on your disk that result in a “repaired” directory structure but with missing or damaged data, or they will incorrectly begin to “repair” your directory and then give up when they realize that they have modified the directory to an irreparable state (for more information on directory structure and directory data, refer to *What is the Directory?* on page 9, “Chapter 1: Introduction.”). These cases may prevent even DiskWarrior from recovering all of your files.

Using DiskWarrior as Preventative Maintenance

The most basic use of DiskWarrior is as preventative maintenance for your disks. Many forms of directory damage do not manifest themselves until long after the damage has actually occurred. You can prevent this damage from escalating by running DiskWarrior on your disks regularly. DiskWarrior will rebuild your disk directory, eliminating all existing directory damage. The rebuilt disk directory will also be optimized for maximum disk performance. You will find doing this regular maintenance of your directories more useful than rebuilding your desktop. Simply follow the instructions in *Running DiskWarrior* on page 30 in this chapter on a regular basis and you will be able to prevent minor directory errors from turning into major catastrophes!

Using DiskWarrior When There Seems to Be a Problem

As you use your computer, particularly after crashes, you may believe there to be missing files or folders, or there may be crashes when files are used. You may have another program such as DiskExpress Pro or PlusOptimizer reporting directory damage. You can use DiskWarrior to rebuild your disk directories, and thus recover the missing files or folders, reduce the likelihood of crashes, or allow your disk optimization program to optimize your disk. Just follow the instructions in the next section, *Running DiskWarrior* on page 30 in this chapter. If you believe the problem is with your startup disk, refer to *Rebuilding Your Startup Disk* on page 38 in this chapter.

Using DiskWarrior to Recover Data from Malfunctioning Disks

Occasionally, due to a mechanical malfunction, a disk becomes unusable. Unfortunately, you usually still have data you need on the disk when this happens. Although a malfunctioning disk

cannot be repaired, DiskWarrior can allow you to recover as much data as possible from such a disk, even if it is a disk to which data can no longer be written. Follow the directions in the next section, *Running DiskWarrior* on page 30 in this chapter. At step 8) *Test the replacement directory*: on page 32 in this chapter, use the DiskWarrior replacement directory to access the damaged disk and copy as many files and folders as possible to another hard disk, removable media, floppies, etc., using the Finder. You may need to copy the original files to several disks, depending upon the amount and size of the files on the source and the size of the disks to which you are copying the files. Another option is to copy only the files that you absolutely need, such as those that have changed since your last backup, or only your data files if you are planning to reinstall your system and applications. In either case, with this type of damaged disk, it is possible that the Finder will not be able to copy all of the files you select. If the Finder displays such an error, select “Continue” to continue copying the remainder of the files you selected. When the copy operation is complete, you may want to attempt to copy the skipped files again in case the error is intermittent and the copy operation can be performed for those files.

What to Do If Your Computer Has a Malfunctioning Internal Disk

The easiest way to rebuild your normal startup disk, whether you are having problems with it or not, is to use the DiskWarrior CD. Just follow the directions in *Rebuilding Your Startup Disk Using the DiskWarrior CD* on page 41 in this chapter.

If you do not have the DiskWarrior CD, there are several options depending upon the type of Mac you have and if you are having problems accessing the normal startup disk.

If you are not having problems accessing the normal startup disk, you can follow the instructions in the section *Rebuilding Your Startup Disk Using One Removable Media Disk* on page 39 in this chapter.

If you are having problems accessing the normal startup disk, what you do will depend upon the type of Mac you have and if you have access to a Mac network or more than one Mac.

For Macs that have a CD drive and a rewriteable disk that can be read while started from a Mac OS CD (such as another hard disk, a floppy disk, or a third-party removable media disk), follow the procedure described in the section *Rebuilding Your Startup Disk Using a CD Drive and a Rewriteable Disk* on page 38 in this chapter.

For Macs that only have a CD drive (besides the internal disk) and have access to a Mac network, follow the procedure in the section *Rebuilding Your Startup Disk Using a CD Drive and a Network* on page 42 in this chapter.

If none of these methods are employable for your Mac (you have only one Mac that has no external disks and it is an iMac, a PowerBook G3 Series with only the CD drive and the internal disk, or a Blue and White G3 without the built-in Zip disk), then your only means of using DiskWarrior is to use the DiskWarrior CD. Contact Alsoft for more information on obtaining the CD.

What to Do If You Used Another Utility First

If you have used another utility before DiskWarrior and now you have a directory that has no errors but is missing data, you can make DiskWarrior scavenge the directory to find the lost data if the other utility did not write over it. **Hold down the Option key** in step 6) *Click the Rebuild button*. The Rebuild button will change to Scavenge and when you press Scavenge, DiskWarrior will scavenge the directory.



Note: This is the same scavenge procedure DiskWarrior uses to recover your data when it finds directory errors, but it normally skips the scavenge procedure when the directory has no major errors. Therefore, you do not need to make DiskWarrior scavenge the directory except when DiskWarrior states “All file and folder data was easily located” in the DiskWarrior Report but you suspect that files and/or folders are still missing from the replacement directory.

Running DiskWarrior

Rebuilding Your HFS and HFS Plus Disks

You will find DiskWarrior extremely easy to use. You will start by selecting a disk, clicking Rebuild, and then waiting a moment for the DiskWarrior Report. Then you will view the Report, making note of the problems that were found and repaired and anything that DiskWarrior recommends to you. At this point, you should preview the rebuilt disk by checking if any files or folders you may have lost have been recovered, opening documents, and running applications. Once you are satisfied that the Preview disk is satisfactory, you will click Replace to replace the directory on the original disk with the new, optimized replacement directory that you just previewed.

Alsoft recommends, however, that you thoroughly read the remainder of this chapter so that you understand how DiskWarrior works, and what you should look for in each step. Follow these steps to rebuild your disks with DiskWarrior:



Note: Alsoft recommends that you regularly make a complete backup of your disks. This will allow you to restore your data regardless of any problem that might arise, including those that DiskWarrior cannot repair such as damaged partition maps, corrupted disk drivers, or mechanical disk malfunctions.

1) Restart your computer from a disk other than the disk to be rebuilt.

DiskWarrior cannot rebuild the directory on the disk from which the Mac OS computer was started (refer to *Rebuilding Your Startup Disk* on page 38 in this chapter). If you startup from the DiskWarrior CD or a Mac OS system CD with Mac OS 8.1 through Mac OS 9.x, this will allow DiskWarrior to rebuild the directory of any HFS or HFS Plus disk locally connected to your Mac OS computer.



Note: If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off.

2) Close all open applications.

Directories cannot be rebuilt on disks with open applications.



Tip: Depending on the number of files on the disk to be rebuilt, DiskWarrior may require a large amount of memory to rebuild the disk. To give DiskWarrior the maximum amount of memory, either start up from the DiskWarrior CD, a Mac OS system CD, or start up with

all extensions off, and make sure there are no applications open before starting DiskWarrior.

3) Double-click the DiskWarrior application.

This will start DiskWarrior. If this is the first time you have run DiskWarrior and you are not running it from the DiskWarrior CD, you will be presented with several dialogs. Read each carefully and respond appropriately to each. Make sure you fill out all of the fields in the registration dialog. You will then be presented with the DiskWarrior main window from which you can rebuild disk directories.

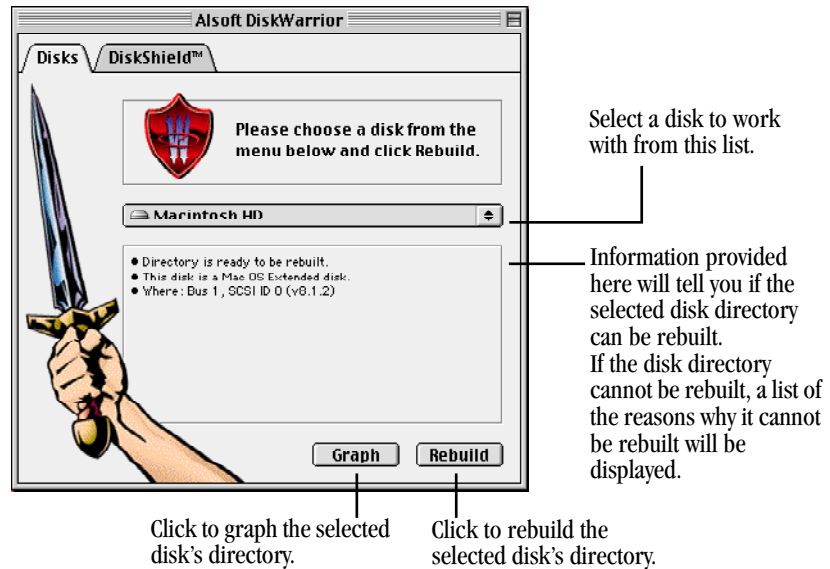


Figure 2-3
The DiskWarrior Main Window



Note: If you have selected an HFS Plus disk in the disks pop-up menu, you must be running Mac OS 8.1 through Mac OS 9.x in order to rebuild the HFS Plus directory. If you select an HFS Plus disk while running an OS prior to Mac OS 8.1, you will not be able to rebuild the HFS Plus disk.

4) Select the disk to be rebuilt from the disks pop-up menu.

If you have problems finding the disk whose directory you want to rebuild, refer to *Problem: The disk I want to rebuild does not appear in the disks Pop-up menu.* on page 56, "Chapter 3: Troubleshooting and Error Messages."

5) The lower portion of the main window will indicate whether the directory is ready to be rebuilt.

If for some reason DiskWarrior cannot rebuild the disk's directory, it will indicate the reasons the directory cannot be rebuilt. For more information on disk requirements for repair, refer to *Requirements* on page 20 in this chapter. For methods to overcome the reasons a disk directory cannot be rebuilt, refer to *Disk Status Messages* on page 59, "Chapter 3: Troubleshooting and Error Messages."

6) Click the Rebuild button.

DiskWarrior will begin building the replacement directory on the disk to be rebuilt. It will first analyze the disk. This analysis can take anywhere from several seconds to several minutes or longer, depending on the number of files on the disk.

7) Read the DiskWarrior Report.

When DiskWarrior is finished, it will display a dialog informing you of the results of the rebuild. This will include any files and folders that may have been affected by directory damage. You should pay particular attention to these files and folders while inspecting the Preview disk in the next step. For further information on what DiskWarrior reports, refer to *What to Look for in the DiskWarrior Report* on page 35 in this chapter. If you have used another utility to "repair" your disk before running DiskWarrior, refer to *What to Do If You Used Another Utility First* on page 29 in this chapter.

8) Test the replacement directory.

At this point, the original directory information on your disk has not been replaced, and it will not be until you click "Replace" in step 10) *Click "Replace" to use the replacement directory, or "Cancel" to leave the directory untouched.* The DiskWarrior Report gives you an option to preview how your disk will appear after the original directory is replaced. If you are working with a disk that was originally mounted and appeared on the desktop, clicking Preview will cause DiskWarrior to present you with an icon for the disk in its original state and a separate icon for the Preview disk. You can double click both icons and compare them. If the original disk did not appear on the desktop, then only the Preview disk icon will be shown. If, for instance, you are using DiskWarrior to recover lost files or folders, you can verify that the replacement directory has these files. For further information, refer to *What to Look for During Preview* on page 35 in this chapter.



Caution: Never remove the original disk or the preview disk from the desktop during preview.



Note: If, when DiskWarrior switches you to the Finder during Preview, the Finder displays out of memory messages, simply switch back to DiskWarrior, stop the Preview, and continue with the following steps to rebuild the original disk. This situation can occur due to a combination of the amount of available memory in your computer and the number of files on the original and preview disks.



Caution: In the unlikely event that the preview disk remains on the desktop when DiskWarrior is not running, do not use the preview disk. You should restart your computer and attempt to rebuild the disk with DiskWarrior again.

9) Make sure that you close all files and folders, and quit any applications you have tested in the previous step before proceeding.

You do not need to stop the Preview before proceeding, but you may if you wish. DiskWarrior will automatically close all open applications and documents on the disk being rebuilt.



Note: If the disk you have selected is locked, you will be able to preview the replacement directory but you will not be able to write the new directory to the disk. For more information about locked disks, refer to *Troubleshooting* on page 54, "Chapter 3: Troubleshooting and Error Messages."

10) Click "Replace" to use the replacement directory, or "Cancel" to leave the directory untouched.

If you click "Replace," DiskWarrior will install the replacement directory on your disk. This will result in your disk being "replaced" by the Preview disk described in step 8) *Test the replacement directory*. If you click "Cancel," your disk will be untouched and you will be returned to step 4) *Select the disk to be rebuilt from the disks pop-up menu*. The Replace button is disabled when the disk is locked, there is a malfunction, or the disk is too severely damaged to be repaired.



Note: In the event that critical items that you wish to recover remain missing during the preview, it is recommended that you **do not proceed with the rebuild** (refer to *What to Look for During Preview* on page 35 in this chapter).

11) DiskWarrior will install the rebuilt directory and keep you updated with its progress.

DiskWarrior uses a fail-safe method of replacing the directory whenever possible, which will be most cases. To use the fail-safe method, there merely needs to be enough free space on the disk to write the new directory. There is redundancy designed into the fail-safe method, assuring there is never any risk of ending up with an unusable disk if the process is interrupted. You can go back to step 4 for any disk for which the process was interrupted.

12) If the disk you selected in step 4 was your startup disk, your System Folder may need to be “reblessed” in order to successfully restart from this disk.

If you have one system folder on this disk, DiskWarrior will automatically rebless the system folder. If there is more than one system folder on the disk, DiskWarrior will present you with a dialog and ask you which system folder should be blessed. DiskWarrior will also repair any damage to the boot blocks if necessary.

13) If there were any files listed in the DiskWarrior Report as occupying portions of the disk already occupied by other files, DiskWarrior will relocate the files to unique portions of the disk now.

When the procedure is complete, you must inspect these files to determine which of them had been overwritten and damaged. The detailed view of the report lists the files that overlap. The amount of time that this process takes depends upon the amount of disk space taken by the overlapped files.

14) If any items were missing in the Preview (step 8) and found to be invisible, you can make them visible now.

These are the steps to perform in ResEdit (available free from Apple) to make an item visible. First, go to ResEdit's File menu and select "Get File/Folder Info." Next, select the item in the dialog that appears and click the "Get Info" button. Uncheck the Invisible check box, and then choose "Save" from the File menu. The item should now appear within its containing folder.

15) If you have started your Mac OS computer from a disk besides your normal startup disk (such as the DiskWarrior CD or a Mac OS system CD), select “Restart” from the Special menu to resume running from your normal startup disk.

What to Look for in the DiskWarrior Report

After the rebuild has been completed, DiskWarrior will show you a DiskWarrior Report. When DiskWarrior first displays the DiskWarrior Report, it defaults to showing you a summary of the results of the comparison, all the problems found and repaired, and DiskWarrior's recommendation to you. However, if you wish to see more detail regarding the problems found and repaired, you can select the Detail button for this information. This will also list all the files and folders that were affected by directory damage. You should pay particular attention to these files and folders while inspecting the Preview disk.

For a complete list of the summary information, recommendations, notes, and error types that can be displayed in the DiskWarrior Report, refer to *DiskWarrior Report Messages* on page 78, "Chapter 3: Troubleshooting and Error Messages."

What to Look for During Preview

When DiskWarrior presents the "preview disk," you have the opportunity to check and test the disk as it will appear after it is rebuilt. You can run applications, open documents, and see if files and folders that you lost have been recovered. You can also inspect the files and folders listed in the DiskWarrior Report.



Figure 2-4

The Default DiskWarrior Preview Disk Icon

If the original disk was visible on the desktop before you ran DiskWarrior, DiskWarrior will display both the original disk and the preview disk on the desktop during the preview. Both of these disks will be locked during the preview, so you will not be able to make any changes to either of them. Both the original disk and the preview disk will appear with the same name on the desktop. If you are running Mac OS 8.5 through Mac OS 9.x, the original disk will have its normal icon, and the preview disk will have a special DiskWarrior preview icon. If you are running a Mac OS earlier than Mac OS 8.5, the preview disk will use the special DiskWarrior preview icon only if the original disk does not have a custom icon. If the original disk does have a custom icon, you will need to open the Get Info window (under the File menu in the Finder) to determine which disk is which. The original disk will be shown with the normal driver and bus location information under the "Where:" heading, while "Alsoft DiskWarrior Preview" will be shown under the "Where:" heading for the preview disk.

DiskWarrior may create special folders at the root level of the disk. You should pay particular attention to the files and folders that DiskWarrior places in these folders. The folder called “Rescued Items” contains files and folders whose enclosing folder could not be found and files that had an entry in an inaccessible portion of the directory. If any of the files or folders whose enclosing folder could not be found are part of a software package, you may need to create enclosing folders with the correct names and locations after you have rebuilt your disk so that the software that uses these files works correctly, or you may need to reinstall the software package. The files that had an entry in an inaccessible portion of the directory may have been lost or thrown away. You must inspect these files to determine the extent of any damage. You must also determine whether these files should be discarded.

If DiskWarrior creates a folder titled “Damaged Items,” then this folder contains files that were recovered but may have problems. For instance, these files may have been truncated because blocks were missing from the file. Once the rebuild is complete, you will need to determine if these files can be salvaged.

At this point in the process, if you discover that there are items missing from the preview disk, use Find File or Sherlock (in the Apple Menu, or Find. . . in the File menu in the Finder) to search for invisible items. Make sure the preview disk is the disk selected in the top pop-up menu. Hold down the option key and select “visibility” in the left hand pop-up menu, making sure the right hand pop-up menu says “invisible.” Click the Find button. Check the list to see if the missing items are included. If they are, you will need to use a utility such as ResEdit (available free from Apple) to make the item visible after the rebuild is completed [see step 14] *If any items were missing in the Preview (step 8) and found to be invisible, you can make them visible now.* in this chapter].

In the event that critical items that you wish to recover remain missing during the preview, it is recommended that you **do not proceed with the rebuild**. Since the directory information for the items that are missing was overwritten or deleted at some point previously, DiskWarrior could not recover these items. You will need to send your disk to a professional recovery service to recover your lost files. While in preview, you should copy as many items from your disk as possible to another hard disk, removable media, floppy disks, etc., using the Finder. You may need to copy the original files to several disks, depending upon the amount and size of the files on the source and the size of the disks to which you are copying the files. Another option is to copy only the files that you absolutely need, such as those that have changed since your last backup, or only your data files if you are planning to reinstall your system and applications. In either case, it is possible that the Finder will not be able to copy all of the files you select. If the Finder displays such an error, select “Continue” to continue copying the remainder of the files you selected. When the copy operation is complete, you may want to attempt to copy the skipped files

again in case the error is intermittent and the copy operation can be performed for those files. This will minimize the number of items that the recovery service will need to recover for you.

DiskWarrior Shortcuts - AppleScripting and Drag and Drop

Now that you fully understand the steps required to rebuild your disks with DiskWarrior, there are two other methods you can use to rebuild your disks with DiskWarrior. However, you should be aware of the following two caveats:

1. Make sure that you have entered in your registration information as described in step 3 above.
2. Any error messages will halt the operation of DiskWarrior while it waits for your response.

If either of these occur while using DiskWarrior as described below, no further progress will be made on any analysis or repair that you expected DiskWarrior to perform.

AppleScripts

DiskWarrior is AppleScriptable. For more information, see the document “DiskWarrior Read Me” that came with DiskWarrior. There is a sample AppleScript on the DiskWarrior web page at the Alsoft web site (www.Alsoft.com).

Drag and Drop

By simply dragging a disk in the Finder onto the DiskWarrior application (or an alias of it), DiskWarrior will begin rebuilding the disk’s directory immediately. You can also drag a group of disks onto the DiskWarrior application and DiskWarrior will rebuild them all sequentially.

Rebuilding Your Startup Disk

Rebuilding Your Startup Disk Using a CD Drive and a Rewriteable Disk

Your startup disk is the disk containing the current System Folder. Since the directory on the disk containing the current System Folder cannot be rebuilt, you need to start up from another disk to rebuild this disk directory. If you do not have another hard disk with a System Folder, you can start up from your Mac OS system CD by following these steps. (For instructions on how to use the DiskWarrior CD, refer to *Rebuilding Your Startup Disk Using the DiskWarrior CD* on page 41 in this chapter)

1) Turn on your Mac OS computer.

2) Insert a Mac OS system CD in your internal CD drive.

You must use a Mac OS 7.1 through Mac OS 9.x CD in a drive from which you can start your Mac OS computer to rebuild Mac OS Standard (HFS) disk directories. To rebuild Mac OS Extended (HFS Plus) disk directories, the Mac OS system CD you are using must be Mac OS 8.1 through Mac OS 9.x.

3) Choose Restart from the Special menu to restart your Mac OS computer.

On most Mac OS computers, you need to hold down the “c” key to start from a CD. Consult the documentation that came with your computer to determine what you need to do to start from the Mac OS system CD. If you cannot start from your normal startup disk and you see a blinking question mark on your screen when you turn on your computer, skip this step.

4) When the computer has completed starting up from the Mac OS system CD, insert a rewriteable disk with the DiskWarrior folder in the rewriteable disk drive.

This can be a backup of the disk you received from Alsoft, or the disk on which you put your copy of DiskWarrior as described in *If You Received DiskWarrior Electronically* on page 21 in this chapter.

5) Continue with step 3 on page 31 in this chapter.

Follow the remaining steps in the preceding section of this chapter to rebuild your startup disk directory.

Rebuilding Your Startup Disk Using One Removable Media Disk

Your startup disk is the disk containing the current System Folder. Since the directory on the disk containing the current System Folder cannot be rebuilt, you need to start up from another disk to rebuild this disk directory. On some Mac OS computers such as PowerBooks, you can only use one disk besides the internal hard disk at a time (floppy or CD drive). You can completely rebuild your internal hard disk by following these steps.



Note: If the internal disk in your computer is damaged, you will not be able to follow this procedure. To rebuild your internal disk directory in this case, refer to *What to Do If Your Computer Has a Malfunctioning Internal Disk* on page 28 in this chapter.

- 1) Turn on your Mac OS computer.**
- 2) Copy the folder containing DiskWarrior to your internal hard disk.**

If you downloaded DiskWarrior electronically, then it is likely that you already have this folder on your internal hard disk. If you received DiskWarrior on a disk, then you need to copy the contents of the DiskWarrior disk to your internal hard disk.
- 3) Insert a Mac OS system CD in your internal CD drive, or a Disk Tools disk in your floppy drive.**

You must use a Mac OS 7.1 through Mac OS 9.x CD or Disk Tools floppy in a drive from which you can start your Mac OS computer to rebuild Mac OS Standard (HFS) disk directories. To rebuild Mac OS Extended (HFS Plus) disk directories, the Mac OS system CD or Disk Tools floppy you are using must be Mac OS 8.1 through Mac OS 9.x.
- 4) Choose Restart from the Special menu to restart your Mac OS computer.**

On most Mac OS computers, you need to hold down the “c” key to start from a CD. Consult the documentation that came with your computer to determine what you need to do to start from the Mac OS system CD.
- 5) When the computer has completed starting up, create a RAM disk using the Memory control panel.**

Open the Memory control panel in the system folder of your hard disk and create a RAM disk large enough to store the DiskWarrior folder (1.4 MB or larger should suffice).

6) **Copy the DiskWarrior folder from your hard disk to the RAM disk.**

7) **Continue with step 3 on page 30 in this chapter.**

Follow the remaining steps in the section *Rebuilding Your HFS and HFS Plus Disks* in this chapter to rebuild your startup disk directory.

Rebuilding Your Startup Disk Using the DiskWarrior CD

Your startup disk is the disk containing the current System Folder. Since the directory on the disk containing the current System Folder cannot be rebuilt, you need to start up from another disk to rebuild this disk directory. If you do not have another hard disk with a System Folder, you can start up from the DiskWarrior CD by following these steps.

- 1) Turn on your Mac OS computer.**
- 2) Insert the DiskWarrior CD in your internal CD drive.**

The DiskWarrior CD is bootable.
- 3) Select Restart from the Special menu to restart your Mac OS computer.**

On most Mac OS computers, you need to hold down the “c” key to start from a CD. Consult the documentation that came with your computer to determine what you need to do to start from the DiskWarrior CD. If you cannot start from your normal startup disk and you see a blinking question mark on your screen when you turn on your computer, skip this step.
- 4) When the computer has completed starting up from the DiskWarrior CD, run the DiskWarrior application that is included on the DiskWarrior CD.**

DiskWarrior is located in the root level of the DiskWarrior CD. It should be visible in the “DiskWarrior CD” window that appears when starting up is complete.
- 5) Continue with step 3 on page 30 in this chapter.**

Follow the remaining steps in the section *Rebuilding Your HFS and HFS Plus Disks* in this chapter to rebuild your startup disk directory.

Rebuilding Your Startup Disk Using a CD Drive and a Network

Your startup disk is the disk containing the current System Folder. Since the directory on the disk containing the current System Folder cannot be rebuilt, you need to start up from another disk to rebuild this disk directory. If you do not have another hard disk with a System Folder but you do have access to a Mac network, you can start up from the Mac OS system CD and rebuild your internal disk by following these steps.

- 1) **Turn on the Mac OS computer that has the copy of DiskWarrior that you will run.**
- 2) **Turn on File Sharing for the disk that has the copy of DiskWarrior.**
Make sure you can access this disk either as a guest, or that you have the correct password. See the information that came with the Mac OS computer for more information.
- 3) **Make sure the Mac OS computer that has the copy of DiskWarrior that you will run is connected to the network.**
- 4) **Make sure the Mac OS computer with the internal disk that is to be rebuilt is connected to the network.**
- 5) **Turn on the Mac OS computer with the internal disk that is to be rebuilt.**
- 6) **Insert a Mac OS system CD in your internal CD drive.**
You must use a Mac OS 8.0 through Mac OS 9.x CD in a drive from which you can start your Mac OS computer to rebuild Mac OS Standard (HFS) disk directories when using a copy of DiskWarrior over a network. To rebuild Mac OS Extended (HFS Plus) disk directories, the Mac OS system CD you are using must be Mac OS 8.1 through Mac OS 9.x.
- 7) **Choose Restart from the Special menu to restart your Mac OS computer.**
On most Mac OS computers, you need to hold down the “c” key to start from a CD. Consult the documentation that came with your computer to determine what you need to do to start from the Mac OS system CD. If you cannot start from your normal startup disk and you see a blinking question mark on your screen when you turn on your computer, skip this step.

- 8) **Select the disk with the copy of DiskWarrior in the Chooser or Network Browser for sharing so that it appears on the desktop of the Mac OS computer with the internal disk that is to be rebuilt.**

- 9) **Continue with step 3 on page 30 in this chapter.**
Follow the remaining steps in the section *Rebuilding Your HFS and HFS Plus Disks* in this chapter to rebuild your startup disk directory.

Graphing a Disk Directory

DiskWarrior allows you to create a graph that indicates the degree the directory is internally fragmented. This graph visually shows you the number of fragments and the distance each fragment is out of place. Rebuilding your directory with DiskWarrior optimizes your directory. Other programs don't provide the true directory optimization provided by DiskWarrior.

Background

To understand directory optimization you first have to understand the way that the directory is internally organized. If you don't want to read the details it is enough to know that the data structures in the directory can be internally fragmented and use space inefficiently. Directory optimization is the process of organizing the data structures for fastest access. Directory optimization typically results in a 50% to 60% decrease in the time it takes programs to scan the directory and a 10% to 20% decrease in startup time. If you want the details then read on.

Mac OS Standard (HFS) and Mac OS Extended (HFS Plus) disk directories have a very complex structure. Each file or folder (item) on a disk has an entry in the disk's directory. These entries are in order of enclosing folder and then item name. This is similar to a yellow pages directory being sorted by type of business and then business name. Just like a yellow pages directory, the disk directory has pages—except that its pages are called nodes. Unlike the yellow pages, nodes are dynamic and change as you add and delete items. It's sort of like a real-time yellow pages.

Imagine that the pages of the yellow pages are not in order and at the bottom of each page it says "Continued on page n," where n is the page that contains the next set of listings for the particular type of business that you're looking up. Well, nodes are not necessarily arranged in order and each node has a reference, or link, to the next node that contains the next set of ordered items.

When you have a fresh new directory, all of the nodes are in order. So node 1 has a link to node 2 which has a link to node 3, and so on. Nodes don't stay in order for very long. Whenever a file or folder (item) is created, an entry for the item is added to the directory in the appropriate node. When a node fills up, a new node is added and the entries are divided evenly between the old node and the new node. This leaves both nodes only half full. The new node is most likely going to be at the end of the directory, just like an addendum. To keep the items in the nodes in order, node 1—which was previously linked to the old node—will link to the new node and the new node will link to the old node.

For example, let's say that you have a directory with 3 nodes. Node 1 links to node 2 which links to node 3 (Figure 2-5). If you add an item that causes node 2 to overflow, a new node 4 will be added. The items from node 2 and the new item will be split between node 2 and node 4. Node

1 will now link to node 4 and node 4 will now link to node 2. This causes the nodes to be out of order. The links indicate the order in which the nodes are to be read. Following the links you visit all of the nodes and items in the correct order. However, to follow the links, you will have to jump from node 1 to node 4 then back to node 2 and then to node 3 (Figure 2-6). As more items are added to the directory, this process of splitting is repeated and the nodes are increasingly out of order. A typical directory has hundreds or thousands of nodes. If a program or the Mac OS needs to search the directory it will follow the links and jump back and forth in the directory.

Directory optimization is the process of defragmenting and packing nodes. Defragmenting makes the physical order equal the linked (logical) order. Packing combines nodes that are not full so that you end up with fewer nodes. Continuing with the directory in the previous example, the directory is defragmented and the items are packed into just 2 nodes (Figure 2-7). The resulting speed increase is due to the fact that fewer nodes need to be read and there is no need to jump around within the directory.

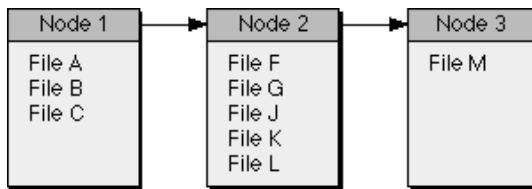


Figure 2-5

Example directory with 3 nodes. Files are in order.

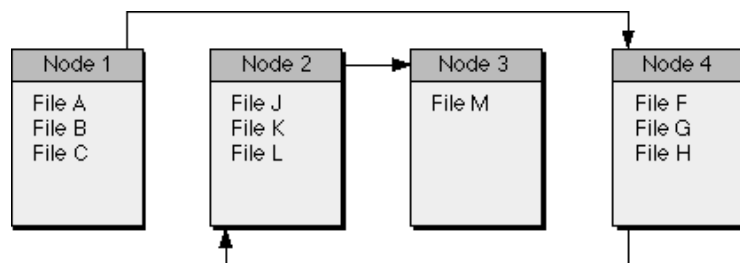


Figure 2-6

Adding "File H" causes node 2 to split and fragment the directory.

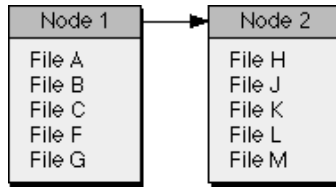


Figure 2-7
Optimizing defragments and removes unnecessary nodes.

About DiskWarrior's Directory Optimization Graph

DiskWarrior's Directory Optimization Graph creates an optimization graph that indicates the degree the directory is internally fragmented. It doesn't just indicate the number of fragments. You can visually determine the number of fragments and the distance each fragment is out of place.



Note: The Directory Optimization Graph does not (and can not) modify the directory or any other part of the disk in any way while graphing a directory.

Graphing a Disk

To build a graph for the directory of a disk, all of the following must be true.

- 1) The disk must appear on the desktop.
- 2) The disk must be an HFS (Mac OS Standard) or HFS Plus disk (Mac OS Extended).
- 3) The disk must be locally attached.
- 4) There must not be any detected hardware problems with the disk.
- 5) If the disk is an HFS Plus (Mac OS Extended) disk, you must be running Mac OS 8.1 through Mac OS 9.x.

Follow these steps to graph the directory of a disk.

- 1) Double-click the DiskWarrior application.**
This will start DiskWarrior.
- 2) Make sure the Disks tab is selected.**

3) **Select the disk to be graphed from the disks pop-up menu.**

4) **Click the Graph button.**

A progress dialog will appear and, after a brief delay, it will be replaced with a window containing the graph.



Note: In order to graph a disk, your display will need to be set to thousands of colors. If it is not, you will be shown a message that will ask if you want DiskWarrior to change this display setting. Then, when you close the graph window, DiskWarrior will return your display setting to its previous setting.

5) **If you wish to save a copy of the graph, choose “Save” from the File menu.**

A Save dialog will appear. Pick a location and name for the saved graph.

Understanding the Graph

Each part (node) of the directory is assigned a color along a gradient between white and dark blue depending upon its optimized position. The graph of a perfectly optimized directory is a perfect gradient from white to blue. Fragmentation interrupts the gradient. The more distant a fragment is from its optimized position, the greater the difference between the color of the fragment and the color of the same position in the example optimized graph.

Directory optimization is the process of defragmenting and packing nodes. Defragmenting makes the physical order equal the linked (logical) order. Packing combines nodes that are not full so that you end up with fewer nodes. The graph does not indicate whether the nodes need to be packed. It would take a completely different representation of the nodes to indicate that information. However, fragmentation has a far greater impact on performance. It is much worse to jump around from one part of the directory to another than to read some extra nodes.

The more nodes that are out of order, the more files and folders are out of order and the more impact you'll see on performance. Other utilities don't optimize your directory the way DiskWarrior does.

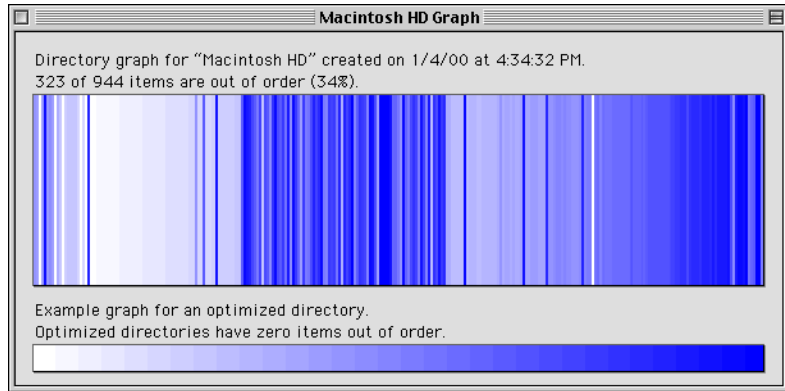


Figure 2-8
Graph of a typical hard disk before optimization.

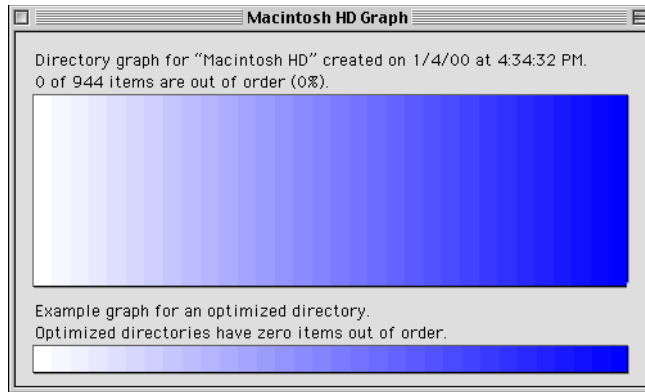


Figure 2-9
Graph of the same disk after optimization, nodes are packed and in order.

Configuring DiskWarrior

Use the DiskShield Tab to control DiskWarrior's DiskShield protection, to set how DiskWarrior notifies you if it detects a problem, and to set exceptions for programs that may conflict with it.



Tip: You can use Balloon Help to get a brief message about the item over which the mouse pointer is positioned. To turn on Balloon Help click the help icon near the top right of the DiskShield Tab, or choose Show Balloons from the Help menu.

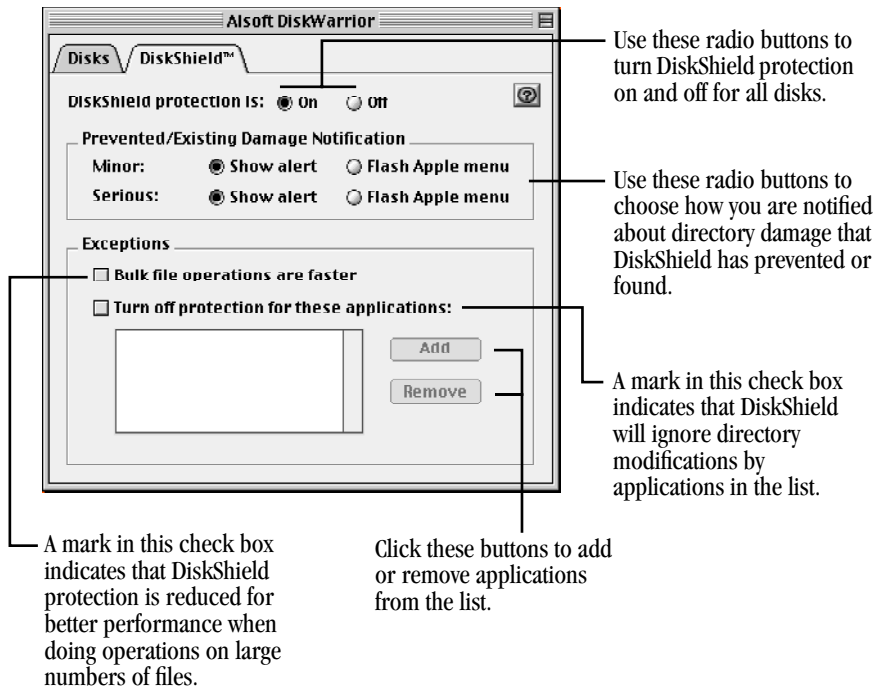


Figure 2-10
The DiskShield Tab

DiskShield Protection

You can turn DiskShield protection for all of your disks on or off. When it is off, file system operations on your directory are performed by the Mac OS as usual. When you turn DiskShield protection on, all reads and writes to your directories are checked for validity, the copy of the directory on the disk is updated immediately when the copy of the directory the Mac OS caches

in memory is updated, and you are notified of any directory errors found as well as any attempts by any program to do anything that would have damaged your directory.

To Turn DiskShield Protection On or Off

Simply use the On or Off radio buttons at the top of the DiskShield Tab to turn DiskWarrior's DiskShield protection on or off.



Note: DiskShield will not provide protection on disks that are shared under Classic in Mac OS X, nor will it protect locked disks such as CDs. If you are trying to access files on a locked disk that has directory damage, you can use DiskWarrior's Preview to try to copy the files off the disk; refer to *Using DiskWarrior to Recover Data from Malfunctioning Disks* on page 27 in this chapter.



DiskShield Prevented/Existing Damage Notification

When DiskWarrior encounters an error in your directory or an attempt to damage your directory, DiskWarrior can notify you in one of two ways. If you choose to be notified by the Show alert option, DiskWarrior will display an alert that describes the problem encountered. If you choose to be notified via the Flash Apple menu method, DiskWarrior will flash its icon over the Apple menu icon in the menu bar whenever it encounters an error. This flashing icon is your cue to open the DiskWarrior application to display a message describing the error encountered. For a listing of possible DiskWarrior error messages, what they mean and what you should do if you receive one, refer to *Error Messages and Notifications* on page 62, "Chapter 3: Troubleshooting and Error Messages."

There are two classifications of problems about which DiskWarrior will notify you. You can choose how you are notified for each of these problems.

Minor

The first classification of problem is Minor. This is defined as a problem where there is damage in your directory, but it is restricted to a small portion of it and may only affect an individual file or folder. You should run DiskWarrior to eliminate this problem.

To be notified immediately by an alert of a Minor problem, select the Show alert radio button. To be notified via the Flash Apple menu option, select the Flash Apple menu radio button. This flashing icon is your cue to open the DiskWarrior application to display a message describing the error encountered.



Note: DiskShield will only notify you of one Minor problem on a particular disk per hour, and will not notify you of any encountered Minor problems on a disk if it has already alerted you to a Serious problem for the same disk. This is because it is possible that you will encounter the same Minor problem repeatedly and it is assumed that you will run DiskWarrior as soon as possible to fix the problem.

Serious

The second classification of problem is Serious, and this classification actually encompasses two kinds of problems that equal in severity but differ in how you will need to respond to them. The first kind is where damage already exists in your directory that is so severe that portions of your directory are unrecognizable as such. In this case you should run DiskWarrior immediately to rebuild your directory. The second kind is when DiskWarrior has stopped an attempt by a program to write data to your directory that is invalid and that would have caused a loss of files and/or folders. When this occurs, your ultimate response will depend upon the program that caused the error and what you were attempting to do at the time. For example, if you were using a disk editor to modify your directory, you will probably ignore the error and make an exception for the disk editor (refer to *Turn off protection for these applications* on page 52 in this chapter). On the other hand, if the error was caused by your Web browser while you were simply browsing the Web, you might want to consider updating or replacing that program.

To be notified immediately by an alert of a Serious problem, select the Show alert radio button. To be notified via the Flash Apple menu option, select the Flash Apple menu radio button. This flashing icon is your cue to open the DiskWarrior application to display a message describing the error encountered.



Note: DiskShield will only notify you of one Serious problem on a particular disk per hour. This is because it is possible that you will encounter the same Serious problem repeatedly and it is assumed that you will run DiskWarrior immediately to fix the problem.

DiskShield Exceptions

Bulk file operations

While in most cases you will not notice any performance effects by having DiskShield protection turned on, there are some instances where you may wish to sacrifice some safety for performance. For instance, if you copy large numbers of smaller files, delete large numbers of small files, or modify the attributes of a large number of small files, you may wish to check the Bulk file operations are Faster option. This makes DiskWarrior update the directory on disk less frequently for better performance, while



still updating it more frequently than the Mac OS normally would. All other features of DiskWarrior's DiskShield protection are still in effect.

Caution: If a crash or loss of power does occur while you are performing an operation such as copying a large number of files and you have checked the Bulk file operations are Faster option, there is a higher risk of losing directory data for the most recent changes in the operation. While this risk is much less than it would be if you did not have any DiskShield protection, you should take this into consideration if you decide to set this option.

Turn off protection for these applications

DiskWarrior checks the validity of all data being written to and read from your directory. If you use any program that writes directly to your directory, you can add it to this list. An example of this kind of program is a disk editor. If you encounter error messages from DiskWarrior while you are using a program that you know to be safe, you can add it to the list.

Chapter 3

Troubleshooting and

Error Messages

Troubleshooting

If after installing DiskWarrior, your Mac OS computer begins behaving abnormally, you may be experiencing an “extension conflict.” Extension conflicts are incompatibilities between software that extends your System, such as System extensions, Control Panels and Chooser extensions.

Typical symptoms of conflict with a newly installed extension are:

- 1) An extension’s startup icon is not displayed normally (indicating it could not load properly).
- 2) Your Mac OS computer “stalls” during startup.
- 3) Your screen freezes and/or the mouse becomes inactive.
- 4) A System error occurs.

Some common sense rules for installing any extension into your System Folder:

- 1) Add only one (1) extension at a time.
- 2) Test the new extension.
- 3) Test your previously installed extensions.
- 4) Test your applications.
- 5) If no problems, install your next extension.

If none of the startup icons for DiskWarrior are displayed at startup and you have some type of extension management utility program (Extensions Manager, Now Startup Manager, Conflict Catcher, etc.), verify that your utility has ENABLED the DiskWarrior Extension.



Figure 3-1

DiskWarrior icons displayed at startup.

If you encounter any NEW difficulties after installing DiskWarrior, the following steps can be used to quickly identify the conflict or, in some cases, even eliminate it. Try each, one at a time, in the order shown:

- 1) **Verify that you are running Mac OS 8.1 or greater.**
 - This can be done by choosing “About This Computer . . .” from the Apple menu while in the Finder.

2) **Reinstall DiskWarrior.**

- Reinstall DiskWarrior using the ORIGINAL DiskWarrior package you received. For instructions on installing DiskWarrior, refer to *Installing DiskWarrior* on page 22, "Chapter 2: Using DiskWarrior."
- Restart your Mac OS computer and test to see if the difficulty remains.

3) **Adjust the loading order of extensions and control panels.**

- Change the name of the DiskWarrior Extension installed in your System Folder from "DiskWarrior Extension" to "aDiskWarrior Extension". This will let it start before most other extensions. Restart your Mac OS computer and test.
- If you are using a startup management utility, configure it to have the DiskWarrior Extension load first or last. Restart your Mac OS computer and test.
- Experiment with the loading order. Many conflicts among extensions and control panels can be resolved by adjusting the loading order.

4) **Try running DiskWarrior in isolation.**

- Except for the DiskWarrior Extension, move ALL non-Apple Computer extensions and control panels out of the System Folder, Control Panels folder, and Extensions folder. (They do not have to be thrown away, just moved outside of the System Folder.) Restart your Mac OS computer and test.
- If you are using a startup management utility, configure it to have the DiskWarrior Extension be the only non-Apple Computer extension to load. Restart your Mac OS computer and test.
- If the conflict remains, go immediately to step 5. Otherwise, start putting the moved items back into their proper folders one at a time or start re-enabling the items disabled with your startup management utility. Restart your Mac OS computer and test after each one is moved back or enabled.

5) **Reinstall your system files**

- The only reliable way to do this is by restarting your Mac OS computer from the Apple Computer installer diskette or CD.
- Open the System Folder on your disk and put the System file into the Trash. Empty the Trash.
- Start the "Installer" program on the installer disk and perform the appropriate system software installation.
- Restart your Mac OS computer and test.
- If this cures the conflict, start putting the moved extensions back into their proper folders one at a time. Restart your Mac OS computer and test after each one is moved back.

Note: Be sure to read the document "DiskWarrior Read Me". Last minute changes to the documentation are detailed there.



- ❑ **Problem: The disk I want to rebuild does not appear in the disks Pop-up menu.**

DiskWarrior cannot rebuild a disk that is not HFS or HFS Plus (Mac OS Standard or Mac OS Extended). The disk to be rebuilt must be locally connected, must not be write protected, and must have a valid partition map and driver.

- ❑ **Problem: DiskWarrior tells me that the disk to be rebuilt is locked. The “Replace” button is disabled.**

The disk you have selected is either locked, or is a media type such as a CD-ROM to which data cannot be written. For a disk reported as locked, first check if there is a mechanical lock switch on the disk and make sure it is set to the unlocked position. If the disk is still reported as locked, launch the software driver package that was used to initially set up the disk (for Apple disks, the software is Drive Setup and can be found on Mac OS system CDs) and follow the instructions that came with the software to unlock the disk.

- ❑ **Problem: I can't start from my normal startup disk, even though it appears on the desktop, the correct System Folder is present, etc.**

This can occur immediately after a rebuild if the System Folder was damaged and repaired by DiskWarrior, or it could be a previous problem. In either case, you simply need to “rebleb” your System Folder in order to successfully restart from this disk. Simply drag the System suitcase or the Finder from the System Folder on this disk to the desktop. Then, drag the item you moved back to the same System Folder. The Mac OS icon should appear on the System Folder.

- ❑ **Problem: When I start up, a disk icon with a blinking question mark appears.**

This indicates that your computer cannot find the system software it needs to start up. If you already have reblebbed your system folder as described above, there are some other possibilities.

Your Macintosh may be having a problem recognizing external SCSI peripherals such as hard disks, scanners, or removable media drives. Turn off your Macintosh and all of the external SCSI devices and disconnect them from your computer's SCSI port. Restart your computer. If your computer then starts up properly, refer to the documentation that came with these SCSI devices to determine what is causing the problem.


There may be a problem with the system software installed on the disk you are attempting to use. If, after rebuilding your disk directory with DiskWarrior and reblebbling your System Folder this

problem continues to occur, you may need to reinstall your system software. Refer to the documentation supplied with the version of the Mac OS System you are using for directions on how to reinstall system software.

Problem: Icons are not appearing correctly.

or

Problem: When I double-click a document that belongs to an application, I get a message that says that the application that created this document cannot be found, but I can open the document from the Open command in the application.

These are signs that your desktop needs to be rebuilt. Hold down the Option and  (command) keys while you start up your computer, until you see a message asking whether you want to rebuild the desktop.

Problem: My Mac OS computer “hangs” during the rebuild (pointer moves when the mouse is moved, but there is no reaction when I click anywhere on the screen).

If your Macintosh hangs during the operation of DiskWarrior, this could be caused by hardware or software problems with a hard disk or a problem with the SCSI chain.

Make sure that the disk drivers are the current versions for the operating system running on your computer. If the operating system was recently updated to a new version, you may need to update the drivers as well. In the case of an Apple formatted disk, use the Drive Setup utility (found on the Mac OS system CD) to perform the update. For disks from other vendors, check with the manufacturer of the formatting software for the latest version of their drivers. It is also possible that the driver has become corrupted, so a simple reinstallation of the driver may solve the problem.

Another possible cause is a SCSI noise problem. Shut down your computer and disconnect all but the disk you are trying to rebuild, a startup disk, and the disk you have DiskWarrior on and see if your computer still freezes. Then try connecting your disks one at a time (with the power off). Do not connect other non hard disk SCSI devices until all hard disks have been connected and tested. Termination is another potential problem with the SCSI chain.

If the problem is due to bad blocks on the disk or DiskWarrior has problems reading or writing to the disk, you will need to reformat the disk. In the case that bad blocks were the problem, the

disk needs to be reformatted to exclude the bad blocks. Follow the procedure recommended by the manufacturer for your particular disk for reformatting. Note that reformatting is not simply erasing the hard disk. Make sure to backup up your hard disk first because everything will be erased by reformatting.

- ❑ **Problem: The power to my Mac OS computer was disconnected, shut off, or otherwise interrupted while doing the repair.**

DiskWarrior was designed to permit interruptions. Simply run DiskWarrior again to complete the repair of the disk that was being rebuilt.

Disk Status Messages

These messages appear in the main window and describe the status of the selected disk.

Directory is ready to be rebuilt.

Click Rebuild to rebuild the selected disk.

Directory is ready to be rebuilt again.

Click Rebuild to rebuild the selected disk.

Directory cannot be rebuilt because this is the startup disk.

Your startup disk is the disk containing the current System Folder. The selected disk is the startup disk. To rebuild this disk, refer to *Rebuilding Your Startup Disk Using a CD Drive and a Rewritable Disk* on page 38, "Chapter 2: Using DiskWarrior."

Directory cannot be rebuilt because DiskWarrior resides on this disk.

DiskWarrior cannot rebuild the directory of the disk on which it resides. To rebuild the directory of this disk, copy DiskWarrior to another disk, such as a floppy, and run that copy of DiskWarrior.

Directory cannot be replaced because this disk is locked.

This disk is not writable. You need to unlock the disk.

Directory cannot be rebuilt because this disk is shared with Mac OS X.

DiskWarrior cannot rebuild the directory of a disk that is not locally attached or is shared. If you are running DiskWarrior in Mac OS X's Classic environment, you should note that all disks in Classic are shared with Mac OS X. Since DiskWarrior is a Classic application, you will not be able to rebuild disks while running under Mac OS X. You will need to restart under Mac OS 9.x in order to rebuild Mac OS X Extended disks with DiskWarrior.

- Directory cannot be rebuilt because an error occurred trying to access this disk (error number, error number).**

This error message indicates that DiskWarrior was unable to access this disk. This could be evidence of a bad block on the disk, a hardware defect, or problems with termination or cabling.

- Directory cannot be rebuilt. Starting from Mac OS 8.1 or later is required to rebuild Mac OS Extended Format directories.**

For more information on DiskWarrior operating system requirements, refer to *Requirements* on page 20, "Chapter 2: Using DiskWarrior."

- Where:**

This provides the same information about the disk's physical location as the Get Info window in the Finder.

- This disk is a [Mac OS Standard or Mac OS Extended] disk.**
- This disk appears to be a [Mac OS Standard or Mac OS Extended] disk.**

The disk does not appear on the desktop. A quick exam of the disk was made to try to determine its format. The actual format will be determined, if possible, while rebuilding.

- Directory cannot be rebuilt because this is not a Macintosh disk.**

DiskWarrior cannot rebuild a disk that is not HFS or HFS Plus (Mac OS Standard or Mac OS Extended).

- This disk does not appear on the desktop.**
- Directory has been successfully rebuilt and replaced.**
- Rebuilding was canceled.**
- Rebuilding was stopped because of an error (error number).**

- Directory cannot be rebuilt because of a problem communicating with this disk (error number, error number).**

This error message indicates that DiskWarrior was unable to access this disk. This could be evidence of a bad block on the disk, a hardware defect, or problems with termination or cabling.

- Directory is ready to be previewed.**

This disk is locked. The directory cannot be replaced, but the disk can be previewed. Click Rebuild to proceed.

- Directory cannot be rebuilt because this disk is used for virtual memory.**

Open the Memory control panel in the system folder of your hard disk, turn virtual memory off, and restart your computer.

Error Messages and Notifications

These are the messages you may receive while using DiskWarrior.

- DiskWarrior requires Mac OS 7.1 or later.**

For more information on DiskWarrior operating system requirements, refer to *Requirements* on page 20, "Chapter 2: Using DiskWarrior."

- This is not a valid serial number. Please enter the serial number again.**

Note your DiskWarrior serial number on the original diskette label or CD packaging. Make sure that you not entering an O (letter) for a 0 (number), and that you haven't transposed the order of any of the characters.

- DiskWarrior requires a Mac OS compatible computer with a 68020 or PowerPC processor.**

For more information on DiskWarrior hardware requirements, refer to *Requirements* on page 20, "Chapter 2: Using DiskWarrior."

- A required resource is missing. DiskWarrior may be damaged. Please reinstall DiskWarrior (error number).**

It appears that DiskWarrior has been corrupted on disk or has been tampered with. Please start with a newly installed copy. Make a new copy from the original. If the original is corrupt, contact Alsoft to obtain a new copy.

- DiskWarrior is busy performing another operation and cannot start this one.**

The current operation must be completed before another is started. Wait until the current operation is complete and try again.

- The directory of the disk "disk name" cannot be rebuilt. The disk cannot be found (error number).**

The disk selected for rebuilding was ejected or removed from the desktop. It must be returned to the desktop before it can be rebuilt.

- The directory of the disk “disk name” cannot be rebuilt. This disk is not eligible. Only Mac OS disks that are locally attached are eligible (error number).**

DiskWarrior cannot rebuild a disk that is not HFS or HFS Plus (Mac OS Standard or Mac OS Extended). The disk to be rebuilt must be locally connected, must not be write protected, and must have a valid partition map and driver.

- DiskWarrior encountered an unexpected error while attempting to rebuild the directory of the disk “disk name”. Rebuilding was canceled and the disk was not modified. Quit all other applications, start without extensions and try rebuilding again (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer as described above. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- The directory of the disk “disk name” cannot be rebuilt. The disk is still in use. Quit all other applications, start without extensions and try rebuilding again (error number).**

If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. Make sure to quit all other applications, and if you are running from a Mac OS prior to 7.6, make sure that File Sharing is turned off.

- This computer's internal clock indicates the current date is "date" and the current time is "time". Do you want to continue using the current date and time?**

It appears that the system clock is not correct. While rebuilding it may be necessary to repair dates that are stored in the directory. The internal clock's date and time is used to make these repairs.

- There is more text than can be displayed in the report window.**

If you save the report, all of the text will be saved and can be viewed by any application capable of displaying large text files.

- The directory cannot be rebuilt while other applications are using the disk. Do you want to continue and quit the other applications?**

If you select Continue, all other applications will be quit, after asking you to save any changes to any open documents.

- One or more of the open applications did not quit. Please quit them manually and try rebuilding again.**

One or more of the open applications did not respond to the request to quit. You will need to quit them manually to rebuild the directory on this disk.

- The directory of the disk “disk name” cannot be rebuilt. There is not enough memory. Quit all other applications, start without extensions and try rebuilding again (error number).**

Make sure any other applications are closed. If you are not running from the DiskWarrior CD or a Mac OS system CD, make sure that you have started with extensions off. Try running DiskWarrior again.

- The directory of the disk “disk name” cannot be rebuilt. DiskWarrior has not modified this disk. The original directory is too severely damaged. It appears another disk utility has erased critical directory information (error number).**

In certain cases, the disk may still be recoverable. Alsoft technical support personnel may be able to provide additional help with the recovery of this disk. The technical support email address is: tech.support@Alsoft.com.

- The directory of the disk “disk name” cannot be rebuilt. The original directory is too severely damaged. The disk was not modified (error number).**

Damage to some items may result in an unrecoverable disk. However, both the master directory block and alternate master directory block (HFS) or the volume header and alternate volume header (HFS Plus) would have to be damaged or unrecoverable for the disk to be unrecoverable. Since these items are located at opposite ends of the disk, damage to both is extremely unlikely. In certain cases, the disk may still be recoverable. Alsoft technical support personnel may be able to provide additional help with the recovery of this disk. The technical support email address is: tech.support@Alsoft.com.

- ❑ **DiskWarrior encountered an unexpected error while attempting compare the original and replacement directories. Error (error number).**

Try rebuilding again. To skip the comparison step, press the 'control' key after the progress window is displayed and continue to press until the report is shown.

- ❑ **DiskWarrior encountered an unexpected error while attempting to display the report window.**

If possible, quit all other applications, start without extensions and try rebuilding again (error number).

- ❑ **DiskWarrior encountered an unexpected error while attempting to show the preview disk “disk name” on the desktop. To preview this disk, quit all other applications, start without extensions and try rebuilding again (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer as described above. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior encountered an unexpected error while attempting to launch the Finder for disk previewing. To preview, quit all other applications, start without extensions and try rebuilding again (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer as described above. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior encountered an unexpected error while writing the replacement directory of the disk “disk name”. Rebuild this disk again. Preview the disk and backup all files from the preview disk (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive). If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all exten-

sions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior encountered an unexpected error while attempting to show the disk “disk name” on the desktop. Rebuild this disk again. Preview the disk and backup all files from the preview disk (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive). If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior requires Text Encoding Converter (TEC) version 1.3 or greater to be installed.**

The TEC extension is installed in the Extensions folder and the Text Encodings folder is installed in the System Folder. TEC 1.3 is part of Mac OS 8.1 or higher.

- ❑ **DiskWarrior encountered an unexpected error while attempting to show the disk “disk name” on the desktop. The disk was not modified (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **Directory rebuilding of the disk “disk name” was canceled. The disk was ejected or removed from the desktop by another application (error number).**

Make sure any other applications are closed. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, make sure that you have started with extensions off. If your computer is part of a network, it is possible that another computer on the network modified your disk.

- The directory of the disk “disk name” cannot be rebuilt. The disk is locked or otherwise write protected (error number).**

Unlock the disk and try to rebuild again.

- Directory rebuilding of the disk “disk name” was canceled. The disk was ejected and replaced by another disk.**

The disk selected for repair was ejected or removed from the desktop. It must be returned to the desktop before it can be rebuilt.

- The original disk “disk name” could not be shown on the desktop. Previewing will continue though only the preview disk will appear on the desktop (error number).**

- Directory rebuilding of the disk “disk name” was canceled. The original or preview disk was altered or removed from the desktop.**

Make sure any other applications are closed. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, make sure that you have started with extensions off. If your computer is part of a network, it is possible that another computer on the network modified your disk.

- There is a preview disk on the desktop that cannot be removed. Please save all your work and restart your computer.**

In the unlikely event that the preview disk remains on the desktop when DiskWarrior is not running, do not use the preview disk. You should restart your computer and attempt to rebuild the disk with DiskWarrior again. It is possible that some application or extension may be preventing DiskWarrior from removing the preview disk from the desktop. Make sure you have quit all other applications, and restart with all extensions off or start from the DiskWarrior CD or a Mac OS system CD.

- Another copy of DiskWarrior is already open and only one copy may be open.**

- The original disk and the preview disk now appear on the desktop. Both disks are locked to prevent alteration during preview.**

The Finder will be brought to the front so that you may view the disks. When finished, please return to DiskWarrior and click either “Replace” or “Cancel.” Please do not remove either disk from the desktop.

- The preview disk now appears on the desktop. It is locked to prevent alteration.**

The Finder will be brought to the front so that you may view the disk. When finished, please return to DiskWarrior and click either “Replace” or “Cancel.” Please do not remove the preview disk from the desktop.

- There is not enough free disk space to perform a fail-safe replacement of the directory. Do you want to continue and place the new directory directly over the original directory?**

An interruption during the few seconds usually required to replace the directory could leave the disk’s contents inaccessible. If the original disk appears on the desktop, then move files from the original disk to another disk, such as a floppy, to make room for a replacement directory. DiskWarrior uses a fail-safe method of replacing the directory whenever possible, which will be most cases. To use the fail-safe method, there merely needs to be enough free space on the disk to write the new directory. There is redundancy designed into the fail-safe method, assuring there is never any risk of ending up with an unusable disk if the process is interrupted.

- The original directory is empty and there are no files and folders in the replacement directory. This disk will be empty after replacing the directory. Do you want to continue and replace the directory?**

This disk was either newly initialized, or the directory data was erased before running DiskWarrior.

- The internet browser could not be located and launched (error number).**

Install a web browser or, if you have one installed, rebuild your desktop files.

- ❑ **A disk malfunction occurred while writing the replacement directory to the disk “disk name”. Rebuild this disk again. Preview the disk and backup all files from the preview disk (error number).**

This could be due to a hardware malfunction, a driver problem, or some other error occurring with the disk. You should backup the disk, update or reinstall the driver and try again. If this is not successful, you may need to reformat your disk and restore from the backup.

- ❑ **The disk “disk name” is full and the repair of overlapped files could not be completed. Increase the amount of free space on the disk and try rebuilding again (error number).**

When files are overlapped on disk, they have to be copied to new locations to separate them. In this case there is not enough free space to make the copies. Move files off of the disk and try rebuilding again.

- ❑ **DiskWarrior encountered an unexpected error while attempting to repair overlapped files on the disk “disk name”. Quit all other applications, start without extensions and try rebuilding again (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **The replacement directory for the disk “disk name” could not be built. The disk was not modified. Start without extensions and try rebuilding again (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior encountered an unexpected error while attempting to stop previewing. The original or preview disk could not be removed from the desktop or another error occurred. Start without extensions and try rebuilding again (error number).**

In the unlikely event that the preview disk remains on the desktop when DiskWarrior is not running, do not use the preview disk. You should restart your computer and attempt to rebuild the disk with DiskWarrior again. It is possible that some application or extension may be preventing DiskWarrior from removing the preview disk from the desktop. Make sure you have quit all other applications, and restart with all extensions off or start from the DiskWarrior CD or a Mac OS system CD.

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior encountered an unexpected error (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- ❑ **DiskWarrior encountered an unexpected error and cannot complete the current operation. If you report this error, mention the number (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer. If you are not starting up from the DiskWarrior CD or a Mac OS system CD, start up with all extensions off. If DiskWarrior reports this error number again, please contact Alsoft Technical Support.

- Available memory has been exhausted. DiskWarrior cannot continue to execute. (error number).**

Memory is so dangerously low that continuing risks crashing. Make sure any other applications are closed. If you are not started up from the DiskWarrior CD or a Mac OS system CD, make sure that you have started with extensions off. Try running DiskWarrior again.

- DiskWarrior encountered an error while saving the report. Please choose another disk on which to save the report (error number).**

The report could not be saved to a file on the selected disk. Make sure you have enough free space on the disk where you are trying to save the file, and make sure the disk is not locked, or select another disk.

- DiskWarrior cannot be run from a locked disk. Please unlock the disk and then open DiskWarrior again.**

- The directory of the disk "disk name" was successfully rebuilt.**

The disk has been successfully rebuilt.

- The directory of the disk "disk name" was successfully rebuilt. Do you want to save the report for this disk?**

DiskWarrior found problems and the report was not saved. The report is a useful reference.

- DiskWarrior encountered an unexpected error while attempting to bless the system folder. Error (error number).**

You may not be able to start up from this disk unless you reinstall the system software.

- DiskWarrior encountered an unexpected error while attempting to repair the boot blocks. Error (error number).**

You may not be able to start up from this disk unless you reinstall the system software.

- This DiskWarrior® application is not compatible with the version of this DiskWarrior Extension that is loaded.**

To use this application please load the proper version of the extension.

- The DiskWarrior extension encountered an unexpected error and has been turned off. Error (error number).**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer to activate the DiskWarrior extension again.

- DiskWarrior encountered an unexpected error while attempting to edit the list.**

It is possible that the DiskWarrior preferences file is corrupt and needs to be thrown away (error number). This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer.

- Directory graphs are designed for display with at least thousands of colors. Do you want to change the monitor to display thousands of colors?**

If you select “Change,” your monitor will be set to display thousands of colors, and the current setting will be restored when you quit DiskWarrior.

- Directory graphs are designed for display with at least thousands of colors. This monitor cannot display thousands of colors. The graph will not accurately represent the directory.**

Decreasing screen resolution may permit the monitor to display thousands of colors.

- The disk named “disk name” could not be graphed. An unexpected error occurred. Error (error number)**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer.

- The directory of the disk “disk name” cannot be graphed.**

There is not enough memory. Quit all other applications, start without extensions and try graphing again (error number).

- DiskWarrior encountered an error while saving the graph.**

Please choose another disk on which to save the graph (error number). The graph could not be saved to a file on the selected disk. Make sure you have enough free space on the disk where you are trying to save the file, and make sure the disk is not locked, or select another disk.

- A graph for the disk named “disk name” cannot be created because existing directory damage has been detected.**

Please rebuild the directory of the disk named “disk name”. Error: (error number).

- DiskWarrior encountered an unexpected error while attempting to copy the graph to the clipboard. Error (error number)**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer.

- There is not enough available memory to copy the graph to the clipboard.**

Close some windows or quit other applications to create more available memory and try again.

- The DiskShield™ tab cannot be displayed.**

DiskShield requires Mac OS 8.1 or later and Appearance Manager 1.0.1 or later.

- The application named “[app name]” already exists in the bypass list. It was not added to the list a second time.**

It is only necessary to have an application in the list once in order for it to be bypassed. It is possible that you have attempted to add a different version of the same program to the list. If this is the case, then the one program will suffice for DiskWarrior to bypass both versions.

- The DiskWarrior preferences file was determined to be corrupt and has been moved to the trash. A new preferences file has been created with default settings.**

Click on the DiskShield tab to restore your preferences.

- The DiskWarrior preferences file has been determined to be corrupt. Please quit DiskWarrior and then throw away the preferences file. Next, open DiskWarrior and a new preferences file will be created with default settings.**

The DiskWarrior preferences file should be located within the Application Support folder in the System Folder. After you delete the preferences file, click on the DiskShield tab to restore your preferences.

- The DiskWarrior preferences file could not be read or updated. It was created by a newer version of DiskWarrior.**

Please use the newer version of DiskWarrior or throw away the preferences file and restart to create a new preferences file with default settings. The DiskWarrior preferences file should be located within the Application Support folder in the System Folder. If you delete the preferences file, click on the DiskShield tab to restore your preferences.

- DiskWarrior encountered an unexpected error while attempting to use the DiskWarrior preferences file.**

Throw away the preferences file and restart to create a new preferences file with default settings. The DiskWarrior preferences file should be located within the Application Support folder in the System Folder. Error (error number). After you delete the preferences file, click on the DiskShield tab to restore your preferences.

- The DiskWarrior preferences file could not be read or updated because it could not be found. Error (error number).**

You will be using default preferences and they will not be saved.

- The DiskWarrior preferences file could not be read or updated because the current startup disk is locked. Error (error number).**

This occurred because you attempted to change a setting in the DiskShield tab while started from a locked disk, such as a CD.

- The DiskWarrior preferences file could not be updated because the preferences file is locked.**

Unlock the preferences file if it has not been locked intentionally. It should be located within the Application Support folder in the System Folder.

- ❑ **The DiskWarrior preferences file could not be updated because the current startup disk is full.**

Please create some free disk space on the current startup disk and try again.

DiskShield Prevented/Existing Damage Notification

- ❑ **(Damage type) exists in the (directory component) of the disk “disk name”.
(Suggestion) (error number)**

Damage type can either be Minor damage or Corruption (refer to *DiskShield Prevented/Existing Damage Notification* on page 50, "Chapter 2: Using DiskWarrior."). The possible directory components can be directory, extents tree, catalog tree, volume bitmap, volume info, or alternate volume info. You should perform the suggestion in the message (“You should rebuild the directory with DiskWarrior as soon as possible,” “You should rebuild the directory with DiskWarrior immediately,” or “You should restart this computer and rebuild the directory with DiskWarrior immediately”).

- ❑ **The (directory component) of the disk “disk name” was incorrectly updated and has minor damage. Rebuild the directory with DiskWarrior as soon as possible. (error number)**

The possible directory components can be directory, extents tree, catalog tree, volume bitmap, volume info, or alternate volume info. You should rebuild the directory with DiskWarrior as soon as possible.

- ❑ **An attempt to seriously damage the (directory component) of the disk “disk name” was prevented! Restart and use DiskWarrior to ensure the integrity of the disk. (error number)**

The possible directory components can be directory, extents tree, catalog tree, volume bitmap, volume info, or alternate volume info. You should restart this computer and rebuild the directory with DiskWarrior immediately.

- ❑ **The (directory component) of the disk “disk name” was incorrectly updated and has minor damage. (Program name) was the current application. Rebuild the directory with DiskWarrior as soon as possible. (error number)**

The possible directory components can be directory, extents tree, catalog tree, volume bitmap, volume info, or alternate volume info. You should rebuild the directory with DiskWarrior as soon

as possible. When this occurs, your ultimate response will depend upon the program that caused the error and what you were attempting to do at the time. For example, if you were using a disk editor to modify your directory, you will probably ignore the error and make an exception for the disk editor (refer to *Turn off protection for these applications* on page 52, "Chapter 2: Using DiskWarrior."). On the other hand, if the error was caused by your Web browser while you were simply browsing the Web, you might want to consider updating or replacing that program.

- An attempt to seriously damage the (directory component) of the disk “disk name” was prevented! (Program name) was the current application. Restart and use DiskWarrior to ensure the integrity of the disk. (error number)**

The possible directory components can be directory, extents tree, catalog tree, volume bitmap, volume info, or alternate volume info. You should restart this computer and rebuild the directory with DiskWarrior immediately. When this occurs, your ultimate response will depend upon the program that caused the error and what you were attempting to do at the time. For example, if you were using a disk editor to modify your directory, you will probably ignore the error and make an exception for the disk editor (refer to *Turn off protection for these applications* on page 52, "Chapter 2: Using DiskWarrior."). On the other hand, if the error was caused by your Web browser while you were simply browsing the Web, you might want to consider updating or replacing that program.

- An unexpected error occurred while attempting to provide DiskShield protection for the disk “disk name”. Protection has been turned off for this disk. Please restart this computer to turn protection back on. (error number)**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer.

- An unexpected error occurred while attempting to provide DiskShield protection for disks attached to this computer. Protection has been turned off for all disks. Please restart this computer to turn protection back on. (error number)**

This error message indicates that DiskWarrior has encountered an unusual error. Make note of this message and the error number (including whether the number was negative or positive) and then restart your computer.

- ❑ **The DiskWarrior® Preferences file has been determined to be corrupt. Please throw this file away. The preferences file should be located within the Application Support folder. Restart and a new preferences file will be created with default settings.**

The DiskWarrior preferences file should be located within the Application Support folder in the System Folder. After you delete the preferences file, click on the DiskShield tab to restore your preferences.

DiskWarrior Report Messages

The following is a list of all of the *possible* messages that can be included in a DiskWarrior Report. Please note that this list is provided only for reference and some messages are exclusive of others. In other words, the occurrence of some messages (errors) prevents the occurrence of other messages. Also, this is an example list and quantities may vary in real situations.

Summary Messages

DiskWarrior has successfully built a new optimized directory for the disk named "Untitled." The new directory is ready to replace the original directory.

All file and folder data was easily located.

Comparison of the original and replacement directories indicates that there will be no changes to the number or contents of files and folders.

Comparison of the original and replacement directories indicates that there will be changes to the number, the contents and/or the attributes of the files and folders. It is recommended that you preview the replacement directory and examine the items listed below.

Comparison of the original and replacement directories was skipped. A complete comparison may provide additional useful information.

- All errors in the directory structure such as tree depth, header node, map nodes, node size, node counts, node links, indexes and more have been repaired.
- Errors, if any, in the directory structure such as tree depth, header node, map nodes, node size, node counts, node links, indexes and more have been repaired.
- Media errors were encountered during rebuilding. Some data may be missing because it could not be read from disk.
- 1 file had to be recovered. The file may have been lost or thrown away. You must inspect the file to determine the extent of any damage. You must also determine whether the file should be discarded.
- 1 iNode file had a link count that was repaired.
- 1 link file had a creation date that was repaired.

- 1 link file no longer point(s) to an original file and therefore cannot be repaired.
- 1 file had a directory entry with an incorrect flag that was repaired.
- 1 file had a directory entry with an incorrect alias flag that was repaired.
- 1 file had a duplicate ID that was repaired.
- 1 file had an ID that was repaired.
- 1 file had a directory entry with an incorrect text encoding value that was repaired.
- 1 files occupy portions of the disk already occupied by another file. The files will be relocated to unique portions of the disk after replacing the directory. You must inspect these files to determine which of them had been overwritten and damaged. The detailed view of this report lists the files that overlap.
- 1 file had a directory entry with an incorrect starting allocation value that was repaired. You must inspect the file to determine the extent of any damage. The detailed view of this report lists the file.
- 1 file had a directory entry with an incorrect allocation length value that was repaired. You must inspect the file to determine the extent of any damage. The detailed view of this report lists the file.
- 1 file had a duplicate name that was repaired.
- 1 file had an incorrect allocated size that was repaired.
- 1 file had an incorrect actual size that was repaired.
- 1 file had an incorrect clump size that was repaired.
- 1 file had an oversized thread that was repaired.
- 1 file with a circular allocation was detected. The circular allocation will be repaired after replacing the directory. You must inspect the file to determine the extent of the damage. The detailed view of this report lists the file.

- 1 file had an incorrect key that was repaired.
- 1 file had a directory entry with an incorrect value in a reserved field that was repaired.
- 1 file had a resource fork that was found to be damaged.
- 1 file had to be moved to the "Damaged Items" folder.
- 1 missing folder had to be recreated.
- 1 folder had a duplicate ID that was repaired.
- The disk was made visible.
- The disk name is no longer locked.
- 1 folder had a directory entry with an incorrect value in a reserved field that was repaired.
- 1 folder had a directory entry with an incorrect flag that was repaired.
- 1 folder had a duplicate name that was repaired.
- 1 folder had an oversized thread that was repaired.
- 1 file/folder had an incorrect record type that was repaired.
- 1 folder had an incorrect item count that was repaired.
- 1 folder had a custom icon that was found to be damaged.
- 1 folder had a directory entry with an incorrect custom icon flag that was repaired.
- 1 folder had a directory entry with an incorrect text encoding value that was repaired.
- 1 folder had an incorrect key that was repaired.
- The Root creation date was repaired.
- 2 files/folders had to be moved to the "Rescued Items" folder.

- Incorrect values in the Volume Information were repaired.
- Critical values in the Volume Information are incorrect and need to be repaired.
- Critical values in the Volume Information were incorrect and were repaired.
- The Wrapper Volume is damaged and needs to be repaired.
- The Wrapper Volume needs to be updated.
- The Boot Blocks are damaged and will be repaired after replacing the directory.
- No System Folder was found.
- The System Folder was blessed.
- There is no blessed System Folder, you will be asked to choose a System Folder after replacing the directory.
- Volume Information was changed.
- 1 file could not be found.
- 1 folder could not be found.
- 1 folder will have more items.
- 1 folder will have fewer items.
- 1 file will now become accessible.
- 1 folder will now become accessible.
- 1 file had a File Type that changed.
- 1 file had a File Creator that changed.
- 1 file had a Creation Date that changed.
- 1 file had a Modification Date that changed.
- 1 folder had a Creation Date that changed.

- 1 folder had a Modification Date that changed.
- 1 file had a Finder Flag that changed.
- 1 folder had a Finder Flag that changed.
- 1 file had a Name that changed.
- 1 folder had a Name that changed.
- 1 folder had too many items for comparison to be completed.
- 1 folder could not be completely compared due to damage in the original directory.

Detail Messages

DiskWarrior has successfully built a new optimized directory for the disk named "Untitled." The new directory is ready to replace the original directory.

DiskWarrior has successfully built a new directory for the disk named "Untitled." The new directory cannot replace the original directory because the disk is locked.

DiskWarrior has successfully built a new directory for the disk named "Untitled." The new directory cannot replace the original directory because of a disk malfunction.

DiskWarrior has successfully built a new directory for the disk named "Untitled." The new directory cannot replace the original directory because the original directory was too severely damaged.

DiskWarrior has detected damage in the wrapper Volume Information for the disk named "Untitled." The replacement directory cannot be built unless this damage is repaired.

DiskWarrior has detected damage in the wrapper volume for the disk named "Untitled." The replacement directory cannot be built unless this damage is repaired.

It is recommended that you replace your original directory.

There is not enough contiguous free space for a fail-safe replacement of the directory. It is highly recommended that you create (number) MB of contiguous free space before replacing the original directory.

It is highly recommended that you backup all of your data from the preview disk.

It is highly recommended that you repair the wrapper Volume Information.

It is highly recommended that you repair the wrapper volume.

There is not enough contiguous free space for a fail-safe replacement of the directory. It is highly recommended that you backup all of your data from the preview disk before replacing the directory.

Notes:

All file and folder data was easily located.

The original directory is damaged and it was necessary to scavenge the directory to find file and folder data.

Some files that had been lost or thrown away may have been recovered.

The original directory is severely damaged and it was necessary to scavenge the directory to find file and folder data.

Some file and folder data may be missing, and some files that had been lost or thrown away may have been recovered.

The disk was not on the desktop prior to rebuilding. Only the preview disk will appear if you preview the replacement directory.

Optimizing the Extents Tree Directory File has increased available disk space.

Optimizing the Catalog Tree Directory File has increased available disk space.

Comparison of the original and replacement directories indicates that there will be no changes to the number or contents of files and folders.

Comparison of the original and replacement directories indicates that there will be changes to the number, the contents and/or the attributes of the files and folders. It is recommended that you preview the replacement directory and examine the items listed below.

Comparison of the original and replacement directories was skipped. A complete comparison may provide additional useful information.

- All errors in the directory structure such as tree depth, header node, map nodes, node size, node counts, node links, indexes and more have been repaired.
- Errors, if any, in the directory structure such as tree depth, header node, map nodes, node size, node counts, node links, indexes and more have been repaired.

Disk: "Untitled"

Detected Media Errors in the critical Volume Information

Detected Media Errors in the Wrapper volume

Detected Media Errors in the critical Volume Information

Detected Media Errors in the Catalog Tree Directory File

Detected Media Errors in the Extents Tree Directory File

Repaired Invisible Disk

Repaired Locked Disk Name

Repaired the Root creation date

Repaired the Reserved Field of the Volume Information

Repaired the Total File Count of the Volume Information

Repaired the Total Folder Count of the Volume Information

Repaired the Available Disk Space of the Volume Information

Repaired the Text Encodings Bitmap of the Volume Information

Repaired the Root File Count of the Volume Information

Repaired the Root Folder Count of the Volume Information

Repaired the Volume Name of the Volume Information

Repaired the Allocation File Length of the Volume Information

The Signature of the Volume Information is incorrect and needs to be repaired.

The Creation Date of the Volume Information is incorrect and needs to be repaired.

The Modification Date of the Volume Information is incorrect and needs to be repaired.

The Attribute Bits of the Volume Information is incorrect and needs to be repaired.

The Number of Files of the Volume Information is incorrect and needs to be repaired.

The Volume Bitmap Start of the Volume Information is incorrect and needs to be repaired.

The Allocation Pointer of the Volume Information is incorrect and needs to be repaired.

The Number of Allocation Blocks of the Volume Information is incorrect and needs to be repaired.

The Allocation Block Size of the Volume Information is incorrect and needs to be repaired.

The File Clump Size of the Volume Information is incorrect and needs to be repaired.

The Data Fork Clump Size of the Volume Information is incorrect and needs to be repaired.

The Resource Fork Clump Size of the Volume Information is incorrect and needs to be repaired.

The Allocation Block Start of the Volume Information is incorrect and needs to be repaired.
The Next Catalog ID of the Volume Information is incorrect and needs to be repaired.
The Number of Free Blocks of the Volume Information is incorrect and needs to be repaired.
The Volume Name of the Volume Information is incorrect and needs to be repaired.
The Tree Clump Size of the Volume Information is incorrect and needs to be repaired.
The Number of Root Folders of the Volume Information is incorrect and needs to be repaired.
The Number of Root Files of the Volume Information is incorrect and needs to be repaired.
The Number of Folders of the Volume Information is incorrect and needs to be repaired.
The Finder Information of the Volume Information is incorrect and needs to be repaired.
The Embedded Signature of the Volume Information is incorrect and needs to be repaired.
The Embedded Extents Data of the Volume Information is incorrect and needs to be repaired.
The BTree Size of the Volume Information is incorrect and needs to be repaired.
The Extents Tree Extents Data of the Volume Information is incorrect and needs to be repaired.
The Catalog Tree Extents Data of the Volume Information is incorrect and needs to be repaired.
The Last Mount Version of the Volume Information is incorrect and needs to be repaired.
The Encodings Bitmap of the Volume Information is incorrect and needs to be repaired.
The Allocation File Fork Data of the Volume Information is incorrect and needs to be repaired.
The Extents File Fork Data of the Volume Information is incorrect and needs to be repaired.
The Catalog File Fork Data of the Volume Information is incorrect and needs to be repaired.
The Attributes File Fork Data of the Volume Information is incorrect and needs to be repaired.
The Startup File Fork Data of the Volume Information is incorrect and needs to be repaired.
The Embedded Volume Block Size of the Volume Information is incorrect and needs to be repaired.

Repaired the Signature of the critical Volume Information
Repaired the Creation Date of the critical Volume Information
Repaired the Modification Date of the critical Volume Information
Repaired the Attribute Bits of the critical Volume Information
Repaired the Number of Files of the critical Volume Information
Repaired the Volume Bitmap Start of the critical Volume Information
Repaired the Allocation Pointer of the critical Volume Information
Repaired the Number of Allocation Blocks of the critical Volume Information
Repaired the Allocation Block Size of the critical Volume Information
Repaired the File Clump Size of the critical Volume Information
Repaired the Data Fork Clump Size of the critical Volume Information
Repaired the Resource Fork Clump Size of the critical Volume Information
Repaired the Allocation Block Start of the critical Volume Information
Repaired the Next Catalog ID of the critical Volume Information
Repaired the Number of Free Blocks of the critical Volume Information
Repaired the Volume Name of the critical Volume Information
Repaired the Tree Clump Size of the critical Volume Information

Repaired the Number of Root Folders of the critical Volume Information
Repaired the Number of Root Files of the critical Volume Information
Repaired the Number of Folders of the critical Volume Information
Repaired the Finder Information of the critical Volume Information
Repaired the Embedded Signature of the critical Volume Information
Repaired the Embedded Extents Data of the critical Volume Information
Repaired the BTree Size of the critical Volume Information
Repaired the Extents Tree Extents Data of the critical Volume Information
Repaired the Catalog Tree Extents Data of the critical Volume Information
Repaired the Last Mount Version of the critical Volume Information
Repaired the Encodings Bitmap of the critical Volume Information
Repaired the Allocation File Fork Data of the critical Volume Information
Repaired the Extents File Fork Data of the critical Volume Information
Repaired the Catalog File Fork Data of the critical Volume Information
Repaired the Attributes File Fork Data of the critical Volume Information
Repaired the Startup File Fork Data of the critical Volume Information
Repaired the Embedded Volume Block Size of the critical Volume Information
The directory files of the Wrapper Volume need to be repaired
The files of the Wrapper Volume need to be repaired
The files of the Wrapper Volume need to be updated
Detected damaged Boot Blocks, they will be repaired AFTER replacing the directory
Detected that the System Folder is missing
Detected that there is no blessed System Folder, you will be asked to choose one AFTER replacing the directory
Detected that the Software Lock Flag of the Volume Information changed
Detected that the Spared Blocks Flag of the Volume Information changed
Detected that the No Cache Required Flag of the Volume Information changed
Detected that the File System Identifier of the Volume Information changed
Detected that the Blessed System Folder of the Volume Information changed
Detected that the Total Bytes of the Volume Information changed
Detected that the Free Bytes of the Volume Information changed
Location: "Desktop"

Folder: "folder"

Recreated this Missing Folder
Repaired Duplicate ID
Repaired Reserved Field
Repaired Folder Flags
Repaired Duplicate Name
Repaired Oversized Thread

Repaired Record Type
Repaired Item Count
Detected that the Custom Icon is damaged and cannot be repaired
Repaired Custom Icon Flag
Repaired Text Encoding
Repaired Key
Moved to the Rescued Items Folder
Blessed this System Folder
Detected More Items
Detected Fewer Items
Detected this folder is now Accessible
Detected that the Creation Date changed
Detected that the Modification Date changed
Detected that the Locked Name Finder Flag changed
Detected that the Visibility Finder Flag changed
Detected that the Name changed
This folder had Too Many Items for comparison to be completed
Comparison Failed for this folder due to damage in the original directory
Location: "Untitled:"

File: "filename"

Recovered this file
Repaired this iNode File link count
Creation Date for this Link File was repaired
This Link File no longer points to an original file
Repaired File Flags
Repaired Alias Flag
Repaired Duplicate ID
Repaired ID
Repaired Text Encoding
Detected Overlapping Contents, this file will be relocated AFTER replacing the directory
Repaired Starting Allocation
Repaired Allocation Length
Repaired Duplicate Name
Repaired Allocated Size
Repaired Actual Size
Repaired Clump Size
Repaired Oversized Thread
Detected Circular Contents, this file will be repaired AFTER replacing the directory
Repaired Key

Repaired Reserved Fields

Detected that the Resource Fork is damaged and cannot be repaired

Moved to the Damaged Items Folder

Moved to the Rescued Items Folder

Detected this file is now Accessible

Detected that the File Type changed

Detected that the File Creator changed

Detected that the Creation Date changed

Detected that the Modification Date changed

Detected that the Stationery Finder Flag changed

Detected that the Locked Name Finder Flag changed

Detected that the Bundle Finder Flag changed

Detected that the Visibility Finder Flag changed

Detected that the Alias Finder Flag changed

Detected that the Name changed

Location: "Untitled:folder:"

File: "filename"

Detected that this file is Absent

Location: ""

File: "folder"

Detected that this folder is Absent

Location: ""

Explanations:

Absent: References to these items could not be found in the replacement directory, but appeared to exist in the original directory.

Accessible: These are items that had an entry in an inaccessible portion of the original directory. They are accessible in the replacement directory.

Actual Size: A file's actual size is the size of its contents. Repairs prevent the contents of these files from being damaged when the files are used or copied.

Alias Flag: Every file has a flag that indicates whether or not it has an alias. Repairs ensure the proper functioning of any aliases to these files.

Allocated Size: A file's allocated size is the sum of all portions of the disk it occupies. Repairs

prevent the contents of these files from being damaged when the files are copied or resized.

Allocation Length: Files with allocation errors are files that occupy portions of the disk that don't actually exist and don't contain any data in these locations. These files have been moved to the "Damaged Items" folder. You must inspect these files to determine which, if any, have missing contents.

Boot Blocks: The Boot Blocks are the first two blocks on a disk. They contain startup parameters and a tiny amount of code necessary to start up from a Mac OS disk.

Circular Contents: A file with a circular allocation is a file that occupies the same portions of the disk more than once. These files will be repaired **after replacing the directory**. You must inspect these files to determine the extent of the damage. Be aware that opening damaged files can cause the computer to crash.

Clump Size: A file's clump size is the amount a file grows when the size of its contents are increased beyond its actual size. Repairs prevent these files from becoming excessively fragmented or occupying excessive disk space.

Comparison Failed: Severe damage in the original directory can prevent access to some files and folders. This damage made comparison of one or more folders impossible.

Creation Date: This is a date that is part of the directory information for each disk, file and folder. It indicates the date and time a disk was initialized or a file or folder was created. For a Link File, this date is used as part of the reference to its original file.

Custom Icon: Every folder that has a custom icon contains a file that is normally invisible, named "Icon", where the icon is stored. If the icon file is damaged the custom icon will not be displayed properly and may cause the computer to crash.

Custom Icon Flag: Every folder has a flag that indicates whether or not it has a custom icon. Repairs ensure that the icons of these folders will be properly displayed.

Damaged Items Folder: Files are moved to this folder so they may be inspected for reasons stated in other sections of this report.

Duplicate ID: Every file and folder has an identification number that must be unique. Repairs ensure that applications can locate them if they are renamed or moved to a new location.

Duplicate Name: Every item within a given folder must have a unique name. Repairs ensure that

these items can be used.

Fewer Items: These folders have fewer items in the replacement directory than they had in the original directory. This is usually the result of items being moved to the "Damaged Items" folder.

File Creator: This is a four character code that is part of the directory information for each file that indicates with which application a file is associated. When you double-click a document to open it, the Finder uses its file creator to determine which application to use to open the file.

File Flags: These are true/false settings that indicate attributes of a file such as whether the file is locked. Repairs ensure proper access to these files.

File Type: This is a four character code that is part of the directory information for each file that indicates the type of data contained within the file. For example, the file type 'TEXT' plainly describes the contents of a text file, while 'APPL' is the file type used for applications.

Finder Flags: These are true/false settings that provide information about an item to the Finder. For example, one flag indicates whether an item should be visible, while another flag indicates whether the Finder will allow an item's name to be changed.

Folder Flags: These are for future expansion of the Mac OS filing system and are required to be zero. Repairs prevent a future version of the Mac OS from having difficulties with these folders.

ID: Every file and folder has a unique identification number that must be valid. Repairs ensure that applications can locate them if they are renamed or moved to a new location.

iNode File: This is a file that is being referenced by one or more Link Files and it is the file that is actually opened when one of the Link Files is opened.

Invisible Disk: The disk has a setting that prohibits the Finder from displaying it on the desktop. This repair allows the disk to be displayed.

Item Count: Every folder keeps a record of the number of items that it contains. Repairs ensure that all items are present when viewing the contents of these folders.

Key: These store the names and locations of files and folders and are used to find their entries in the directory. Repairs ensure that they can be used.

Link File: This is a file that points to another file. When you open a link file, the original file that the link file points to opens. A Link File's creation date is part of its reference to the original file.

Locked Disk Name: The disk has a setting that prohibits you from renaming it. This repair allows the disk to be renamed.

Media Errors: These can be evidence of bad blocks on the disk, a hardware defect, or problems with termination or cabling. Some data may be missing because it could not be read from disk.

Missing Folder: References to these folders were found, but the actual folders were missing or damaged. Recreating these folders allows access to any files and folders within them.

Modification Date: This is a date that is part of the directory information for each disk, file and folder that indicates the date and time a disk, file or folder was last altered.

More Items: These folders have more items in the replacement directory than they had in the original directory. This is usually the result of lost files being recovered.

Name: This is text that is part of the directory information for each disk, file and folder and uniquely identifies a file or folder within its enclosing folder.

Overlapping Contents: Overlapping files are files that occupy portions of the disk already occupied by another file. These files will be relocated **after replacing the directory**. You must inspect these files to determine which of them had been overwritten and damaged. Be aware that opening damaged files can cause the computer to crash.

Oversized Thread: Threads are used as a shortcut for accessing files and folders. Repairs reclaim wasted space within the directory.

Record Type: Every item in the directory has a record type that identifies it as a file, folder or thread. Repairs make the files and folders accessible.

Recovered Files: These are files that had an entry in an inaccessible portion of the directory. These files may have been lost or thrown away. You must inspect these files to determine the extent of any damage. You must also determine whether these files should be discarded.

Rescued Items Folder: Orphaned files and folders don't belong to any folder. They have been relocated to this folder to make them accessible.

Reserved Fields: These are for future expansion of the Mac OS filing system and are required to be zero. Repairs prevent a future version of the Mac OS from having difficulties with these files.

Resource Fork: This is a simple database that can be part of a file. It contains resources such as the menus and windows used by applications. Retrieval of the resources may not be possible or the computer may crash if the resource fork is damaged.

Root: This is the top level of a disk hierarchy. The root has increased significance for Mac OS X disks.

Starting Allocation: Files with allocation errors are files that occupy portions of the disk that don't actually exist and don't contain any data in these locations. These files have been moved to the "Damaged Items" folder. You must inspect these files to determine which, if any, had missing contents.

System Folder: This folder contains the files and folders necessary to start up from a Mac OS disk. Also referred to as the "blessed folder."

Text Encoding: File and folder names are stored in Unicode characters. The text encoding value indicates the method used to convert the file name to Unicode. Repairs prevent the name from being displayed incorrectly.

Too Many Items: You cannot access more than 32,767 items in a folder on a Mac OS Standard Format disk when started from any version of the Mac OS. You can only access more than 32,767 items in a folder on a Mac OS Extended Format disk when started from Mac OS 9.0 or later.

Volume Information: Every disk has information that describes its contents. Repairs prevent problems such as wasted disk space and applications not functioning properly.

Wrapper Volume: There is a Mac OS Standard volume that wraps around this Mac OS Extended disk. The wrapper volume is required for backward compatibility and to startup from this Mac OS Extended disk. Repairs prevent problems with compatibility and starting up.