

DiskWarrior 5



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Introduction

Welcome to DiskWarrior

Alsoft, the Utility Company

At Alsoft, we have been writing software for Mac OS computers since 1984. We are a Macintosh-only software company whose expertise is in providing powerful, useful and safe utilities that enhance the user experience while maintaining the ease-of-use Macintosh owners have come to 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. With the release of Mac OS 8.1 in January 1998, Apple introduced their new disk format for Mac OS computers, known as Mac OS Extended format or HFS Plus. 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 elimination utility for Mac OS computers only from Alsoft. DiskWarrior has won more awards than any other disk utility and is recommended as the first choice by Mac experts everywhere.

What Is DiskWarrior?

DiskWarrior is a utility program designed from the ground up with a totally different approach to preventing and resolving directory damage which is the leading cause of Mac instability.

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 - 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 volume headers and alternate volume headers (HFS Plus), volume bitmaps, catalog trees, and extents trees and with master directory blocks and alternate master directory blocks (HFS).

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.

Directory damage isn't the only threat to your data. A physical hardware malfunction can cause intermittent loss of access to any data on the drive. If the malfunction is serious enough, the only way to retrieve the data on the drive is through an expensive data recovery service. DiskWarrior can be configured to automatically check drives for possible drive malfunction, giving you the chance to back up your data before a drive completely fails. The hardware monitoring can also be run manually if you suspect a drive malfunction.

Alsoft has been making disk utilities for the Mac nearly 30 years. Our disk optimization utilities have always chosen the safety and security of your data over anything else, and have been able to detect and report directory errors no other

program can (the others obviously couldn't fix the problems they couldn't even find). That knowledge has been put into DiskWarrior to give you the only tool that can eliminate all directory problems and recover files and folders! And, as an added bonus, the directory DiskWarrior creates is optimized for maximum speed when accessing your files!

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 the information stored in the directory are 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 has two components, the data and the structure. The directory data is the information the directory contains, 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 Mac OS uses the structure to quickly access the data and thus find out where in the directory the data is located. (The directory structure is not the folder organization you see on your disk, nor is it organized as such.) 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 by category (automotive, computers, physicians, etc.).

What Is Directory Damage and How Does It Affect Me?

The directory is the portion of your disk set aside to record the names and locations of your files and folders. When your directory is either incorrectly updated or not updated at all, your directory is damaged.

If your Mac crashes or loses power, updated directory information that the OS X caches in memory for faster access never gets written to your disk, resulting in

directory damage. The presence of directory damage may be very minor and go unnoticed. Or it could make some or all of your files inaccessible!

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

How Does Directory Damage Occur?

Common types of unexpected interruptions are kernel panics 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.

Why Use DiskWarrior First?

When other utilities attempt to repair your directory, they attempt to do so by "patching" the directory one problem at a time, ignoring the big picture of what is truly wrong with your directory and risking file information that might otherwise have been saved. 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.

Because other utilities may delete directory data in their repair attempts, you should always use DiskWarrior first when you suspect directory damage on your disk. DiskWarrior uses a unique method of quickly rebuilding your directory from the data recovered in your old directory.

This method recovers files and folders that you thought were lost and that no other program can recover. Otherwise, you risk losing directory data and thus access to your files. With DiskWarrior, there is never a risk of losing directory data and thus never a risk of losing access to your files.

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, missing files or folders, or crashes when files are used. You will also find DiskWarrior useful when another program reports directory damage.

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 - we suggest at least once each month. 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.

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 Spotlight, the Finder, applications that search for their preference files, applications that build font menus, and open dialogs. DiskWarrior optimizes the

directory, improving the speed of all of these activities and many more. Other programs may not provide the true directory optimization provided by DiskWarrior.

Why Alsoft DiskWarrior Is the Only Answer

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. DiskWarrior then uses this information to build an entirely new replacement directory structure. This approach is similar to that taken by FileMaker with its databases. 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. 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 be mounted.

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. Because of this, 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. 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 Preview.

DiskWarrior's patented Preview feature lets you examine your disk as it will appear after the directory is rebuilt, but 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 will also perform other checks. It will repair damaged boot blocks and re-bless the System folder if it is necessary to do so on your disk. This ensures that your disk will properly start your OS X computer once the rebuilding is complete.

DiskWarrior also checks and repairs OS X user permissions and it checks special files internal formats.

DiskWarrior can be used to activate internal diagnostics that are built into disk devices to help determine if a drive is in danger of physical malfunction. These tests can be executed manually, or you can choose to have the tests run automatically every day, week or month. DiskWarrior also provides several notification options should the diagnostics report a problem.

We Put the State-of-the-Art Technologies You Expect from Alsoft in

DiskWarrior:

- 64-Bit Architecture allows DiskWarrior 5 to handle even the largest disks.
- Supports ACLs (Access Control Lists)
- New Directory Optimization Index
- Repairs Time Machine backup disks
- Repairs Partition Table damage.
- Significantly faster
- Supports FileVault 2 encrypted disks
- Runs from an OS X Recovery Disk
- Recovers more data from drives with hardware malfunctions
- Detects and repairs more disk problems than ever
- Supports Directory Hard Links (such as used by Time Machine)
- Supports Extended Attributes
- Supports FileVault encrypted user accounts
- Uses directory data to quickly rebuild the directory structure
- Supports file journaling
- Repairs Mac OS User permissions
- Scavenges directory to find all salvageable file and folder data, even data contained in damaged nodes
 - 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
 - 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
 - Monitors drive hardware for potential drive failure
 - Verification of replacement directory ensures data integrity
 - Comparison of original directory with replacement directory tells you which 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, blesses the system folder, repairs the HFS wrapper when Mac OS 9 and early versions of Mac OS X are being utilized

- Checks custom icon files for corruption, eliminating a common cause of system crashes

- Safely permits interruptions of any kind, including power outages

- Advanced “Verify Reads and Writes” technology protects your data

- Supports bad block sparing software

- Checks special system files internal format

Copyright Notice

As stated in the copyright notice in this manual, you may install and use DiskWarrior on any computer owned by you, for the purpose of performing its functions on any disk owned by you. However the software may not exist on more than one computer at a time.

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

You can register your software on the Web at <http://www.Alsoft.com/registrationform.html>. You will need to enter your registration number as your serial number.

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.



How to Utilize DiskWarrior

The Four Methods for Utilizing the Software.

To utilize DiskWarrior to rebuild the directory of a disk, you can:

- 1) Install DiskWarrior to the computer's main hard drive
- 2) Install DiskWarrior to a secondary/external drive or USB Flash device, which contains a valid operating system installation
- 3) Utilize Target Disk Mode
- 4) Launch DiskWarrior from the OS X Recovery Disk

The decision on which method to utilize will be based on what disk you are wanting to rebuild with DiskWarrior.

Rebuilding the Computer's Main/Only Disk

For DiskWarrior to rebuild the directory of a disk, it must first be unmounted - so that it is no longer active. Because of this, DiskWarrior does not rebuild the directory of the disk that contains the operating system that is currently running the computer (usually this would be the computer's internal hard drive). To rebuild the directory of the disk that usually operates the computer, the computer must be temporarily started up from another source such as a secondary/external drive, USB Flash device, or be connected to another computer. For this type of repair, you can use options 2, 3, and 4, as listed above.

Rebuilding the Computer's Secondary/External Disk/Disk Image

For DiskWarrior to rebuild the directory of a secondary disk, external disk or a disk image, the storage volume must also first be unmounted so that it is no longer an active disk. However, since these disks are not providing the operating system which is running the computer, you can simply launch DiskWarrior from the Applications folder of the disk that contains the active operating system.

Installing DiskWarrior

To install DiskWarrior, drag the application to the Applications folder. Installation of DiskWarrior will require an administrative password and your DiskWarrior serial number.

Note: If you suspect there is directory damage on your disk, then you should first rebuild the directory of the disk before installing DiskWarrior. Alsoft recommends that you run DiskWarrior on your disk before installing DiskWarrior.



Figure 4-1 The Serialization Dialog Box

If You Received DiskWarrior Electronically

DiskWarrior cannot be run from the disk image containing the DiskWarrior application that you received electronically. Please refer to Installing DiskWarrior below for instructions on how to install DiskWarrior. It is recommended that you put the disk image containing the DiskWarrior application and the other files on another hard 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.

Record the registration 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.

Installing the DiskWarrior Received Via Download Purchase

1) Open the ‘DiskWarrior.dmg’ file you received via download. Doing so will cause the disk image named ‘DiskWarrior’ to be mounted.

2) Double click on the Installer. The DiskWarrior application will be installed into the Applications folder.

Uninstalling DiskWarrior

If you ever have a need to uninstall DiskWarrior, simply drag the DiskWarrior application icon from the Applications folder to the trash.

If you have configured DiskWarrior to do Automatic Hardware Monitoring (refer to About DiskWarrior’s Hardware Monitoring on Page 46 in this chapter), you will need to remove the DiskWarriorStarter from your user’s Login Items in the System Preferences.

Opening DiskWarrior

To open an installed copy of DiskWarrior, double-click the DiskWarrior icon located in the Applications folder.

The following pages will provide step by step instructions for installing and utilizing DiskWarrior in each of the four configurations.

Quitting DiskWarrior

To quit the DiskWarrior application, choose Quit from the DiskWarrior menu. This closes the DiskWarrior application window, but any automatic DiskWarrior features you have enabled will still take place. (*Note: DiskWarrior will not Quit if it is in the middle of the rebuilding process*)

1) Install DiskWarrior to the Computer's Main Hard Drive

The Following are the System Requirements to Install and Utilize DiskWarrior From the Computer's Main Hard Drive:

For an Intel-based computer...

To install and launch DiskWarrior 5 from a hard drive, your computer must be started from OS X v. 10.5.8 or higher.

Any Intel-based Macintosh computer that is capable of running OS X 10.5.8 (Leopard).

For DiskWarrior to rebuild the directory of a drive that is encrypted with FileVault 2, DiskWarrior must be running from a computer running OS X 10.7.x (Lion) or newer as earlier versions of the operating system do not recognize a FileVault 2 encrypted device. For more detailed information about DiskWarrior and FileVault and encrypted devices, please see Page 44.

For a PowerPC computer...

To install and launch DiskWarrior 5 on a PowerPC computer, your computer must be started from OS X v. 10.5.8 (Leopard).

The Apple System requirements for OS X 10.5.8 (Leopard) are a 867Mhz G4 Mac or better (such as a G4 or G5) with built-in FireWire and a minimum 512 MB RAM (1 GB recommended).

Can the Disk Be Repaired by DiskWarrior?

In the configuration of DiskWarrior installed to the computer's main hard drive, DiskWarrior can rebuild any disk that is not the disk which contains the active operating system as long as it meets the following requirements:

The disk to be rebuilt must be a locally connected (Internal, USB, FireWire, eSATA, Thunderbolt, etc.) non-network attached (not via ethernet nor wireless) must not be write protected, and must have a valid partition map.

To repair a disk, DiskWarrior does not require a drive to be mounted. However, the storage volume must be available to DiskWarrior. The availability of the storage volume of a mountable drive will look like this in the Apple Disk Utility application:



The availability of an unmounted or unmountable (damaged) volume will look like this (notice the volume name is in grey - sometimes this will be just an identifier such as disk1s2):



In both of the instances above, a drive can have the directory rebuilt by DiskWarrior. To learn more go to Chapter 5, The Directory Rebuild.

For DiskWarrior to Build a Directory Optimization Index (DOI) for the Directory of a Disk, all of the Following Must be True...

- 1) The disk must be mounted.
- 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.

2) Install DiskWarrior to a Secondary/External drive or USB Flash Device

The primary reason for utilizing DiskWarrior from a secondary/external drive or USB Flash device, is to use the software to repair the computer's main hard drive - typically the computer's internal hard disk.

To do so, the secondary/external drive or USB Flash device, must have an operating system installed on it so as to start up the computer.

The following are the System Requirements to install and utilize DiskWarrior from a secondary / external drive or USB Flash device:

For an Intel-based computer...

To install and launch DiskWarrior 5 from a secondary/external drive or USB Flash device, your computer must be started from OS X v. 10.5.8 or higher.

Any Intel-based Macintosh computer that is capable of running a minimum of OS X 10.5.8 (Leopard).

For an Intel-based Macintosh computer, the external drive may be connected via FireWire, USB, or Thunderbolt. Some eSATA drives can be used for this task, but not all. Please contact the manufacturer of the specific device to learn more. These external disks must be formatted with the GUID Partition Table (GPT).

For DiskWarrior to rebuild the directory of a drive that is encrypted with FileVault 2, DiskWarrior must be running from a computer running OS X 10.7.x (Lion) or newer as earlier versions of the operating system do not recognize a FileVault 2 encrypted device. For more detailed information about DiskWarrior and FileVault and encrypted devices, please see Page 44.

For a PowerPC computer...

To install and launch DiskWarrior 5 on a PowerPC computer, using a secondary/external drive as the startup device, your computer must be started from OS X v. 10.5.8 (Leopard).

The Apple System requirements for OS X 10.5.8 (Leopard) are a 867Mhz G4 Mac or better (such as a G4 or G5) with built-in FireWire and a minimum 512 MB RAM (1 GB recommended).

For a PowerPC computer, only a FireWire drive can be used as an external device to start up the computer. The disk must be formatted with an Apple Partition Map (APM).

How to Install an Operating System Onto a Secondary / External Drive or USB Flash Device...

There are many methods to install an operating system onto a secondary/external drive or USB Flash device, so as to use the DiskWarrior application to rebuild the computer's main hard drive. It is possible that not all of these will be available to your specific computer:

- * Utilize DiskWarrior Recovery Maker (OS X 10.7 or later) to make a startup device. *(Note: Please see DiskWarrior Recovery Maker documentation for detailed instructions)*

- * Install an operating system while a computer is started from an OS X Recovery Disk

- * Utilize the Internet Recovery feature to install an operating system from Apple's servers.

- * Utilize an Apple Installation CD or DVD that will install an operating system that meets the System Requirements for DiskWarrior.

- * Utilize an Apple operating system installation application acquired from the Mac App Store.

Can the Disk be Repaired by DiskWarrior?

While the configuration of the computer started up from a secondary / external drive or USB Flash device and DiskWarrior launched from the secondary / external drive or USB Flash device, is primarily used to rebuild the computer's main disk, in this configuration DiskWarrior can still be used to rebuild any disk that is not the disk which contains the active operating system as long as it meets the following requirements:

The disk to be rebuilt must be a locally connected (Internal, USB, FireWire, eSATA, Thunderbolt, etc.) non-network attached (not via ethernet nor wireless) must not be write protected, and must have a valid partition map.

To repair a disk, DiskWarrior does not require a drive to be mounted. However, the storage volume must be available to DiskWarrior. The availability of the storage volume of a mountable drive will look like this in the Apple Disk Utility application:



The availability of an unmounted or unmountable (damaged) volume will look like this (notice the volume name is in grey - sometimes this will be just an identifier such as disk1s2):



In both of the instances above, a drive can have the directory rebuilt by DiskWarrior. To learn more go to Chapter 5, The Directory Rebuild.

For DiskWarrior to Build a Directory Optimization Index (DOI) for the Directory of a Disk, all of the Following Must be True...

- 1) The disk must be mounted.
- 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.

3) Utilize Target Disk Mode

Sometimes, a secondary/external drive or USB Flash device is not available to start up a computer. However, if you have two computers, both of which have a FireWire or Thunderbolt (or combination of both - see more specific hardware requirements later in this section) you can utilize Target Disk Mode to run DiskWarrior from one computer (the Host computer), to rebuild the directory of the drive in the Target computer.

The primary reason for utilizing DiskWarrior via Target Disk Mode is to use the software to repair a second computer's main hard drive - typically the computer's internal hard disk.

Target Disk Mode can be used regardless of the processor type of a computer. A PowerPC computer can be used as a host to rebuild the directory of an Intel-based Macintosh (as long as both computers have FireWire) and an Intel-based Macintosh can be used as the host to rebuild a drive in a PowerPC-based computer. Of course, PowerPC to PowerPC and Intel to Intel is compatible.

Note: Do not connect the computers through a hub or other FireWire or Thunderbolt port. This configuration only works when the computers are connected directly.

To utilize Target Disk Mode, configure your computers in the following manner:

Connect two Macs with a FireWire or Thunderbolt cable (not all options will be applicable depending on the model of your computer) where one is the "host" and the other is a "target". The host Mac should be running OS X (10.5.8 "Leopard" or higher - 10.7.x (Lion) or higher if utilizing FileVault 2). In this scenario, the target Mac is the computer whose internal hard drive you want to repair. Start by shutting down the target Mac. Then turn it on while holding down the "T" key. Run DiskWarrior from the Applications folder of the host Mac and rebuild the target Mac's disk.

The following are the System Requirements to Install and Utilize DiskWarrior via Target Disk Mode:

For an Intel-based computer...

To install and launch DiskWarrior 5 on an Intel-based computer, and use it as the Host computer, the computer must be started from OS X v. 10.5.8 (Leopard).

Any Intel-based Macintosh computer that is capable of running a minimum of OS X 10.5.8 (Leopard).

When DiskWarrior is launched from an Intel-based computer, any PowerPC computer which is Target Disk Mode compatible can be connected via Target Disk Mode. If the Host computer has FireWire and also if the Host computer has Thunderbolt (this requires the Apple Thunderbolt to FireWire adapter). Further, any Intel-based Macintosh computer which has FireWire or Thunderbolt can be connected as long as the hardware matches or has the proper adapters.

NOTE: For DiskWarrior in Target Disk Mode to rebuild the directory of a drive that is encrypted with FileVault 2, DiskWarrior must be running from a computer running OS X 10.7.x (Lion) or newer as earlier versions of the operating system do not recognize a FileVault 2 encrypted device. For more detailed information about DiskWarrior and FileVault and encrypted devices, please see Page 44.

For a PowerPC computer...

To install and launch DiskWarrior 5 on a PowerPC computer, and use it as the Host computer, the computer must be started from OS X v. 10.5.8 (Leopard).

The Apple System requirements for OS X 10.5.8 (Leopard) are a 867Mhz G4 Mac or better (such as a G4 or G5) with built-in FireWire and a minimum 512 MB RAM (1 GB recommended).

When DiskWarrior is launched from a PowerPC computer, any PowerPC computer which is Target Disk Mode compatible (*Note: some early FireWire equipped computers cannot be configured in Target Disk Mode*) can be connected via Target Disk

Mode. Further, any Intel-based Macintosh computer which has FireWire can also be the target computer.

Can the Disk be Repaired by DiskWarrior?

While the configuration of computers in Target Disk Mode, is primarily used to rebuild the computer's main disk, in this configuration DiskWarrior can still be used to rebuild any disk that is not the disk which contains the active operating system as long as it meets the following requirements:

The disk to be rebuilt must be a locally connected (Internal, USB, FireWire, eSATA, Thunderbolt, etc.) non-network attached (not via ethernet nor wireless) must not be write protected, and must have a valid partition map.

To repair a disk, DiskWarrior does not require a drive to be mounted. However, the storage volume must be available to DiskWarrior. The availability of the storage volume of a mountable drive will look like this in the Apple Disk Utility application:



The availability of an unmounted or unmountable (damaged) volume will look like this (notice the volume name is in grey - sometimes this will be just an identifier such as disk1s2):



In both of the instances above, a drive can have the directory rebuilt by DiskWarrior. To learn more go to Chapter 5, The Directory Rebuild.

For DiskWarrior to Build a Directory Optimization Index for the Directory of a Disk Connected in Target Disk Mode, All of the Following Must be True:

- 1) The disk must be mounted.
- 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.

4) Running DiskWarrior while started from an OS X Recovery Disk

For computers running OS X 10.7.x (Lion) or newer, another option is to start up the computer from an OS X Recovery Disk and launch DiskWarrior.

Note: These instructions are written as if you have DiskWarrior on the Alsoft-supplied DiskWarrior USB Flash disk.

1) Turn on or restart your Mac and immediately press and hold down the Command key and the R key (Command-R). Press and hold these keys until the Apple logo appears. After the Recovery System finishes starting up, you should see a desktop with an OS X menu bar and an “OS X Utilities” window. Note: If you see a login window or your own desktop and icons, it’s possible that you didn’t hold Command-R early enough. Restart and try again.

2) Choose Terminal from the Utilities menu.



3) When the Terminal window is displayed, type `/Volumes/DW/go` and press the Return key.



4) DiskWarrior will launch.

The DiskWarrior Interface

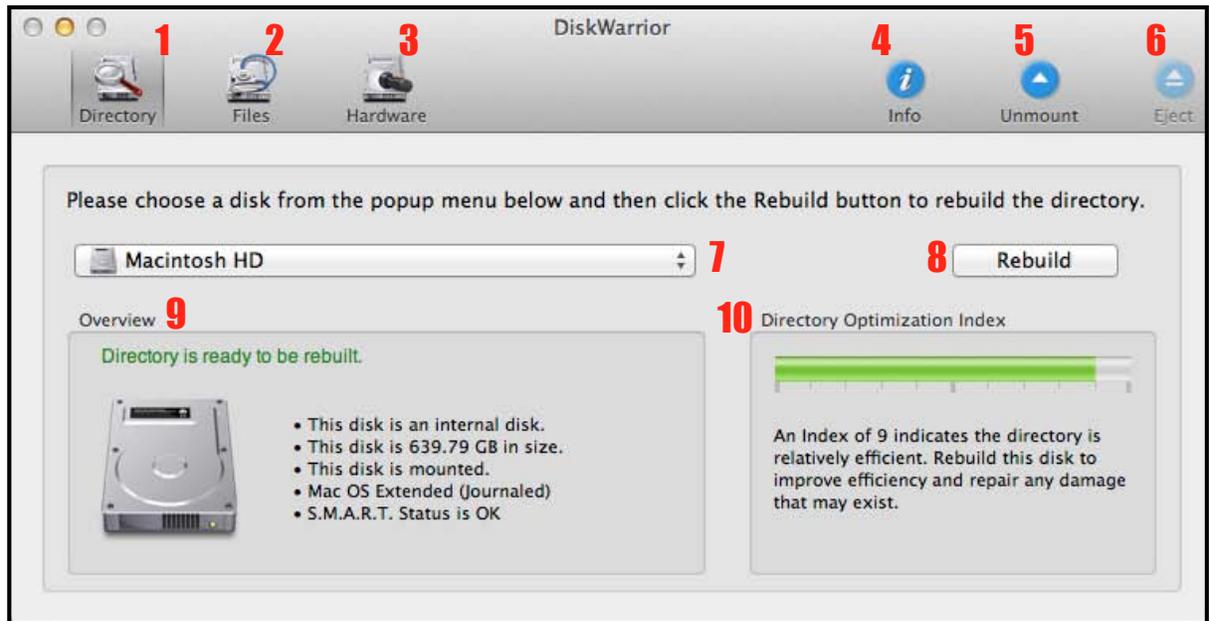


Figure 4-2 The DiskWarrior Main Window

Elements of the DiskWarrior Main Window

- 1) Directory Rebuild
- 2) Files Test
- 3) Hardware Test
- 4) Information Button
- 5) Unmount/Mount Button
- 6) Eject Button
- 7) Disk Popup Menu
- 8) Rebuild Button
- 9) Overview
- 10) Directory Optimization Index

1) Directory Rebuild

This is the main feature of DiskWarrior. The directory rebuilding process repairs damaged disks, performs maintenance to keep disks working, and keeps your computer running at its optimal speed. To learn more, go to “The Directory Feature” on Page 34.

2) Files Test

The Files Test runs the repair permissions routine as well as checking certain file types for damage. To learn more, go to “The Files Feature” on Page 54.

3) Hardware Test

The Hardware Test utilizes SMART diagnostics to determine the physical health of a drive and to report hardware problems. To learn more, go to “The Hardware Feature” on Page 56.

4) Info Button

The Info button will open a new window and provide numerous statistics about the currently selected disk.

5) Unmount/Mount Button

Utilize this button to safely unmount or mount a drive.

6) Eject Button

Before unplugging a hard drive from the computer, it should be properly ejected, to make certain the directory is not damaged.

7) Popup Menu

In the Popup menu, you can select the disk you want DiskWarrior to repair.

8) Rebuild Button

Click this button to start the directory rebuild process - this is the feature used for both maintenance and repair of a disk.

9) Overview

The Overview section provides feedback on the status of a drive, how the drive is connected to the computer, capacity, mount status, format and S.M.A.R.T status.

10) Directory Optimization Index

The Directory Optimization Index gives a quick look at the status of the directory for each mounted disk. To learn more, go to Page 51.



The Directory Feature

Rebuilding Your Mac OS Extended Disks

You will find DiskWarrior extremely easy to use. You will start by selecting a disk, clicking Rebuild, and then waiting a few moments for the DiskWarrior Report. Then you will view the Report, making note of the problems that were found and repair anything that DiskWarrior recommends to you. At this point, you should preview the rebuilt disk, checking if any files or folders you may have lost have been recovered. Once you have determined 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 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 you regularly make a complete backup of your disks. This will allow you to restore your data regardless of any problem that might arise, such as completely deleted directories 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. If you startup from a Recovery Disk, this will allow DiskWarrior to rebuild the directory of any Mac OS Extended disk locally connected to your Mac OS computer.

2) Close all open applications

Directories cannot be rebuilt on disks with open applications.

3) Double-click the DiskWarrior application

This will start DiskWarrior. If this is the first time you have run DiskWarrior, you will be presented with several dialogs. Read each carefully and respond appropriately to each. You will then be presented with the DiskWarrior main window from which you can rebuild disk directories.

Note: To ensure that no files are open on your disk, start up from an OS X Recovery 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 the Troubleshooting section on Page 61.

If any users on a drive use Apple's original FileVault to protect their data, the popup menu of available drives will also contain these FileVaults. The FileVaults will be listed below a separator line and can be selected like any other Disk.

5) Green or red text in the Overview section will indicate whether the disk can 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 19 in this chapter. For methods to overcome the reasons a disk directory cannot be rebuilt, refer to Disk Status Messages on Page 52, "Chapter 3: Troubleshooting and Error Messages."

6) Click the Rebuild button

DiskWarrior will begin building the replacement directory for 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 and folders on the disk.

7) Read the DiskWarrior Report

When DiskWarrior is finished, it will display a window informing you of the results of the rebuild. This will include any files and folders that may have been affected by directory damage in red. 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 39. 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 50.

8) Click Preview and Test the Replacement Directory

At this point, the original directory information on your disk has not been modified, and it will not be until you click “Replace” (*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, 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 39 in this chapter.

- Clicking Preview will cause the DiskWarrior Preview Window to open. The left pane of the DiskWarrior Preview Window will show the contents of your disk in its original state, displayed with its original icon. The right pane of the DiskWarrior Preview Window will show the contents of the Preview disk.

- If the original disk was not mounted, then the Preview Disk will be shown in one pane of the DiskWarrior Preview Window, and the Disk pop-up menu will ask you to select a disk to display in the second pane.

Caution: Never remove/unmount the original disk or the Preview disk during Preview.

Caution: In the unlikely event that the Preview disk remains mounted when DiskWarrior is not running, do not use the Preview disk. You should restart your computer and re-attempt to rebuild the disk with DiskWarrior.

9) Make sure 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. *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.*

10) Click “Replace” to use the replacement directory, or “Cancel” to leave the directory untouched

If you click “Replace,” DiskWarrior will write the replacement directory to your disk. This will result in your disk being “replaced” by the Preview disk described in step 8. If you click “Cancel,” your disk will be untouched and you will be returned to step 4. The Replace button is disabled when the disk is locked, there is a disk malfunction, or the disk is too severely damaged to be repaired. *Note: In the event critical items you wish to recover remain missing during the Preview, it is recommended you do not proceed with the rebuild (refer to What to Look for During Preview on Page 39).*

11) DiskWarrior will write the rebuilt directory to the disk 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 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 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.

13) If you have started your Mac OS computer from a disk besides your normal startup disk (such as an OS X Recovery Disk), select “Restart” from the Apple menu to resume running from your normal startup disk

If you restart and hold down the Option key, the computer will show the Startup Manager. From here, you can choose which disk will start up the computer.

What to Look For in the DiskWarrior Report...

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

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 see if files and folders that you lost have been recovered. You can also inspect the files and folders listed in the DiskWarrior Report.

Clicking Preview will cause the DiskWarrior Preview to open. If your original disk was mounted, then the left pane of the DiskWarrior Preview will show the contents of your disk in its original state. The right pane of the DiskWarrior Preview will show the contents of the Preview disk. If your original disk was not mounted, then only the Preview disk will be shown in the DiskWarrior Preview Window.



Figure 5-1 The Default DiskWarrior Preview Disk Icon

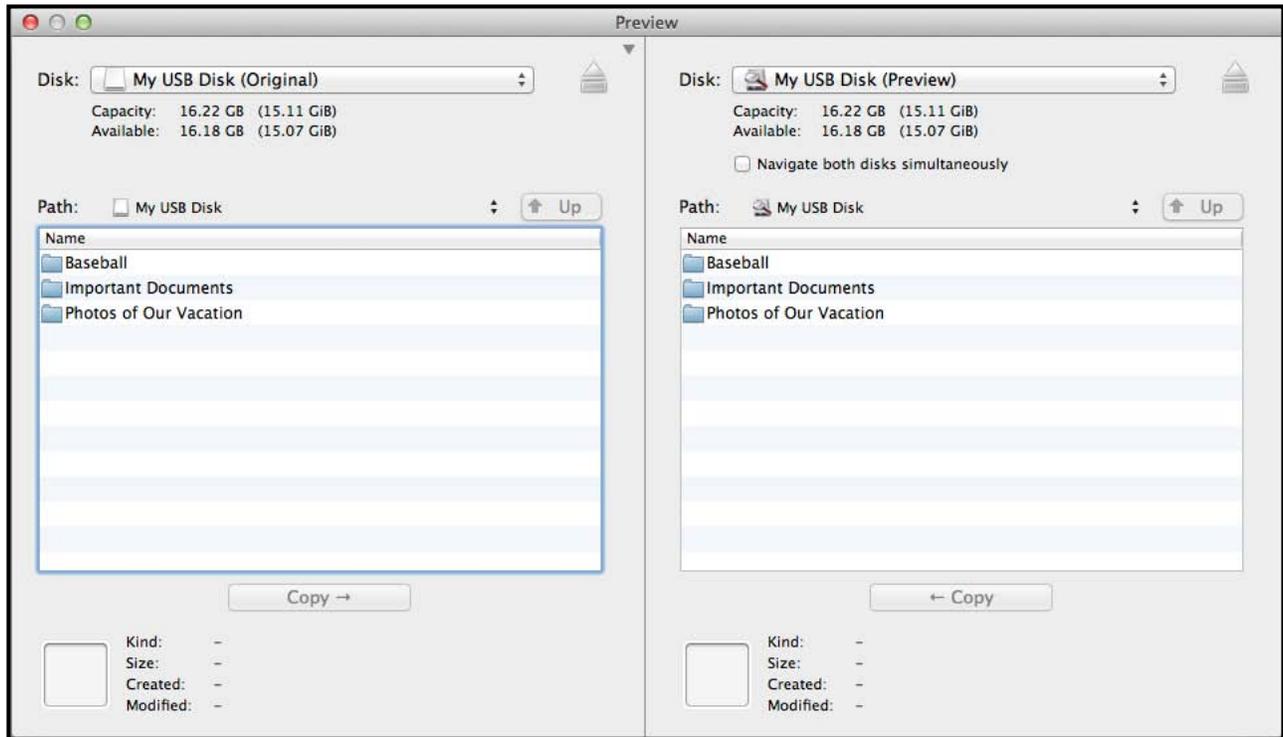


Figure 5-2 The DiskWarrior Preview window

The lower section of each pane will show the icon, kind, size, creation date and modified date of the selected item in that pane. To check for differences in specific items between your original disk and the Preview disk, select the “Navigate both disks simultaneously” check box in the right pane.

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.

Inside of the Rescued Items folder you may find folders named “Missing Folder” that are followed by a number. These are files for which the enclosing folder could not be recovered.

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.

Note: In the event critical items you wish to recover remain missing from the Preview disk, it is recommended that you do not replace the directory. Since the directory information for the missing items was overwritten or deleted DiskWarrior could not recover these items. If this occurs, do not Replace the directory. Simply copy the recovered files, to a new disk. You will need to send your disk to a professional recovery service to recover your lost files.

If you are still missing files while the Preview disk is mounted, you can use the search capability of the DiskWarrior Preview to search the Preview drive. Remember that you may need to look for items that are “invisible” in the Finder.

While in the DiskWarrior Preview Window, you should copy as many items from your disk as possible to another hard disk, removable media, etc. Select the disk to which you wish to copy from the Disk drop-down menu in the left pane. Then select the files you wish to copy and click the Copy button in the right pane. You can also drag and drop files from the Preview to the destination disk.

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 you will not be able to copy all of the files you select. If an error dialogue is displayed, 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 the recovery service will need to recover for you. If you wish to copy files

from the preview disk to another media source (such as another hard disk or other removable media), select the media source from the Disk drop-down menu in the left pane. Then select the files you wish to copy and click the Copy button in the right pane to copy the files onto your media. When you have finished copying files, you can eject the disk by clicking the Eject icon next to the Disk drop-down menu or by ejecting the disk via Finder.

When you have finished with the DiskWarrior Preview Window, return to the DiskWarrior Report window and choose either Replace or Cancel.

Advanced Options

If you hold down the Option key, the Rebuild button will change to Rebuild... Clicking this button will bring up a sheet with additional options (see Figure 5-3).

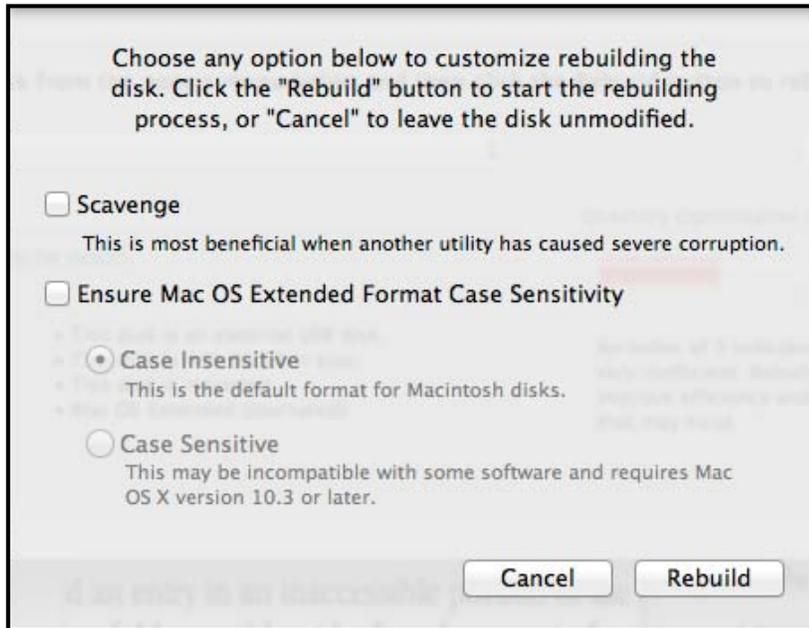


Figure 5-3 The drop-down sheet when "Rebuild..." is clicked

Scavenge Directory

While rebuilding your directory, DiskWarrior will attempt to determine if it needs to perform a scavenge operation to find missing files. In cases where you have run another disk utility before DiskWarrior, this scan will not be performed because it appears unneeded. Checking Scavenge will cause DiskWarrior to perform its scavenge function even if the directory appears not to need it.

Ensure Mac OS Extended Format Case Sensitivity

OS X 10.3 introduced a new version of HFS that is case sensitive. When disk damage causes it to become impossible for DiskWarrior to determine if a disk is case sensitive or insensitive you will be told to use this advanced option. You can also use this command to change the case sensitivity, but you do so at your own risk.

Rebuilding a Disk Image, Including Sparseimage and Sparsebundle

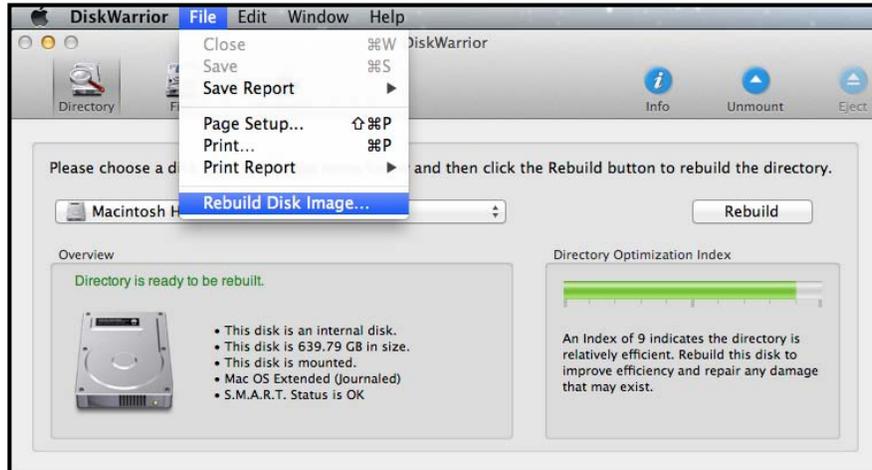


Figure 5-4 How to Rebuild a disk image

To rebuild the directory of a disk image file (which includes .sparseimage and .sparsebundle types), go to the File menu and select “Rebuild Disk Image...” (see Figure 5-4).

A navigation window will appear which allows you to navigate to and select the image to be repaired.

If the image file requires a password, a dialog box will ask for the password prior to the rebuilding process.

Rebuilding a FileVault home folder (not FileVault 2 disk encryption)

To Rebuild a FileVault home folder (created under OS X 10.5.x Leopard and OS X 10.6.x Snow Leopard) simply select the home folder to be repaired, in the popup menu. FileVault home folders will appear in their own section, at the bottom of the popup list.

Special Options Menu



Figure 5-5 Location of the Special Options menu

The Special Options menu (see Figure 5-5) contains two features that are meant for use when working with Alsoft Technical Support.

The “Disallow mounting of disks” option is useful for certain circumstances when disks are physically malfunctioning. This may be useful when a disk is causing a computer to crash or slows down the computer to the point where no disk access is possible. In such an instance you would launch DiskWarrior first, select this option, and then connect the drive to the computer.

The “Disallow replacing of rebuilt directory” option was included at the request of the Forensics community. This option allows for recovery of files while preventing any accidental alterations to the original disk information.

If you think these options apply to a recovery situation, please contact our Technical Support at tech.support@Alsoft.com for further assistance.

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 have seen in the previous 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 8). 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. Alsoft recommends that you run DiskWarrior once a month. DiskWarrior will rebuild your disk directory, eliminating all existing directory damage. The rebuilt disk directory will also be optimized for maximum disk performance. Simply run DiskWarrior 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 files or folders to be missing, or there may be crashes when files are used. You may have another program 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.

Previously accessible data suddenly disappearing, an error message stating your drive is not recognized, a scraping or rattling sound from your hard drive, or your hard drive not spinning may all be symptoms of hardware problems.

DiskWarrior's hardware monitoring will often be able to tell when the problems are being caused by your drive's hardware. However, the drive's built-in diagnostics will have to detect the malfunction in order for DiskWarrior to report it. For information on DiskWarrior's hardware monitoring, refer to "About DiskWarrior's Hardware Monitoring" on Page 57.

Other times you may be unable to startup your computer or login to your User account, but DiskWarrior reports no problems with your directory. This is often caused by corrupt files, and DiskWarrior's file tools may be able to fix or detect problems. For more information refer to Using DiskWarrior's File Checking on Page 43 in this chapter.

Using DiskWarrior to Recover Data from Malfunctioning Disks

Occasionally a disk becomes unusable due to a mechanical malfunction. Unfortunately, you usually still have data you need on the disk when this happens. Although a malfunctioning disk cannot be repaired, DiskWarrior may be able 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 section "How to Utilize DiskWarrior" on Page 16. At the DiskWarrior Report, click Preview to access the damaged disk. Copy as many files and folders as possible to another hard disk, removable media, network disk, etc., using the DiskWarrior Preview Window. 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 System will not be able to copy all of the files you select. Using the DiskWarrior Preview interface to copy files will make the copy without you having to monitor the progress - as any file that does not copy will be listed in the log. 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.

If You See a “Speed Reduced by Disk Malfunction” Message

If DiskWarrior encounters bad blocks (portions of a drive that are no longer reading/writing properly) you will see a message in a red bar that states “Speed Reduced by Disk Malfunction” (see Figure 5-6). This message will be followed by a number, which is a counter. The duration of the rebuilding process will be longer than normal as DiskWarrior works to read the information from the damaged portions of the disk.

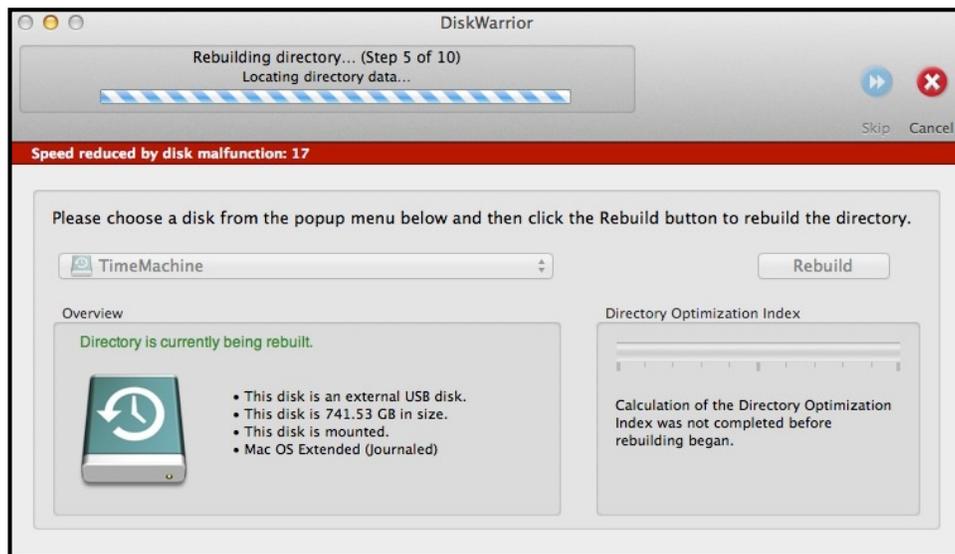


Figure 5-6 The “Speed reduced by disk malfunction” message

As long as the mouse cursor still moves during step 5, then the computer did not hang or freeze. DiskWarrior is still working on reading the directory of the disk.

The "Speed reduced by disk malfunction" message indicates that there is a communication problem with this hard drive. Such slowdowns are usually the result of having bad blocks on the media. DiskWarrior is having trouble reading data from the locations on disk where the directory structures are stored.

Note: If repairing an external drive, we suggest that the drive be connected directly to the computer, not through a hub or monitor, or daisy chained through other devices.

While the application is running, you should see the number of errors increase in the counter, just to the right of the message. The number may not increase at a steady rate as not all of the blocks will be bad.

Note: To recover the data from this drive, please let DiskWarrior continue to run. This is very important. A physically damaged disk mechanism may deteriorate with unnecessary activity like starting and restarting the rebuilding process. Once DiskWarrior moves past Step 5, the process will resume normal functionality.

Since the "Speed reduced by disk malfunction" message indicates hardware-related issues, you will not be given the option to click on the Replace button when DiskWarrior reaches the Report window. Instead, you will need to backup your files from the DiskWarrior Preview window (see the section "What to Look For During Preview" on Page 39) to another hard drive. Once you have a backup of your files, you will need to install a new hard drive to replace the damaged hard drive.

If You See a "Speed Reduced by Lack of Memory" Message

If the size of the directory of a disk is larger than the amount of RAM which is available to DiskWarrior, a "Speed reduced by lack of memory" message (see Figure 5-7) will appear in a yellow bar. This indicates that DiskWarrior is now utilizing Virtual Memory.

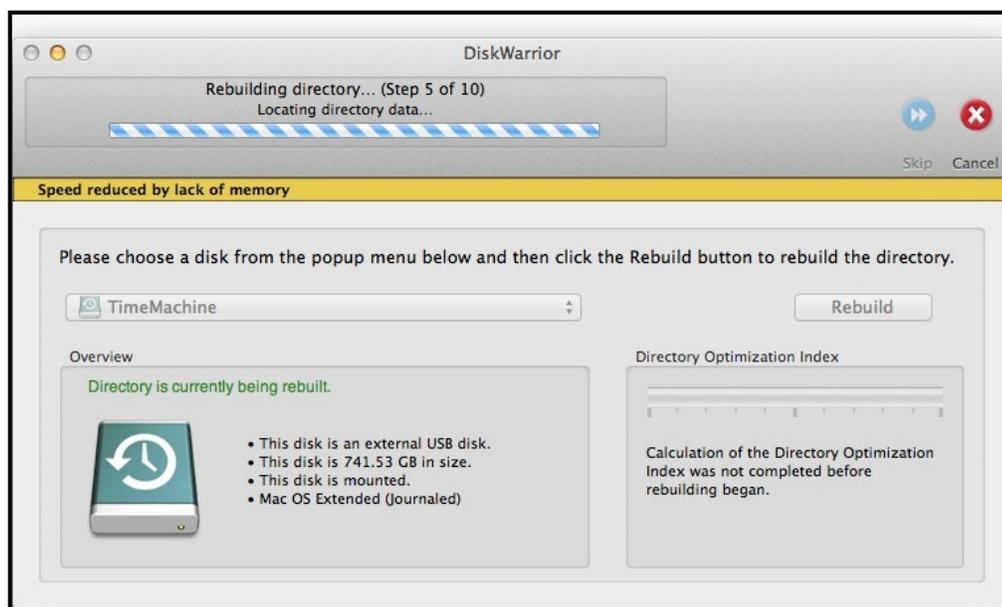


Figure 5-7 The "Speed reduced by lack of memory" message

Usage of Virtual Memory, also known as “swapping” utilizes free space on the computer’s startup disk, to work as RAM. However, for all applications, the usage of Virtual Memory is a considerably slower process than utilizing physical RAM alone.

If this message appears, you should quit all applications other than DiskWarrior, so that all of the computer’s memory resources are available to DiskWarrior. Simply allow DiskWarrior to keep working so that the rebuilding process can be completed.

Once DiskWarrior has completed this part of the rebuilding process, the application will resume functioning at its normal pace.

What to Do If You Used Another Utility First

If you have used another utility before DiskWarrior and now 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. Refer to the Advanced Options on Page 43.

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.

Directory Optimization Index

Upon launching the application, DiskWarrior will create a Directory Optimization Index entry for each valid disk, which indicates on a 10 (best) to 1 (worst) scale of the degree the directory is internally fragmented. This value is a fragmentation of the directory - the index of files and folders. This is **not** a representation of fragmentation of files.

About DiskWarrior's Directory Optimization Index

Note: The Directory Optimization Index does not (and can not) modify the directory or any other part of the disk in any manner.

To build a Directory Optimization Index for the directory of a disk, all of the following must be true.

- 1) The disk must be mounted.
- 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.

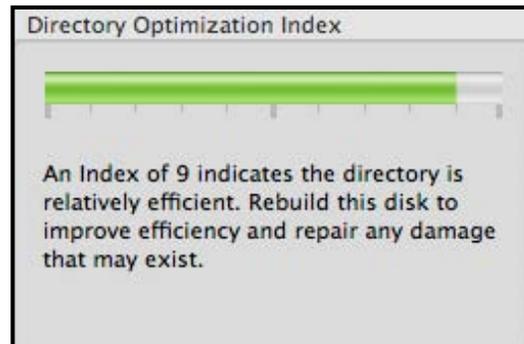
Understanding the Directory Optimization Index

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 you end up with fewer nodes. However, it is fragmentation that has a greater impact on performance as 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 and the more files and folders are out of order, the more impact you'll see on performance. Other utilities may not optimize your directory the way DiskWarrior does.

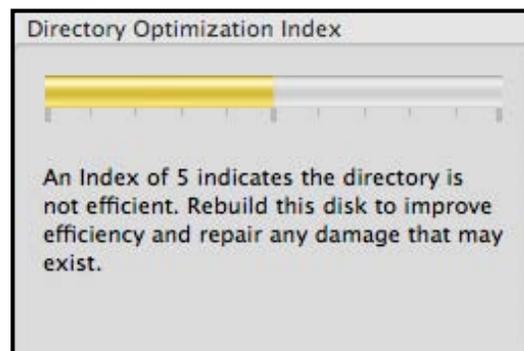
DiskWarrior rates the disk on a scale of 10 (highest - an optimized directory) to 1 (lowest - more directory damage). This scale is split into the following three main sections:

Green



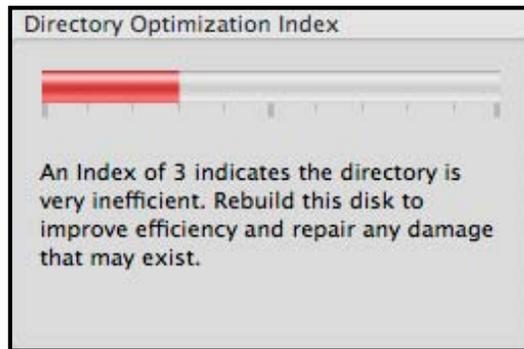
A disk that needs minor repair. Running DiskWarrior would provide minor improvement in efficiency.

Yellow



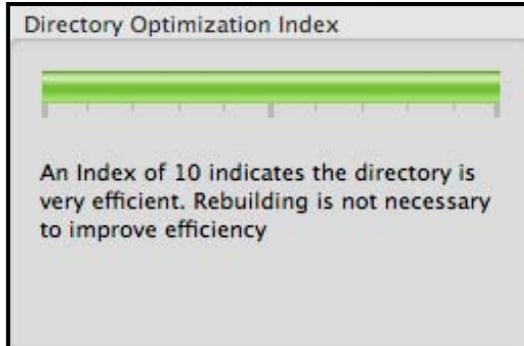
A disk that needs repair before major problems occur. A disk that may already be taking too long to save files, open folders, and retrieve data. Running DiskWarrior would provide moderate improvement in efficiency.

Red



This disk should immediately have the directory rebuilt. Running DiskWarrior would dramatically improve directory efficiency.

After rebuilding...a most efficient directory



The Files Feature

Using DiskWarrior's File Checking

Click the Files icon in the DiskWarrior application to run tests on the files of disks and to repair User permissions on your startup drive.

From the Files tab you can select a volume from the popup menu and perform either or both of the file checking options.



Figure 6-1 The main window of the Files Test

Repair Disk Permissions

In OS X files must have the correct User permissions in order to run without problems. When these get set incorrectly, DiskWarrior can run a tool that compares the permissions software should have with what it does have then sets the permissions correctly. Checking this box will cause this repair to happen. Repair Disk Permissions can only be performed on a volume that has OS X installed on it. Also, if a secondary disk has an installation of OS X, to repair

permissions on this secondary drive, the computer must be running the same operating system as is on the disk for which permissions are being repaired.

The solution, and best way to repair permissions, is to do so when the computer is started up from the hard drive for which you want to run the permissions routine.

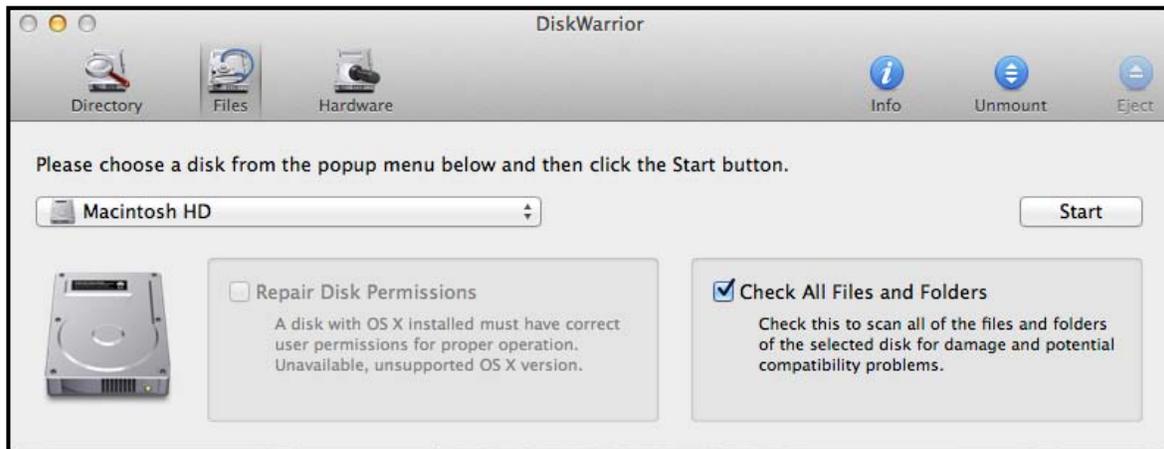


Figure 6-2 When the repair permissions routine is unavailable

Check All Files & Folders

Sometimes the internal structure of special files can become corrupt. Under OS X, preference files (.plist files), as well as many other data files, share a special format. If this format becomes corrupt other parts of the OS will be unable to read these files or will read incorrect data, causing bad system behavior.

DiskWarrior will check the internal structure of these types of files for flaws. If any are found they will be displayed in the report and you can remove those files.

The OS has certain limits for folder depth, number of files in a single folder, and length of file path. DiskWarrior checks for these things and reports them so you can fix them.

Certain system symbolic link file(s) are needed as part of the installation of the OS X. DiskWarrior checks these links and repairs them if possible. The report will tell you what files were repaired and any that could not.

Note: The Files Test does not repair files - it is to alert you of potential problems. Either restore the file from a backup or contact the developer of the software for more specific instructions.

The Hardware Feature

Using DiskWarrior's Hardware Monitoring

Click the hardware icon in the DiskWarrior application to manually activate DiskWarrior's hardware monitoring, to set the frequency of the testing, and to set how DiskWarrior notifies you if it detects a problem.

Note: DiskWarrior's hardware monitoring will only work on internal ATA, internal SATA drives, eSATA drives, Thunderbolt drives, and other devices with built-in S.M.A.R.T. capabilities.

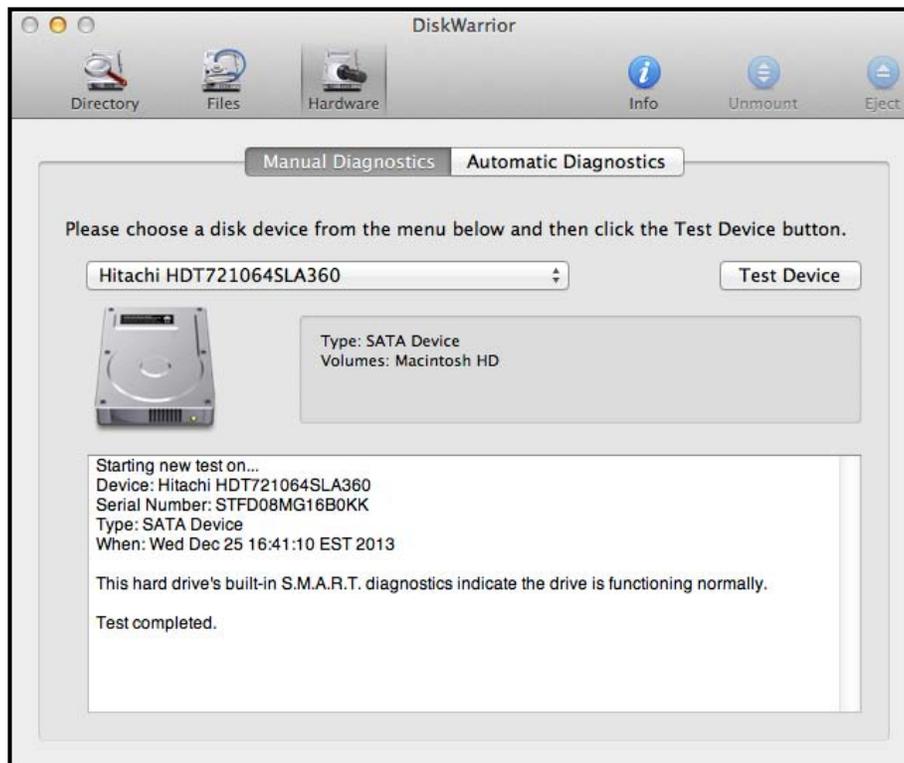


Figure 7-1 The main window of the Hardware Test

About DiskWarrior's Hardware Monitoring

DiskWarrior's hardware monitoring capability uses internal diagnostic routines built into hard drive devices by their manufacturers to detect and track how often a drive exceeds its operating tolerances. The more frequently the drive exceeds these tolerances, the more likely the drive is to experience hardware malfunction, and the more at risk any data on that drive becomes.

The hardware monitoring can be configured to run on your hard drives automatically, or you may choose to run it manually when you suspect a drive of malfunctioning. By activating the automatic diagnostic, DiskWarrior will run the internal diagnostic routines built into your hard drive device as often as you specify. You also choose what action DiskWarrior should take in the event it does detect the potential for hardware failure.

Note: DiskWarrior's hardware monitoring relies upon internal diagnostic routines built into hard drives by their manufacturers. Different drive manufacturers may have different tolerances in their tests.

Caution: In most hard drives, the internal diagnostic routines are inactive by default, and will remain inactive until DiskWarrior's hardware monitoring is activated for the first time on the hard drive. Since the internal diagnostic routines measure changes in the drive over time, to get the maximum benefit from the hardware monitoring, use DiskWarrior to test your drive(s) as soon as possible.

Manual Diagnostics

If you wish to run the hardware monitoring manually, open the DiskWarrior application and click the hardware icon. Choose the hard disk you wish to test from the pop-up menu. The lower portion of the window will indicate the volumes and type of hard disk in the pop-up menu. Click the Test Device button to test the disk.

Note: Some hard drives will generate a sound when the internal diagnostic is run. This sound is normal and not an indicator of mechanical malfunction.

Automatic Diagnostics

You can also configure DiskWarrior to run the hardware monitoring automatically. To do so, the software must be installed. The Automatic Diagnostics will not run from an OS X Recovery Disk. If you choose to have DiskWarrior automatically check your drives, DiskWarrior will install a small program in your Login Items. The program checks periodically to see if it should activate. The program requires very little system resources and virtually no CPU time. It neither reads nor modifies any data from any disk.

Caution: The hardware monitoring can only detect gradual failure of the hard drive over a period of time. It cannot detect unpredictable hard drive failures, such as those caused by a power surge. Therefore, Alsoft recommends that you regularly make a complete backup of your disks.

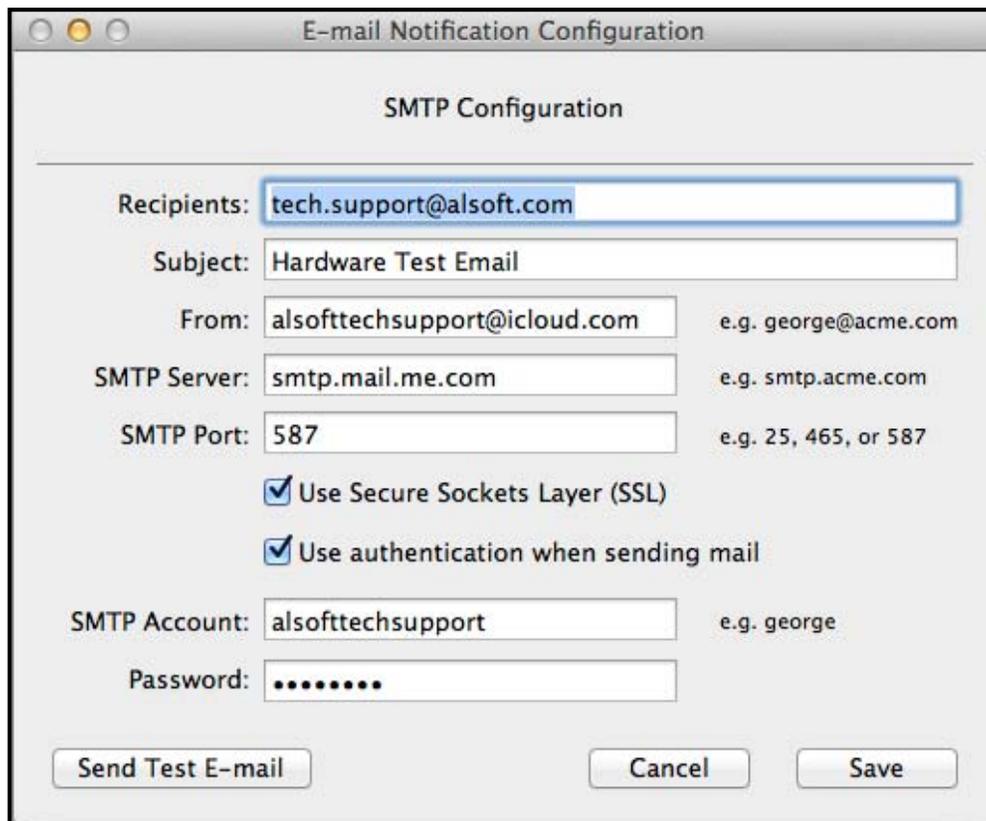
The hardware monitoring can be scheduled to run never, hourly, daily or weekly.

Note: Some hard drives will generate a sound when the internal diagnostic is run. This sound is normal and not an indicator of mechanical malfunction.

If the hardware monitoring detects a malfunction with the drive device, you may choose how DiskWarrior notifies you of the problem.

The E-mail Configuration Window

To configure e-mail notifications, you will need to provide some additional information. In the From field, enter an e-mail address from which the notification e-mail will be sent. If you wish to enter two or more e-mail addresses, separate each address with a comma. Then enter the SMTP server for the e-mail address in the From field. If you wish to use authentication when sending mail, check the appropriate box and enter the SMTP account and password.



The screenshot shows a window titled "E-mail Notification Configuration" with a sub-section "SMTP Configuration". The fields are filled with the following information:

- Recipients: tech.support@alsoft.com
- Subject: Hardware Test Email
- From: alsofttechsupport@icloud.com (with example text "e.g. george@acme.com")
- SMTP Server: smtp.mail.me.com (with example text "e.g. smtp.acme.com")
- SMTP Port: 587 (with example text "e.g. 25, 465, or 587")
- Use Secure Sockets Layer (SSL)
- Use authentication when sending mail
- SMTP Account: alsofttechsupport (with example text "e.g. george")
- Password: [masked with dots]

At the bottom, there are three buttons: "Send Test E-mail", "Cancel", and "Save".

Figure 7-2 Configuring the e-mail alert settings

AppleScript

By choosing this option, DiskWarrior will run an AppleScript applet that you designate when it detects a malfunction.

Note: DiskWarrior will only execute AppleScript applets. It will not execute script files, whether compiled or not.

Text Message

By choosing this option, you can use the SMS capabilities of the operating system to send a text message to a phone or tablet if there is a reported hardware problem with a drive. This is the SMS equivalent of an e-mail being sent to a phone number. To configure, please see the notes in the previous section.

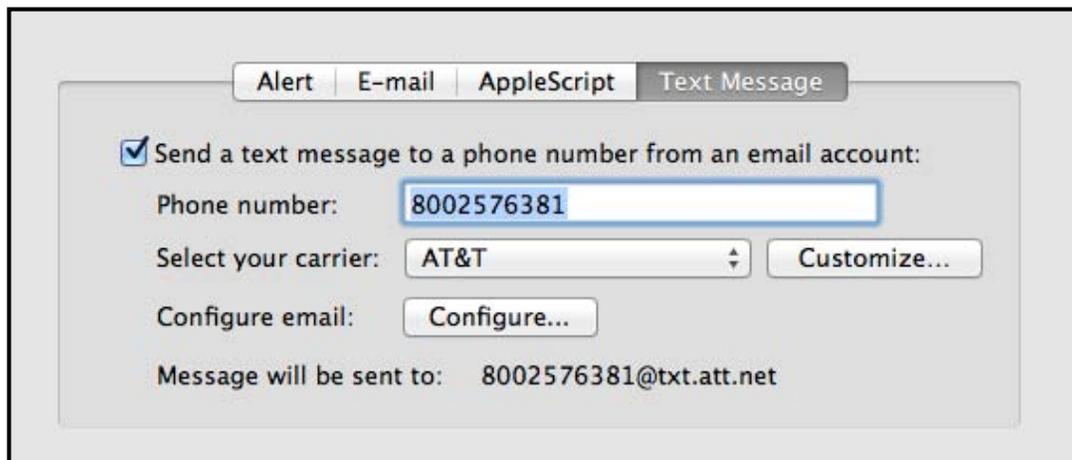


Figure 7-3 Configuring the SMS alert settings



Troubleshooting

Troubleshooting

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 Mac OS Extended or Mac OS Standard. The disk to be rebuilt must be locally connected, must not be write protected, and must have a valid partition map.

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

The disk you have selected either is locked or is a media type such as a CD or DVD 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, open the software driver package that was used to initially set up the disk (for Apple disks, the software is Disk Utility) and follow the instructions that came with the software to unlock the disk.

❑ **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.

Your Macintosh may be having a problem recognizing peripherals such as hard disks, scanners, or removable media drives. Turn off your Macintosh and all external devices and disconnect them from your computer. Restart your computer. If your computer then starts up properly, refer to the documentation that came with these 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, 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 you are using for directions on how to reinstall system software.

❑ **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 USB, FireWire, or Thunderbolt 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 replace the drive.

❑ **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.

❑ **Problem:** My hard drive does not appear in the popup menu in the Hardware section.

DiskWarrior's hardware monitoring supports internal ATA, SATA, and Thunderbolt drives with built-in S.M.A.R.T. testing capabilities. If your computer does not have such a hard drive, all options will be disabled.

❑ **Problem:** Speed Reduced by Disk Malfunction

This message indicates some type of communication problem with the device. For more information see the section “If You See a “Speed Reduced by Disk Malfunction Message” on Page 48.

❑ **Problem:** Speed Reduced by Lack of Memory

This message indicates that DiskWarrior is requiring Virtual Memory to complete the rebuilding process. For more information see the section “If You See a “Speed Reduced by Lack of Memory Message” on Page 49.

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 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 Mac OS Extended Disks” on Page 34.

❑ 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 FireWire disk, 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 due to disk hardware failure (error number, error number).

This status 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 rebuilt and previewed.

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

❑ FileVault is ready to be rebuilt.

Click Rebuild to rebuild the selected FileVault.

❑ FileVault cannot be rebuilt because it is currently in use.

This status message indicates that DiskWarrior wasn't able to operate on the FileVault because it was already in use. This would normally be caused by the user who owns the FileVault being logged in.