User Guide and Reference Manual

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Introduction

Thank you for purchasing Drive 10! We have worked hard to make Drive 10 the most powerful and easy-to-use drive utility available for Macintosh computers running under Mac OS X. Drive 10 allows you to test your HFS or HFS+ drives like a professional. If Drive 10 finds a problem, it will tell you exactly what is wrong and offer suggestions on how to proceed. It will also give you the option of repairing the problem if this is possible.

Registration

Please take a moment to register. Your serial number is your proof of ownership of Drive 10. Keep it in a safe place since you may need it when you make future updates or upgrades. If you lose your serial number we may be able to find it for you if you are registered. In addition, registration is required to receive free technical support for Drive 10. You pay only the toll charge. This is subject to change without notification.

The easiest way to register is online. Simply go to Micromat's web site at www.micromat.com and click **Register**. Fill out and submit the online form and you are done. There is no need to mail in the registration card. If you do not have Internet access then you may fill out the registration card and mail it directly to Micromat.

System Requirements

- A Macintosh running Mac OS X (Mac OS X 10.1 or higher recommended).
- CD-ROM or DVD Drive.

Note that these requirements may change with future updates.

Installing Drive 10

To install:

- Insert the **Drive 10 CD**.
- Drag the icon for the Drive 10 package from the CD to your hard drive.

What's Installed

When you install Drive 10 you install the Drive 10 package. The package contains all the program components in one convenient location.

Drive 10

Contacting Technical Support

Micromat provides technical support to its customers by telephone or email (techsupport@micromat.com). For a current listing of telephone numbers and other contact information, please refer to the back cover of this manual or visit our website at www.micromat.com. Technical support is available Monday through Friday (excluding public holidays), from 9:00 AM to 5:00 p.m., Pacific Time.

If you wish to contact technical support by telephone you will need to have your Drive 10 serial number and version number ready. Our automated phone attendant will require you to enter this information before connecting you to a technician. Please be near your computer when you phone, since our technicians will need to ask you questions about your system, and will attempt to guide you through solving any problems.

Please have the following information ready for the support technician, and be sure to include it in any email you send to Micromat.

- A brief description of your problem.
- Version number of your Drive 10 software.
- Type of Macintosh and configuration. (Example: Apple Macintosh G4/466, 256M RAM, 30G internal hard drive.)

About Micromat Inc.

Micromat Computer Systems Inc. has been developing Macintosh diagnostic utilities since 1989. As the first company to offer diagnostic products for Macintosh, Micromat has pioneered many new technologies for helping Macintosh users bring their computers back to life and to keep them running their absolute best.

Using Drive 10

Launching Drive 10

After successfully installing Drive 10, locate the program on the hard drive and launch Drive 10 by double-clicking its icon.

Drive 10 will prompt you to log in using an administrator account. You will need to enter an administrator password. This is usually the password you chose when you first installed Mac OS X. You must have administrator privileges since Drive 10 is doing checks and/or repairs on a system-wide level.

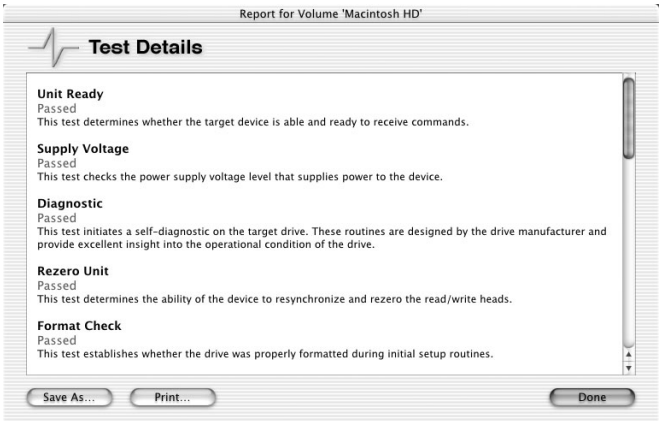
The first time you launch Drive 10 after installation, you will be presented with a dialog box containing fields for your name, company name, and product serial number. Your serial number is listed on the registration card included with Drive 10 and also on the backside of the front cover of your Drive 10 manual. Enter the appropriate information into the corresponding fields.

Sample Session

After launching Drive 10 you will see Drive 10's main window. From here you can run a full suite of Drive 10 tests. Together, these tests will perform a thorough analysis of your computer's drives. To run the tests, press the Start button. As the tests are running you can monitor their progress on the screen. The current test is highlighted under Drive 10's magnifier. When all tests are completed you will be presented with a Report detailing the tests performed, any problems found, and giving you the option to attempt repairs if necessary. As an added precaution, you might consider backing up any important data to a second drive before proceeding with repairs. If repairs cannot be made, Drive 10 will offer advice on how to proceed.

This is all that is required to perform a comprehensive check of the drives attached to your computer.

Reports



As tests are run in Drive 10 a report is generated. When tests are completed this report is displayed on the screen. It lists which tests passed and failed and offers advice on how to proceed. If problems were found that might be repairable, you will have the option to attempt repairs at this time. The Report may be saved as a text document and also printed for future reference.

Reference

Drive 10 Window

The main Drive 10 window is the **Control Center** for Drive 10. It lists all the tests available in the Drive 10 application, allows you to choose the tests you wish to run, and to select the volumes on which you wish to run them. It also provides information about the currently selected volume and indicates the progress of testing as it occurs.

Controls & Displays

Test Panel

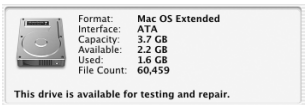
The Test Panel provides a graphic representation of the Drive 10 tests. The name of each test is shown below its graphical representation and the status of the test is shown above. As tests are run, the display scrolls across the screen with the current test appearing under the magnifier.

Options

The Options disclosure triangle allows you to display the individual Drive 10 tests. Click on the disclosure triangle to display/hide the test list. Clicking in the appropriate check box will select/deselect any particular test.

Holding down the shift key while clicking in a check box will allow you to select/deselect all the tests with only one click.

Volume Panel



This panel indicates the currently selected volume. It displays the volume's format (either Mac OS Standard [HFS] or Mac OS Extended [HFS+]), the interface by which the volume is connected, its capacity, the amount of space available and used on the volume, and the number of files on the volume. It also indicates the status of the volume (whether or not it is ready to be repaired).

Volume Select:

This popup menu allows you to choose the volume on which the selected tests will be performed.

Start Button

Pressing this button begins a test suite, stepping through the currently selected tests.

Skip Button

Pressing this button terminates the current test and continues with the next test (or terminates the suite if it was on the last test).

Progress Bar

The progress bar is above the *Skip* button and gives a visual indication of the progress of the current test. Numeric *Step* and/or *Task* counters are displayed above the progress bar as tests are performed.

Tests

Drive 10 analyzes your volumes using a variety of sophisticated test routines. To display the test list use the *Options* disclosure triangle. Tests containing a check mark in the box to the left of the test name will be performed when pressing the *Start* button.

There are two types of tests in Drive 10–low-level and high-level. Low-level tests make calls directly to the disk's controller through the device driver. The controller returns a result of Pass or Fail and this result is then reported by Drive 10. If the test is not supported by the disk, then Drive 10 will report a result of Unavailable. High-level tests make multiple calls to disk routines and then verify that the results are correct. They actually exercise the disk to be sure it is working properly. High-level tests return a result of Pass or Fail. As Drive 10 is running and tests are completed, the result–Pass, Fail, or Unavailable–is shown above the test icon in the status section of the Test Panel.

Following is a description of each test available in Drive 10:

Unit Ready

Unit Ready is a low-level test. It determines whether the target drive is able and ready to receive commands. This test will not typically fail. A failure indicates that the drive has spun down for some reason, such as a loss of power.

Supply Voltage

This is a low-level test that checks the power supply voltage level that powers your drive. Although the test cannot determine the actual voltage to the drive, it will let you know if the voltage is within the allowable tolerances for the drive. A test failure may indicate a problem with either the computer's power supply or the drive itself.

Self-Diagnostic

Self-Diagnostic is a low-level test that initiates self-test routines built into the drive itself. These routines are designed by the drive manufacturer and provide excellent insight into the operational condition of the drive. A failure may indicate a serious mechanical or electrical problem with the drive.

Rezero Unit

This is a low-level test that determines the drive's ability to resynchronize and rezero the read/write heads. A test failure may indicate that the drive is faulty.

Format check

This is a low-level test that establishes whether the drive was properly formatted during initial setup. A test failure indicates that the drive may need to be reinitialized. Reinitializing will erase all data on the entire drive. You will need to backup to a different drive prior to reinitializing.

Spare Sectors

This is a low-level test that checks the service tracks to determine whether there are enough spare blocks left for block repairs. When a drive is manufactured, a certain number of sectors are held in reserve. These spare sectors are used to replace sectors that become damaged during regular operation of the drive and that can no longer store data reliably. Damage to the disk surface may be caused by a manufacturing defect, head crash, or other causes. When a damaged sector (also called a bad block) is found it is locked out so that it cannot be used again. The damaged sector is replaced by an available spare sector—either during a reinitialization or on the fly as the drive is used. If the drive runs out of spare sectors, then bad blocks can no longer be removed from service and the drive will no longer be able to hold data reliably. Hence, if this test fails, the drive may need to be replaced.

Surface Scan

Surface Scan is a high-level test that checks the disk surface for bad blocks. Bad blocks are areas of media that cannot store data reliably. All disks have a few bad blocks when they are made, but these are mapped-out by the manufacturer. Mapping out bad blocks prevents data from being written to these defective areas of the media. Occasionally a good block will go bad. If this occurs and a file resides on that block, the file may be corrupted.

If the Surface Scan test locates any bad blocks, then the drive may need to be reinitialized (which will erase all data on the entire physical drive). Reinitializing checks for bad blocks and will map them out if possible. If the bad blocks cannot be mapped out, then the initialization will fail and the drive will probably need to be replaced.

Random Read

This is a high-level test that is used in conjunction with the Random Write test. It verifies that data can be reliably read from random memory locations. This is important, since it exercises the ability of the drive to accurately read data from across the disk's surface. A test failure may indicate that the disk needs to be reinitialized or replaced.

Random Write

This is a high-level test that is used in conjunction with the Random Read test. It verifies that data can be reliably written to random memory locations. This is important, since it exercises the ability of the drive to accurately write data across the disk surface. A test failure may indicate that the disk needs to be reinitialized or replaced.

Seek

Seek is a low-level test that checks the ability of the initiator to position the device heads in preparation for access to a particular logical block on the drive. A failure may indicate that the drive is faulty.

Linear Read

This is a high-level test that is used in conjunction with the Linear Write test. It verifies that data can be reliably read from a linear set of blocks on the drive. This test is important, since it exercises the ability of the drive to accurately read data from a contiguous run of sectors on the disk. A test failure may indicate that the drive needs to be reinitialized or replaced.

Linear Write

This is a high-level test that is used in conjunction with the Linear Read test. It verifies that data can be reliably written to a linear set of blocks on the drive. This test is important, since it exercises the ability of the drive to accurately write data to a contiguous run of sectors on the disk. A test failure may indicate that the drive needs to be reinitialized or replaced.

Read Buffer

The Read Buffer is a memory cache in the drive itself that temporarily holds data that is to be read from the disk. The Read Buffer test is a high-level test that is used in conjunction with the Write Buffer test. It checks that data can be reliably read from the buffer. An error indicates either a problem with the buffer memory itself, or with the memory data bus.

Write Buffer

The Write Buffer is a memory cache in the drive itself that temporarily holds data that is to be written to the disk. The Write Buffer test is a high-level test that is used in conjunction with the Read Buffer test. It checks that data can be reliably written to the buffer. An error indicates either a problem with the buffer memory itself, or with the memory data bus.

Volume Structure

There are a variety of invisible files, settings, and parameters that the Macintosh file system uses to locate files and free disk space, and for other maintenance and management routines. These are known collectively as the Volume Structures. The Catalog and Disk Directory are part of the volume structures. Damage to these critical data structures can result in lost or damaged files and may necessitate a complete reinitialization of the disk.

Drive 10 can scan your drives for problems related to the numerous structures that are necessary for the them to operate correctly. If problems are found, Drive 10 will indicate this in its Report and you can then choose to repair the damage to help reduce the chance of future problems.

Drive 10 can analyze and attempt to repair the following attributes of a volume:

Volume Header

This block of data is created when the volume is created and contains important data about the rest of the volume such as its name, number of files and folders, and the amount of free space available on the volume. This information is written when the volume is initialized. Whenever the volume is mounted, portions of this information are read into a volume control block for use by the system. Since the volume header con-

tains information concerning the layout of the entire volume, it is absolutely critical that this data is correct. If this data is badly corrupted, then the volume may not be able to be accessed by Drive 10 or any other repair utility. In that case, the volume will need to be reinitialized.

Extents File

Extents are the allocation blocks (storage locations on the disk) assigned to hold a file. The Extents File is a B-tree and keeps track of the extents data for the entire volume. It is an overflow file and stores those file extents that are not stored in the volume header (in the case of the startup, attributes, allocation, catalog, and extents overflow files themselves) or in a catalog file record (in the case of all other files). Damage to the Extents File can cause file corruption if it occurs in a regular file's extents data. If the extents data for a volume structure file itself is damaged, then the effect can be much more insidious.

Catalog File

The Catalog File keeps track of the hierarchy of all the files and folders on the volume. It is organized as a B-tree and consists of header nodes, index nodes, and leaf nodes. Problems in the Catalog File can cause file corruption, disappearing files, and/or improper location of files and folders in the folder hierarchy. For example, damage in the Catalog File can cause files to disappear—or keep them from being able to be opened, moved, copied, or deleted. It can cause all files to appear at the root level of the volume or even cause a folder, all subfolders, and all files in the subfolders to disappear.

Attributes File

The exact organization of the attributes B-tree is still under development by Apple. The Attributes File is not used by Mac OS X at this time, but may be used in the future.

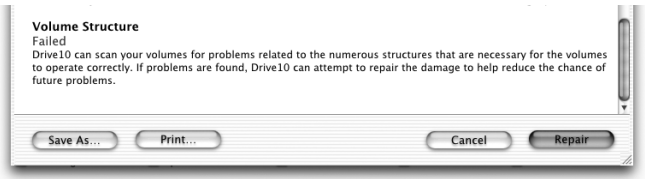
Startup File

The Startup File is a special file intended to hold data needed when booting, but before the volume is mounted. It is essentially a generalization of the boot blocks, but provides a much larger, variable-sized amount of storage.

Allocation File

The Allocation File acts as the main directory. It keeps track of the allocation blocks that are currently used to store files and the blocks that are free for the entire volume. The Allocation File is a bitmap that contains one bit for each allocation block in the volume. If the bit is clear, the corresponding allocation block is not currently used by any file and hence is available for use. Problems in the Allocation File can result in incorrect values being given for free or used space on the volume.

If any problems are found with the above volume structure files, Drive 10 will indicate this in its Report. You may then attempt to repair the problem by choosing the Report's Repair button. As an added precaution be sure to have any important data backed up to another drive before doing repairs if possible.

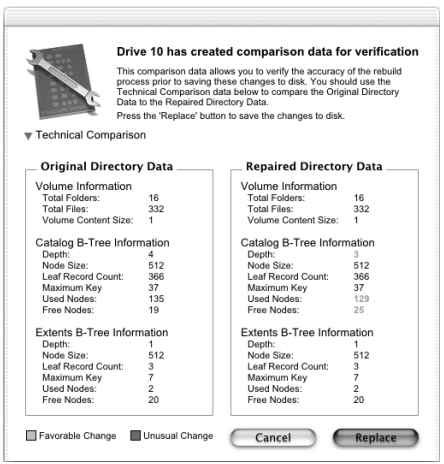


Note: Drive 10 cannot repair the volume structures of an active drive. To perform repairs on a drive it must be unmounted. This means that you must both startup the computer and run Drive 10 from another volume. Drive 10 ships on a bootable CD, so that you can startup the computer and run Drive 10 directly from the Drive 10 CD if necessary. To startup from the CD, hold down the "C" key while restarting the computer with the Drive 10 CD in the drive. (For your convenience, these instructions are printed on the face of the CD itself.)

When you boot from the Drive 10 CD, the Drive 10 application will automatically launch. You will not have full Mac OS X functionality at this time since this is not possible when booting from an Mac OS X CD. When you are finished running Drive 10, simply quit the program from the Drive 10 menu.

Once Drive 10 quits, the computer will automatically restart. It will typically restart from whatever volume was chosen in the Startup Disk preferences.

When Drive 10 is instructed to make volume structure repairs, it will attempt to create new, valid volume structures in memory. If successful, you will be presented with a summary report called the Technical Comparison. Drive 10 has not yet made any changes to the drive.



The Technical Comparison displays important technical information about both the original directories and the newly created directories stored in memory. This includes details such as the total number of folders, files, etc. This data can help you

decide whether or not to commit to the volume repair. Differences between the new and old directories are highlighted. Green indicates a normal change and red indicates an unusual change. Note that a red change is not necessarily a bad change. It is just a change that is unusual and suggests that you consider the ramifications of the change carefully before committing to the repair. If red changes are present, be sure that any important data is backed up before accepting the repair. To accept the repair, press the Replace or Repair button. This will delete the original directories and replace them with the new ones.

If the damage to the volume was severe enough that Drive 10 could not create new directories, or if an examination of the Technical Comparison indicates that the new directories are not correct, then the volume will probably need to be reinitialized. This will erase all data on the volume.

Optimization

Optimization has two goals: to defragment the files on your drive and to consolidate the free space into one large block. This can improve the performance of the drive. Note that optimization can only be performed on HFS+ volumes.

As a drive saves and deletes files, the file system instructs the drive mechanism on where and how to store the information. It can place this information anywhere there is available free space on the drive. If there is not a contiguous free area large enough to store a file, then the file system will fragment the file. It will save a piece here and a piece there. This is transparent to you. Although a file may appear to be one complete logical item, in most cases it is actually physically scattered around the disk in many pieces.

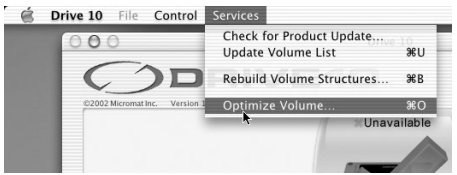
Fragmentation can effect the speed of file access on your drives. It increases the amount of time needed to read and write files resulting in less than optimal performance. Instead of the drive being able to scoop up a requested file in one swoop, it must locate the pieces of a file on the drive and then reconstruct the file. If the free space is fragmented, writing a file may require it to be broken up into many pieces and each individual piece separately written to the disk.

There are two types of fragmentation: file fragmentation and disk fragmentation. File fragmentation occurs when an individual file is broken into multiple segments. Disk fragmentation refers to the free space on the drive being broken into segments. Drive 10 can eliminate both types of fragmentation to fully optimize your drives. This is done much like the game "Hanoi Towers" is played.

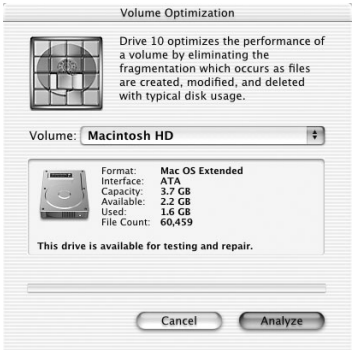
Several files may be moved until the target file will have enough free space to be written contiguously. This process is repeated many times until all or most of the files are no longer fragmented.

You should do a volume structure test with Drive 10 and repair any problems that might be found before optimizing. Since optimizing moves many files around on the drive, any pre-existing problems could be made worse during optimization. If there are no problems on the drive then it is safe to optimize it.

The Optimization feature of Drive 10 is available from the Drive 10 Services menu. To optimize, choose the option **Optimize Volume… (cmd-O)**.



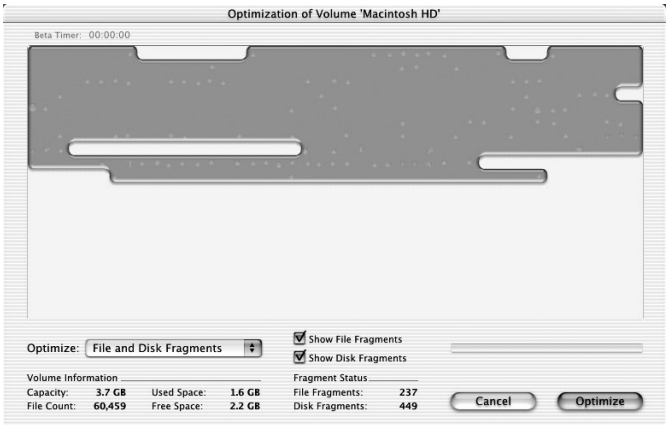
This will bring up the **Volume Optimization** window.



The Volume Optimization window contains the following controls and displays:

- **Volume**: allows you to select the volume to optimize. This area also provides status information about the selected volume.
- **Cancel**: allows you to cancel Optimization.
- **Analyze**: constructs a graph showing space usage on the volume.
- **Progress Bar**: shows the progress of the Analysis.

After selecting Analyze, the **Optimization of Volume <volume name>** window will appear.



This window displays information about the space usage on the volume, the Optimization controls, and other information about the volume and the progress of Optimization.

The top portion of the window displays a large graph showing how the space on the selected volume is used. This allows for an easy visual check of its state of fragmentation. The volume is represented as a grid of equal sized segments. The amount of data represented by a segment depends on the total size of the volume. Segments that contain data are indicated in blue. Those that contain no data are white. The display can be configured to show the amount of fragmentation in each segment. A "bubble" inside a segment indicates the level of fragmentation. The larger the bubble the higher the fragmentation. A dark bubble indicates the amount of file fragmentation and a light bubble indicates disk fragmentation. You may choose whether or not to display the file or disk fragments in the graph by checking the appropriate boxes in the Optimization window. The progress of optimization can be tracked by noting changes in the bubbles in the graph.

The **Optimize**: popup allow you to choose the type of defragmention you wish to perform.

- **File and Disk Fragments**: completely optimizes the volume. This option does file defragmentation followed by free space defragmentation.
- **File Fragments Only**: defragments the files. This will leave the files scattered around on the disk.

You may start or stop the optimization process using the following buttons:

- **Optimize**: this button begins the optimization process.
- **Cancel**: pressing this button will quit optimization.

The Optimization Window also displays the information:

Volume Information

- **Capacity**: total size of the volume.
- **File Count**: the total number of files on the volume.
- **Used Space**: the amount of space used by data on the volume.
- **Free Space**: the amount of space available for use to store data.

Fragment Status

- File Fragments: the number of file fragments on the volume.
- Disk Fragments: the number of free space fragments on the volume.

Progress Bar

The Progress Bar is a visual indication of the progress of optimization. As optimization progresses the block being worked on will be indicated above the bar and the amount of space remaining to relocate will be listed below.

When optimization is complete there will be zero File Fragments and one Disk Fragment remaining. In other words, all the files will be defragmented and all the free space will be contained in one contiguous block.

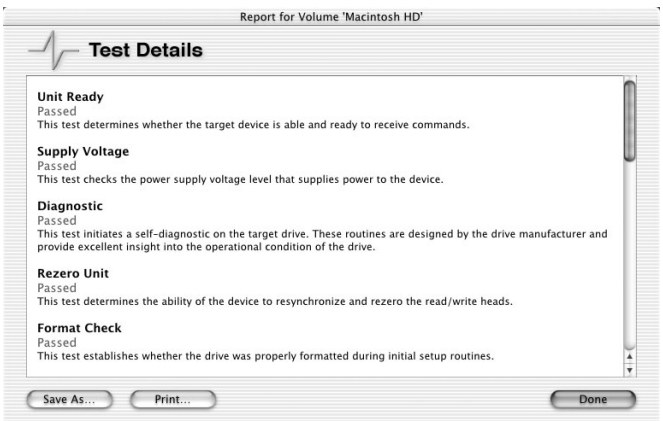
Usage Notes

The optimization feature should be used as a general disk maintenance routine for your Macintosh. Although a fragmented volume will not cause your Macintosh to malfunction, it may keep it from performing to its full potential.

Optimization is very safe if performed on a volume with no directory problems. **It is extremely important to do a volume structure check of the volume before optimizing. If any problems are found they should be resolved before optimizing.** Optimizing moves many files around on the drive. If there is corruption in the volume directories, then this corruption could easily get worse as these files are being relocated. It is possible that a minor volume problem could spread and become a serious problem, possibly resulting in data loss.

In order to optimize a volume it must be unmounted. This means that nothing can be running on the volume. You must both boot your computer and run Drive 10 from a volume other than the one you are attempting to optimize. If the Optimize button is grayed out, then something is most likely active on the volume you have selected. To optimize your normal startup hard volume you would typically boot the computer directly from the Drive 10 CD. Directions for doing this are printed on the face of the CD.

Report



A report is displayed when Drive 10 completes a test run. This report details each test that was run, the test status (whether it

passed, failed, or was unavailable), a brief description of the test, and advice on how to proceed if the test failed.

The following buttons may appear at the bottom of the Report window:

Save As…

Pressing **Save As…** will bring up the file save dialog allowing the report to be saved as a standard text file.

Print…

Pressing **Print. . .** will bring up the print dialog allowing the report to printed.

Done

Pressing **Done** will dismiss the report.

If problems are found the **Done** button will be replaced by the following two buttons.

Repair

Pressing **Repair** will instruct Drive 10 to proceed with repairs.

Cancel

Pressing **Cancel** will dismiss the report and no repairs will be attempted.

Menus

Drive 10 includes a number of menu options that allow additional methods of accessing program functions.

Drive 10 Menu

This is the Drive 10 application menu. The following functions are available from this menu:

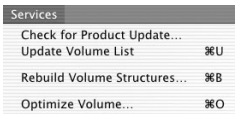
- About Drive 10–brings up the About Drive 10 information panel.
- Hide Drive 10 (cmd-H)–closes the Drive 10 window. Selecting Drive 10 from the dock will redisplay the window.
- Hide Others–hides all windows except the Drive 10 window.
- Show All–shows all the previously hidden windows.
- Quit Drive 10 (cmd-Q)–quits the program.

Control Menu

Following are the functions available from this menu:

- **Start** (cmd-R)–runs the currently selected Drive 10 tests.
- **Skip** (cmd-J)–terminates the current test and continues with the next test (or terminates testing if it on the last test).
- **Stop** (cmd-.)–stops the current run of tests.
- **Enable All Tests** (cmd-A)–selects all tests.
- **Disable All Tests** (cmd-D)–deselects all tests.

Services Menu



The Services Menu contains the following Drive 10 function:

- **Check for Product Update . . . :** connects to the Micromat website and checks to see if an update is available for the running version of Drive 10. If so, you may download it directly from the Download page.
- **Update Volume List** (cmd-U) **:** rescans the computer for available volumes. Use this option if an attached volume does not appear in the Volume test list.
- **Rebuild Volume Structures** . . . (cmd-B) **:** executes the volume rebuild routines of Drive 10. See **Volume Structures** above for more information.
- **Optimize Volume . . .** (cmd-O) **:** choose this option to optimize a volume. See Optimization above for more information.

Commonly Asked Questions

Why must I enter an administrator password to run Drive 10?

Drive 10 needs access to the all the files on the drive in order to do its diagnosis and repair. Hence, it is necessary to verify that you have administrator privileges before the program launches.

Why is the *Repair* button greyed out in the Report when problems are found which need to be repaired?

In order to repair a volume it must be dismounted. This means that you must boot the computer and run Drive 10 from another volume. Once you have done this, you will be able to choose the *Repair* button.

Is Drive 10 able to check a UFS initialized volume?

No. Drive 10 can only work on Macintosh initialized HFS and HFS+ volumes.

Can I select multiple volumes and have Drive 10 diagnose them in one run?

You can only select one drive at a time for diagnosis and repair.

Can Drive 10 check a network volume?

No. Drive 10 can only work with drives physically attached to the computer on which it is running.

How do I initialize a drive in OS X?

Mac OS X includes a program called Disk Utility that allows initialization of disks. Disk Utility is typically located in the Utilities folder (inside the Applications folder). After launching Disk Utility, select the volume and choose the Erase option.

Is Drive 10 able to optimize HFS or UFS initialized volumes?

No. Drive 10 can only optimize a volume that was initialized HFS+.

Short Cuts and Hidden Features

cmd-R: Runs the Drive 10 test suite.

cmd-.: Terminates the test suite.

space, return, or enter: Starts/Stops the test suite.

P: Pauses test execution.

R: Resumes test execution after a pause.

cmd-J: Skips the currently executing test.

esc: Skips the next test.

shift-click test selection box: Propagates the changed check box status to all tests.

cmd-A: Selects all tests.

cmd-D: Deselects all tests.

cmd-B: Rebuilds the selected volume.

cmd-H: Hides the Drive 10 window.

cmd-Q: Quits Drive 10.

cmd-U: Updates the volume list.

cmd-O: Optimize Volume.

Glossary

Allocation Block: An Allocation Block is the smallest logical unit of storage recognized by the file system. It is an integral number of disk sectors (usually 512 bytes).

B-Tree: A B-tree (or binary-tree) is a data structure where each record is linked to two other records. Graphically it resembles a tree with leaves. Data stored in a B-tree may be retrieved much faster than data stored as a simple list. A volume's Catalog file is a B-tree.

Bad Block: A Bad Block is a disk sector that resides on a location of a disk where the surface is physically damaged. The sector can no longer hold data reliably.

Backup: An exact copy of computer information. In case of data loss or corruption the original data can be retrieved from the backup.

Boot Blocks: The boot blocks reside at a special location on a drive. They contain information that is read as the computer starts up and that is necessary for the startup process to complete.

Booting: The term booting originated from bootstrap. It is the process by which the computer starts itself and reads the Operating System. When you boot from a CD you are starting and reading the OS from the CD.

Bus: A Bus is the path that transmits information between a computer and connected devices. An example is the SCSI bus, which connects the computer to SCSI devices such as hard drives.

Byte: A Byte is a unit of information stored in the computer. A byte consists of eight bits. An ASCII character consists of one byte.

Chip: A Chip, or Integrated Circuit, is a miniature electronic component with specialized functions within the computer. Chips include the serial communications controller, SCSI chip, and the CPU itself.

Circuit: A conductor through which an electric current can flow; the entire course traversed by an electric current. Parts and components assembled to function together in an electric or electronic device or system.

Device: A device is any piece of equipment that can be attached to a computer. These might include a monitor, disk drive, printer, etc. Devices are also known as Peripherals.

Disk: A Disk is a flat circular device for storing computer data. The data might be stored magnetically or optically. The most common disks are floppy disks made of flexible plastic, hard disks made of metal, and CD-ROM disks made of plastic.

Disk Drive: A device for controlling and accessing data stored on a disk or disk pack.

Drive: A Drive is a computer peripheral that stores data. It might use a tape cartridge, a disk, or other medium. A drive may be "read only" or "read/write."

Driver: A Driver (or device driver) is software that lets a computer communicate with a device. When you purchase a new device its driver is usually provided as part of the software that comes with it.

File System: Every volume uses a file system to organize the information stored on it. A file system keeps track of where files are located on the volume. The Macintosh typically uses either the HFS or HFS+ filing system.

FireWire: FireWire is Apple's name for the high speed IEEE 1394 bus standard. It can handle data rates of up to 400Mbps and is commonly used to connect hard drives and video cameras to the Macintosh.

Firmware: This is software that has been permanently recorded into ROM (Read Only Memory). It is a cross between hardware and software.

Format: Format refers to the physical layout of the recording magnetic markers that divide the disk into sectors and tracks. This is the foundation on which the logical initialization of the drive is based.

GB: See Gigabyte.

Gigabyte: A Gigabyte consists of 1,024 Megabytes.

Head: A mechanism that reads, writes, or erases data on a storage medium.

Head Crash: A Head Crash refers to contact between a read/write head and the surface of the media on a floppy or a hard disk drive. This usually results in damage to the disk surface and possible loss of data.

HFS: HFS stands for Hierarchical Filing System and is also known as Macintosh OS Standard Format. It is a method of formatting storage devices for Macintosh computers.

HFS+: Macintosh OS Extended Format is a method of formatting storage devices attached to Macintosh computers. Compared to the earlier HFS it supports more files and increases the efficiency of storage on larger drives.

I/O: An acronym for input/output.

IDE/ATA: IDE stands for Integrated Device Electronics. These devices (sometimes called ATA devices) conform to the ATA (AT Attachment Standard) which specifies how peripherals communicate with the computer.

Initialize: Initializing is a process of preparing a storage medium to hold data. During initialization the volume structures for a volume are created specifying locations for storing data. Initialization erases directory information; however, the data from files may still be left on the volume.

Kb: Kilobit or 1024 bits.

KB: Kilobyte or 1024 bytes.

Kbps: Kilobits per second.

KBps: Kilobytes per second.

Low-Level Format: Low-level formatting removes and then recreates the markers that organize the data on a drive. All data on the drive is erased. Low-level formatting is usually followed by initializing.

Mb: See Megabit.

Mbps: Megabits per second.

MB: See Megabyte.

MBps: Megabytes per second.

Megabit: A unit of measure for storage capacity. One megabit is equivalent to 1,048,576 bits.

Megabyte: A unit of measure for storage capacity. One megabyte is equivalent to 1,048,576 bytes.

OS: OS stands for Operating System. This is the software that allows you to interact with your computer and that keeps track of files, peripherals, programs, networks, etc.

Partition: Disks can be divided into subsections called partitions. The computer recognizes each partition as a separate unit (often called a volume).

Root Directory: The top level of a volume's directory. It may contain subdirectories (otherwise known as folders).

SCSI: See Small Computer System Interface.

SCSI Chip: The SCSI Chip allows the Macintosh to communicate with SCSI devices. Most Macintosh computers use the 8530 SCSI chip.

SCSI Conflict: A SCSI Conflict occurs when two or more SCSI devices share the same ID number on the same bus. This can keep the devices from working reliably.

Sector: A Sector is a small portion of a disk drive's track and contains 512 bytes of data.

Small Computer System Interface: Also known as SCSI, this is a parallel interface standard that specifies how peripherals communicate with the computer. There are several varieties of SCSI. The transfer rate for standard SCSI built into the Macintosh is 4MBps. The maximum rate for SCSI is 80MBps.

Termination: A technique of capping the end of a signal bus to prevent resonance from occurring within a signal. The SCSI bus requires a terminator at each end.

Universal Serial Bus: A medium speed protocol for connecting devices to a computer. It is superceding ADB on the newer Macintosh computers. USB is hot-swappable and has a maximum transfer rate of 12Mbps.

USB: See Universal Serial Bus.

Volume: A volume refers to a logical storage unit seen by the computer as a single item. This may be a floppy disk, an entire hard drive, or a partition on a hard drive.