Hard Disk ToolKit™

Personal Edition

Improve performance and make any drive System 7 compatible.

Format, partition, password protect, and test any SCSI hard drive, SyQuest® drive or optical drive.

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This manual was written by **Leslie Feldman, Norman Fong, Kevin Kachadourian, Alex Lau, Neil Strudwick, and Paul Worthington**, with much valuable assistance from Steve Goodman, Henry Kwan, Mike Micheletti, and the rest of the team at FWB.

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Company _____

Address _____

City/State/Zip _____

Telephone _____

Visa/MC # _____ Exp. date _____

Signature _____

HDT Upgrade	$99
(CA Residents add sales tax)	____
Shipping ($4 US, $10 outside US)	____
Total	____

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Table of Contents

Hard Disk ToolKit™

Personal Edition

Thank you for purchasing FWB Software, Inc.'s Hard Disk ToolKit Personal Edition (also referred to in this manual as HDT Personal Edition and ToolKit). You've obtained the most complete personal SCSI formatting and partitioning software available. This program will aid your Macintosh literally every instant it is on.

ToolKit has been designed to make your SCSI drives run faster and more efficiently, and to ensure that they provide years of trouble-free service.

What *Is* Hard Disk ToolKit *Personal Edition*?

Hard Disk ToolKit *Personal Edition* is a versatile and highly configurable SCSI utility that gives you total control over SCSI storage devices. ToolKit will optimize the performance of a wide variety of SCSI storage devices, including hard drives, optical drives, and removable drives.

In addition to standard hard disk utility functions such as formatting drives and installing drivers, ToolKit adds professional features such as:

- Flexible Partitioning
- Password Protection
- Diagnostics

Install all your SCSI drives using ToolKit to minimize incompatibilities and eliminate down time caused by poorly written driver software. Driver software runs transparently every second your Macintosh is on, thus making it imperative you use the best. Standardize on ToolKit company-wide to minimize support problems and, more importantly, to ensure

that different vendors' storage devices can work together. SyQuest cartridges and optical cartridges, for example, can be exchanged between different vendor's drives without worry.

ToolKit replaces your system's current hard drive software when it installs itself. Then, whenever the drive is on, ToolKit's intelligent driver software works to maximize performance, anticipate problems, and prevent crashes. It also eliminates the need to run any third-party or public domain utilities to manage your storage systems.

With ToolKit, you don't have to wait for a vendor to update driver software, which is often written by another party. ToolKit is designed to support many specific drives, but it also has generic modes to support virtually all standard SCSI drives with embedded controllers. (However, ToolKit does not support pre-1986 ST-506 drives that have been converted to SCSI drives through add-on SCSI controllers.) ToolKit is the most up-to-date and versatile personal utility package for all fixed and removable SCSI drives.

ToolKit will also see you into tomorrow's technology: All modules fully exploit the new features of System 7, including color, balloon help, virtual memory, and 32-bit addressing. ToolKit's partitioning fully supports Apple's A/UX 2.X, and can be used with A/UX 3.0. ToolKit also supports SCSI-2; this new specifications standard was still undergoing its approval process as this manual went to press.

Easy to Use, Yet *Powerful*

All features are automatically optimized for the drive you specify. Novices will appreciate ToolKit's concern for safeguarding your data, and its ready-to-use default settings.

ToolKit includes online help, under the Apple menu or through System 7's balloon help. Use this resource to answer questions that arise when using the program.

When to Use Hard Disk ToolKit *Personal Edition*

- To increase the speed and performance of your drives. ToolKit tunes your drives to operate at their highest and most efficient levels.
- To divide a drive into separate partitions for individual projects or applications, or for different users. This can save time, boost productivity, ensure security, and increase your drive's performance and longevity.
- To secure any or all of the data on your disk. ToolKit's password protection is built in at the lowest level possible and cannot be defeated.
- To test *any* drive surface for defects. ToolKit will automatically reallocate any bad blocks to prevent data loss.

Using Hard Disk ToolKit *Personal Edition*

You should consult the **Read Me** file before performing any operations with Hard Disk ToolKit Personal Edition. The **Read Me** file on the original program disk contains late-breaking information that was not available at press time. In addition, please refer to the **Read Me** file should you have any questions that are not addressed in this manual.

ToolKit is divided into three areas of functionality. Each is contained in a separate module.

HDT Primer PE

This module sets up your drive and prepares it for use, and can test a disk for bad blocks.

Use the Primer to:

- Format a new hard drive or reformat an existing drive with optimal parameters.
- Replace the old device driver of your current drive for improved performance *without* affecting the data on the drive.
- Divide the drive into partitions for separate applications or users.
- Secure all or part of a drive through password protection.
- Test the drive for media defects or reliability.
- Expand or shrink partitions at any time to effectively store your data.
- Create and select boot partitions for different system software.

Primer's first task will probably be to format your drive. Afterwards, the formatting function will rarely be needed. HDT's diagnostics and testing features are only needed when you have encountered problems with your drive.

The other two modules, however, are intended for repeated use.

HDT Extension

This INIT, known as a System Extension in System 7, can be used to automatically load device drivers for removable media drives, such as SyQuests, opticals, and Bernoullis.

HDT Prober

Prober is a Control Panel device (cdev) that can be accessed any time to check the SCSI bus.

Use Prober to:

- Scan/rescan the bus for SCSI devices, and determine which are mounted on the Desktop and which have device drivers loaded.
- Mount drives that did not mount during start-up or were unmounted.
- Reset the SCSI bus to clear communication problems.
- Get detailed information about a drive, such as its configuration, manufacturer, and partitioning scheme.
- Get detailed information about your CPU and system.

Hardware Requirements

Hard Disk ToolKit Personal Edition requires:

- A supported SCSI hard drive, optical drive, or removable drive
- A Macintosh with at least 1 MB of RAM
- System 6.02 or higher

About This Manual

The ToolKit Manual is presented in four sections:

- ToolKit Quick Run
- Hard Disk ToolKit Personal Edition Instruction Guide
- Troubleshooting
- Index

ToolKit Quick Run

This is a basic introduction to the use of each module for expert users.

Hard Disk ToolKit *Personal Edition* Instruction Guide

This provides a complete description of each module, along with detailed instructions for every function and option.

Troubleshooting

This chapter identifies problems you may encounter while using ToolKit or your Mac, and offers solutions. A list of error messages is included, as well as the appropriate responses.

Glossary

Important and frequently used terms are explained.

Index

Topics are cross-referenced for quick access.

Read Me file

You should consult the **Read Me** file before performing any operations with Hard Disk ToolKit Personal Edition. The **Read Me** file on the original program disk contains late-breaking information that was not available at press time. In addition, please refer to the **Read Me** file should you have any questions that are not addressed in this manual.

Where do you go from here?

Please turn to the **Instruction Guide** chapter for an in-depth look at operating each of ToolKit's modules.

If you hate reading manuals, go to the **Quick Run**. With it you can start using ToolKit immediately, and refer to the chapters on individual modules when you have specific questions.

Warning!

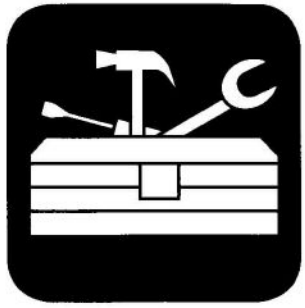
ToolKit is a very powerful tool. Although we have put in as many safeguards as possible, we cannot protect you from yourself. Your mistakes—accidental formatting or initialization, interrupted write testing, etc. - could result in significant irretrievable data loss.

Please observe the warnings and notes in the manual, and *backup* files whenever performing any function that involves erasing or updating data.

We believe this manual provides all the information necessary to understand ToolKit and the storage systems it affects.

Please make use of it whenever you are unsure of a procedure, or to verify what you are sure of.

User Guide



Installation

Before using Hard Disk ToolKit PE, you should already be comfortable using the Macintosh environment. If you need to familiarize yourself with the terminology and operations common to all Macintosh programs, please consult the manuals that were supplied with your computer.

Important: Hard Disk ToolKit PE cannot perform formatting, initializing, and certain other operations on the hard drive from which it is run. If you don't plan to reformat the hard disk that serves as your start-up disk, install ToolKit directly on your hard drive and run the program from there. This will help prevent accidental data loss.

To format a new hard drive or one that you have been using (which will, of course, destroy all the data on the disk), **you will need to run ToolKit from another hard drive or the floppy**. The process for formatting from the floppy, noted below, must be followed by the many users who own only one hard drive.

Once you have formatted and set up your start-up hard drive, it is highly recommended that you run ToolKit from the hard drive and *not* the floppy. If ToolKit is run from the floppy, the risk of unintentionally telling it to perform a destructive procedure, such as formatting or initializing, is greater.

Having ToolKit on your hard drive will keep it close at hand for using its maintenance, partitioning, mounting, and testing features. ToolKit has many features that are nondestructive (that is, they won't harm data) that you may use repeatedly.

Hard Disk Formatting from the Floppy

If you use only one hard drive with your Macintosh and you wish to format or customize it, you will need to run HDT Personal Edition from the floppy drive.

HDT Personal Edition comes on a startup floppy with System 6.0.8 installed. This will work on any Macintosh other than the Classic II, the Quadras, and PowerBooks. You cannot run ToolKit from the write-protected original floppy. You should make a backup copy of the original floppy; if you are unclear on how to do this, see your Macintosh User's Guide for details.

If you are using a Macintosh that cannot use System 6.0.8, you must either create a System 7 startup floppy with HDT Primer PE on it, or start up from a separate floppy. You may then run your backup copy of HDT Personal Edition from the floppy drive. Please note that if you have only one floppy drive, running ToolKit from a non-startup floppy is going to require a lot of disk swapping. If you are unclear on how to do this, see the section on the Primer beginning on p. 14 for step-by-step instructions on creating a System 7 startup floppy or running HDT Personal Edition from two floppy disks.

Installation on Hard Drives

You can install ToolKit either onto a hard drive that was formatted using Primer from the floppy, or onto a drive whose older formatting you wish to save. (We recommend replacing at least the driver; see the beginning of the Quick Run chapter).

To use ToolKit you must be running System 6.02 or higher. ToolKit is also fully compatible with System 7.

ToolKit contains HDT Primer PE, HDT Prober, and the HDT Extension. Create a folder named 'Hard Disk ToolKit Folder' (or any name that you may prefer) on your start-up hard drive. Select the items on the floppy. Holding down the mouse button, drag the items to the ToolKit folder you've created on the hard drive.

Once the files have all been copied, move the HDT Extension and the HDT Prober files onto your System Folder icon (under System 7, they should automatically be placed in the correct folders within the System Folder when placed on the System Folder icon). These INITs or System Extensions will be accessible the next time you boot up.

HDT Prober can be accessed from the Control Panel desk accessory in the Apple menu. If you are using System 7, the Control Panel desk accessory is an alias for the Control Panels folder, and you can just open the HDT Prober icon as you would an application.

Important: If you have only one hard drive and wish to format it, you must run ToolKit from a floppy. Please see the **Hard Disk Formatting from the Floppy** section on the previous page.

With ToolKit loaded you're ready to run, but we recommend reading the rest of the manual before launching the program.

Quick Run

A brief explanation of how to use the

different modules of Hard Disk ToolKit Personal Edition

If you are already familiar with hard drives and SCSI, you may be able to run some or all of the modules with the information contained in this section.

If you are not sure of a procedure, please refer to the complete Instruction Guide.

HDT Primer PE

We've designed HDT Primer PE (also referred to as Primer) to be the best personal hard disk formatting utility available.

Primer can be used to:

- Format the drive
- Create, modify, and delete partitions
- Mount and unmount partitions
- Install or update SCSI device drivers
- Test the drive for defects
- Get information about the drive and computer

For detailed information about these functions, please see the HDT Primer PE chapter.

Important: Make sure you have disabled all System extensions before performing any operations with HDT Primer PE. In System 7, this can be done by holding down the shift key at startup until the "Extensions disabled." message appears; in System 6, this can be done by dragging the System and Finder into a folder by themselves and restarting.

To Format a Drive

To format a hard drive, you must run Primer from a secondary hard drive (not the one you wish to format) or a floppy disk. Open the program by double-clicking on the HDT Primer PE icon.

You cannot run ToolKit from the write-protected original floppy. You should make a backup copy of the original floppy; if you are unclear on how to do this, see your Macintosh User's Guide for details.

The first time you run Primer, the program will prompt you to enter your name, company name, and the serial number of your copy of ToolKit. After you have done so, Primer will scan the SCSI bus and display its main window. **Note:** The serial number is case sensitive - all letters must be entered as uppercase (capitals.) The form is as follows: two capital letters, six numerals, one capital letter, one numeral, and one capital letter. Make sure that you have not entered the numeral "0" (zero) instead of the letter "O" or the numeral "1" (one) instead of the letter "I". There are no spaces in the serial number. If you get an "invalid serial number" message, try entering it again.

Select the drive you wish to Format. Use the arrow keys on the keyboard or click on the drive's ID bar.

Select the **Format** command by clicking on the **Format** icon or choosing **Format** from the File menu. You'll see three different warnings, informing you that this process will *destroy* all data on the selected hard drive.

After you have continued through all the warnings, Primer will begin formatting the target drive. This process cannot be interrupted and will permanently erase all data.

As soon as formatting is complete, Primer is ready to partition the drive. The "Choose Partition Method" dialog box will be automatically displayed.

Partitioning

Partitioning divides the drive into separate volumes represented by separate icons on the Desktop. Each partition can be password protected, encrypted, or given its own System Folder for running under different Systems or A/UX. In effect, each partition will function and look like a separate hard disk.

For the Quick Run, click on **OK** to create a standard full-sized single partition setup most users are familiar with. (For other options, see the Instruction Guide.)

Congratulations! You've successfully formatted and partitioned a hard drive and installed the fastest and safest software drivers available.

Updating Drivers without Reformatting

Important: Make sure you have disabled any password protection, encryption, compression, or any other special feature of your old formatting software before selecting this option.

If you are using a non-HDT-formatted drive, HDT Primer PE will automatically scan your system and ask you to update any obsolete drivers on the disk with the HDT universal driver. In most cases, you can update the driver software and have it take over your existing partitions without reformatting. This way you can enjoy the performance and

functionality increases offered by the HDT driver without having to go through the entire formatting process.

Unfortunately, this update procedure will not work if there is not enough room on the disk for a new partition. If that is the case, you need to back up the data on the drive, re-initialize it, and repartition the drive. However, in most cases HDT Personal Edition can automatically convert your drive to use the HDT driver. For additional information, see the Instruction Guide.

HDT Extension

HDT Extension is a uniquely intelligent start-up program. It will automatically search your SCSI bus for removable devices or erasable optical drives that do not have cartridges inserted. HDT Extension will pre-load drivers into memory for these drives so that cartridges inserted after bootup will automatically mount. If you do not have any removable devices or erasable optical drives, you do not need the HDT Extension.

To install it, drag the Extension's icon onto the System Folder icon. It must be in its proper place within the System Folder in order to function properly; also, please make sure no other removable drive extension is installed. The next time you restart your Macintosh, the HDT Extension will be loaded.

HDT Prober

This control panel device is a quick way to scan or reset the SCSI bus, mount drives, and get detailed information on drives. To install it, place the program's icon in your System Folder.

When you open Prober by opening the control panel and selecting its icon, it will automatically scan the bus and display the addresses and names of all active drives. Drives that are mounted will have a dot next to their ID bar. To see which drives have drivers loaded, press the option key. The mounted dots will now indicate where there is a driver installed.

To mount a drive, select it and click on **Mount.** Prober will mount all partitions on the drive that are defined as automounting. (See p. 27 for explanation of Automount.)

To get information on a drive, select that drive and click on the **Info** button. To get more information on the partitions of that drive, hold down the Option key. The **Info** button will change to **More Info.** Click on **More Info** to get detailed information.

To rescan the bus, click on **Rescan.** To reset the SCSI bus, hold the option key again, and **Rescan** will change to **Reset.** Click on the **Reset** button to reset the SCSI bus.

HDT Primer PE

HDT Primer™ PE

Format, partition, maintain, and test hard drives

HDT Primer PE is the core application of Hard Disk ToolKit *Personal Edition*. Primer carries out the formatting, partitioning, and maintenance functions.

Features

- Low-level format and install drives
- Install or update device drivers
- Create and manage multiple partitions on a hard drive
- Mount and unmount partitions
- Test a drive for defects and automatically reallocate bad sectors
- Modify, expand, optimize, or delete partitions
- Get information on the drive and the computer

Formatting a Hard Drive

Warning! Formatting destroys all data on the drive. Be sure that you have backed up the drive before performing this operation.

Warning! HDT Primer PE performs operations that are critical to your data. Please disable all System extensions before launching the Primer. In System 7, this can be done by holding down the shift key during startup until the "Extensions disabled" message is displayed. In System 6, you should drag the System and Finder out of the System Folder and into a folder by themselves.

Before a drive can be used with a Macintosh, it must first be formatted, partitioned, initialized, and have a driver installed on it. With Primer, this process is quick and easy.

Formatting a drive involves mapping out the magnetic surface of the storage media into error-free sectors, zones, and tracks. Formatting must be done first, so that all areas of the disk are readily accessible by the Macintosh. Drives are typically re-formatted to spare out (allocate to the spare track) any new defects that have arisen, or to clean off the drive and start anew. Most users will start their ToolKit usage by formatting their drive with Primer. Formatting is not something you should need (or want) to do often.

Primer's basic formatting follows a set of optimal default values, and is straightforward enough that you may be able to use it without instruction. You can consult the Quick Run section for a fast introduction to formatting.

For single hard drive systems, see 'Hard Disk Formatting from the Floppy' below.

Installation

To format, initialize, or test a hard drive, you must run Primer from a floppy disk or from a secondary hard drive (not the one you wish to format, initialize, or test). We recommend installing Primer onto your hard drive, as it has many functions beyond formatting that you may find useful on a regular basis.

To install Primer on your hard drive, select the HDT Primer PE icon from the original disk and drag it onto on your hard drive. Please see the installation chapter of the Instruction Guide for more information on installing ToolKit.

Hard Disk Formatting from the Floppy

HDT Personal Edition comes on a startup floppy with System 6.0.8 installed. This will allow any Macintosh other than the Classic II, Quadras, or PowerBooks to start up with HDT Personal Edition from this floppy. You cannot run ToolKit from the write-protected original floppy. You should make a backup copy of the original floppy; if you are unclear on how to do this, see your Macintosh User's Guide for details.

Important: If you are using a Macintosh that cannot use System 6.0.8, you must either create a System 7 startup floppy with HDT Primer PE on it, or start up from a separate floppy. Please note that if you have only one floppy drive, running ToolKit from a non-startup floppy is going to require a lot of disk swapping. Here are step-by-step instructions for running HDT Personal Edition from a single floppy drive:

1. Boot the Macintosh with a System startup floppy disk.

2. Eject the startup floppy disk by selecting the icon and typing Command-E (for Eject). If the System asks you to reinsert the disk, reinsert it and immediately re-eject it.

3. Insert your backup disk with HDT Primer PE on it, and double-click on the HDT Primer PE icon.

4. The System will eject the disk and ask you to re-insert your startup floppy. After you do that, it will eject the startup floppy and ask you to insert the HDT floppy. This will repeat as many as 20 times. Please observe and follow all on-screen instructions for inserting disks.

5. When disk swapping is complete, Primer will ask you for your name, company and serial number. (If you have already entered this information, Primer will display it for you.) You have successfully launched HDT Primer PE from two floppy disks.

To create a System 7 startup floppy for using HDT Personal Edition with a Classic II, Quadra, or PowerBook, consult your Macintosh User's Guide, or follow these steps:

1. Start up with your original Install 1 disk. Click on the **OK** button, then click on **Customize**.

2. Select the **Minimum System** for your Macintosh. Eject the Install 1 disk, and insert an empty, formatted 1.4 MB (high density) floppy. Click on the **Install** button to begin the installation. You will be prompted to insert your original Macintosh System disks several times. Please follow all on-screen instructions for inserting disks.

3. When the System installation onto the floppy is done, restart the computer. Insert the new startup floppy, then eject it by selecting the icon in the Finder and using the **Eject Disk** command from the **Special** menu or typing Command-E.

4. Insert the HDT Personal Edition program disk, and drag the HDT Primer PE application to the new startup floppy. The System will eject the HDT Personal Edition program disk and ask for the startup floppy. Again, follow all on-screen instructions for inserting disks until the file copy has completed.

5. Congratulations! You have created a startup floppy that can be used with your computer.

Launching Primer

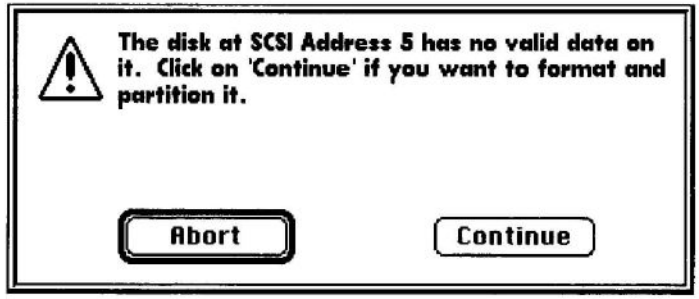
Primer is a standard Macintosh application. You can run it from a backup of the original floppy disk as described above, although we recommend launching it from the ToolKit folder on your hard drive. To launch the program, double click on the HDT Primer PE icon.

Entering the serial number

The first time you run Primer, the program will prompt you to enter your name, company name, and the serial number of your copy of ToolKit. When you have done so, Primer will scan the SCSI bus and display its main window. **Note:** The serial number is case sensitive - all letters must be entered as uppercase (capitals.) The form is as follows: two capital letters, six numerals, one capital letter, one numeral, and one capital letter. Make sure that you have not entered the numeral "0" (zero) instead of the letter "O" or the numeral "1" (one) instead of the letter "I". There are no spaces in the serial number. If you get an "invalid serial number" message, try entering it again.

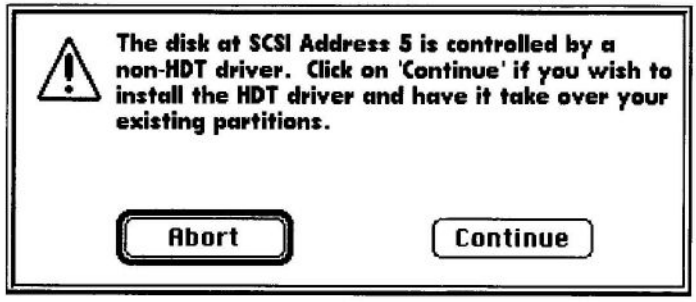
After the serial number has been entered, click the mouse anywhere on-screen to close the opening banner. Primer then automatically scans the SCSI bus for drives.

When HDT Primer PE is launched, it automatically checks the SCSI bus to see if you have a drive in need of updated drivers or formatting. If there is a drive on the SCSI bus without any valid data on it, such as a new drive, you will see the following dialog:



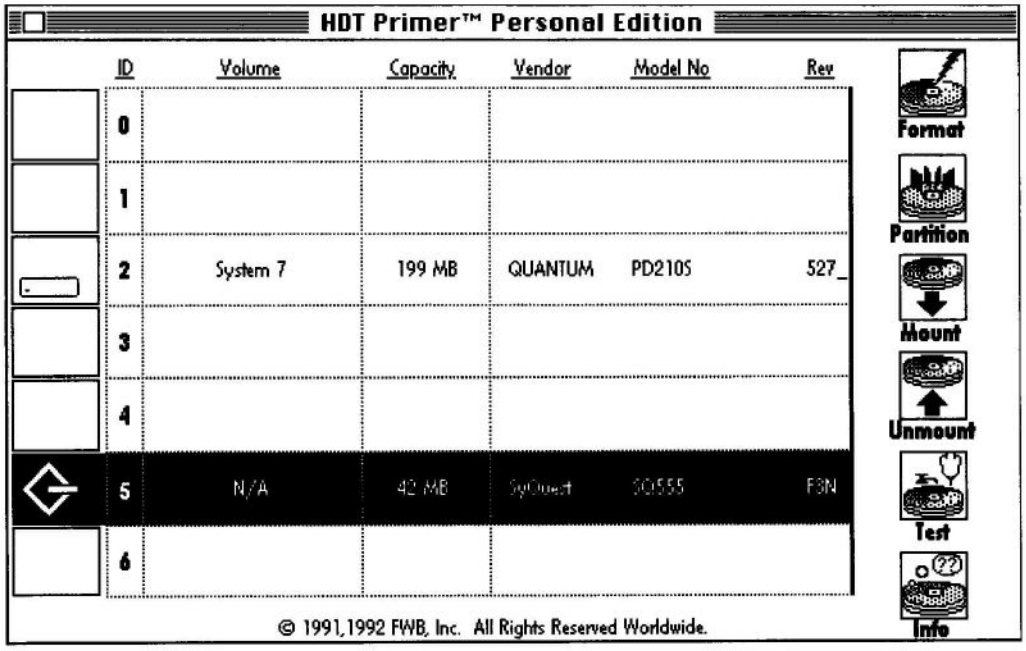
If you wish to go ahead and format the drive, just click on **Continue** and skip ahead to the section on formatting.

If you have never used ToolKit before, Primer will automatically ask you if you wish to update your present driver software to the HDT universal driver. The following dialog box will appear:



See the section on 'Installing the HDT Driver Without Reformatting' for details.

After Primer is done with its automatic tasks, the Volume Selector Screen will appear, listing the drives that are active on the SCSI bus:



The screen display includes an icon for each drive, its SCSI ID, the volume name (if the drive has more than one partition on it, the name of the first Macintosh partition will be the name listed), the drive's capacity, and the make, model number, and revision number of the drive.

Most of Primer's functions are accessed via this window, through the **Format**, **Partition**, **Mount**, **Unmount**, and **Test** buttons located on the right side of the window.

Rescan SCSI Bus

If a SCSI drive does not show up in this display because it has just been powered on, try the **Rescan** command in the **File** menu.

If a device still fails to appear, try quitting the program, shutting off the Macintosh and all peripherals, and checking the connections for all SCSI devices. Make sure that each peripheral has a unique SCSI ID number, and that all devices are correctly cabled and terminated. (See Troubleshooting.)

Select the Drive to Manipulate

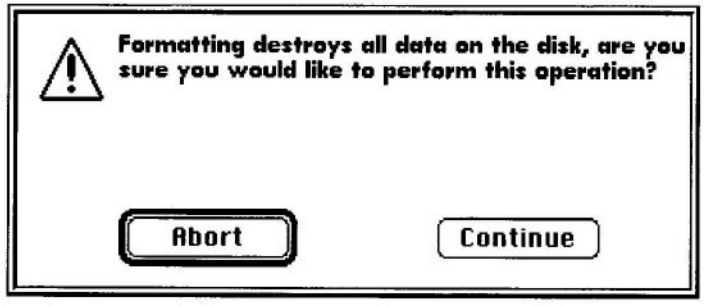
The currently selected drive is highlighted. You can change the selected drive by using the Up and Down Arrow keys on the keyboard or by clicking anywhere on the bar that lists and identifies the drive.

Format the Drive

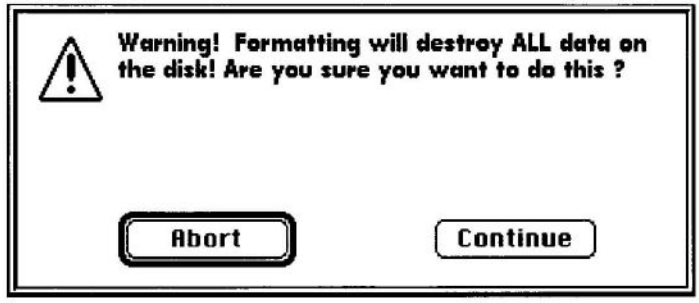
To begin formatting a drive, **make sure you have the correct drive selected.** Choose the **Format** command. This can be done either by clicking the **Format** icon in the upper right corner of the Primer's Drive Selection window or by choosing **Format** from the **File** menu.

If this drive is not directly supported by the program, you will be given a warning that it is not directly supported, and Primer will use a generic mode that is not optimized to adjust all parameters the drive supports. You can contact FWB to let us know what type of drive you have, so that we can add direct support in the future.

You will see the first of two dialog boxes letting you know that formatting will destroy *all* the data on the disk. Data will be lost *forever* (beyond the help of all data/file rescue programs) when formatted.



At this point, you can abort if you realize your data is not backed up. Otherwise, click on **Continue** and you will receive one more warning:



Notice that **Abort** is highlighted, and is therefore the default choice. Pressing Return or Enter on the keyboard will abort the format process with no effect on the drive. If you are sure that you want to format the drive - **and thus destroy any data that might be on it** - click on **Continue**.

When you click on **Continue**, formatting will begin. You will see a status box telling you that formatting has begun and about how long it will take. The size and speed of the drive affect how long it takes to format. **Note:** formatting cannot be aborted or cancelled.

As soon as the formatting is completed, a partition method selection dialog box appears.

If you wish to format multiple removable cartridges, continue with partitioning, then unmount the cartridge by selecting the drive in the main window of Primer and clicking on the **Unmount** button on the right hand side of the window. Eject the cartridge by pushing the eject button on the drive, insert a new cartridge, and repeat the formatting procedures explained above.

Partitioning

Partitioning divides the disk into separate volumes. Each of these volumes is treated by the Macintosh as a separate hard drive represented by its own icon on the Desktop. Multiple users can have their own partition or, if the same disk is used for different purposes (e.g., word processing, accounting, programming, graphics, etc.), a partition can be created for each of these uses and dedicated exclusively to it.

Partitions are also used to hold different operating systems, such as Apple's A/UX, or to hold different versions of the Macintosh OS, such as System 6 and System 7.

Different partitions appear as separate icons. They are "seen" and used by the Finder and applications as if they are separate hard drives. For example, a different partition can be used for the System Folder, documents and files, and for all applications. This lowers seek time, reduces fragmentation, and saves wear on the drive. You can also use partitions to divide groups of files for different projects, for file sharing, or for public access.

Primer creates what are called low-level *Inside Macintosh V* hard partitions; the physical areas of the disk are assigned to separate volumes. This reduces the seek time of the drive by reducing the physical space that the drive needs to search through for data. For example, if an 80-MB disk has been divided into volumes of 20 MB each, the computer, looking at a particular assigned partition, only needs to search a 20-MB area for data instead of the entire 80-MB area. This is in contrast to other programs that create 'soft' partitions that are really invisible files on the disk.

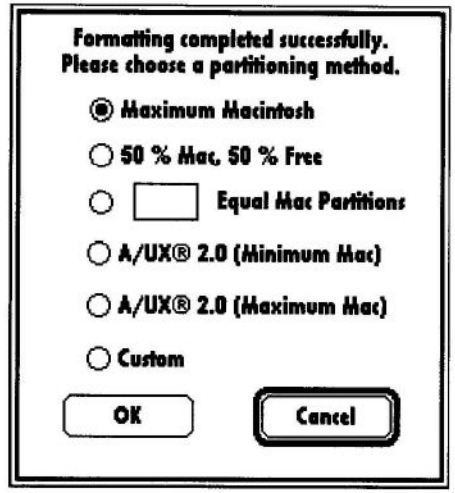
For security, a partition can be password protected. With password protection, a password must be entered before the partition can be mounted or modified. This prevents unauthorized people from accessing any of the files contained in that partition. For multiple-user environments, each user can have a password for his/her own secure partition.

Warning! Be sure to store your password in a safe place. The password is device-driver based, and is asked for before anything else can be loaded, so nothing can circumvent it. If you forget your password, or lose it, you will have lost *all* your data. FWB does not know of a way to bypass this protection to recover the data.

Partitions can also reduce allocation block size, the minimum unit of storage a volume allocates for storage. Partitions with an allocation block size of, say, 2KB would use 2KB of disk space for any file under 2KB, even if it only stored one character. Reducing allocation block size results in the ability to store more real data.

If the same device is used under different operating systems (Mac OS, A/UX, ProDOS), separate partitions can be configured to be used under the different operating systems. Each bootable partition used for the Macintosh OS will need its own System Folder.

When formatting is complete, or if you select **Initialize** from the **File** menu, you will be presented with the partitioning options shown below:



Clicking on **OK** will make Primer immediately use the default **Maximum Macintosh** method of partitioning. Most users will choose this default option to create a single partition with the maximum amount of usable storage space.

- **Maximum Macintosh** uses the entire hard disk space for the Mac OS.
- **50% Mac, 50% Free** uses half the disk for a Mac OS partition, leaving the rest free.
- **Equal Mac Partitions** creates a number of equally sized Mac OS partitions that use up all free space. You need to type in the number of equal partitions you wish to create.
- **A/UX Setup** partitions the drive for use with Apple's A/UX. The **Minimum Macintosh** option allocates the minimum amount of space (2 megabytes, for A/UX 2.0) for a Macintosh partition and gives the rest to A/UX. The **Maximum Macintosh** option creates the standard A/UX partitions, and allocates the rest of the free space to the Macintosh partition. The size of this Macintosh partition will vary with the capacity of the drive. **Important:** A/UX 3.0 requires using Apple's HD SC Setup software to initially create new A/UX partitions.
- **Custom** brings up the partition directory window. See the section on the Partition Directory (page 24) for details.

Once you have chosen a partitioning scheme, Primer will then write out the partition information and initialize any Mac OS partitions. Primer will be finished after a few minutes, and the newly created partitions will automatically mount on the Desktop. You can now quit HDT Primer PE and use the drive.

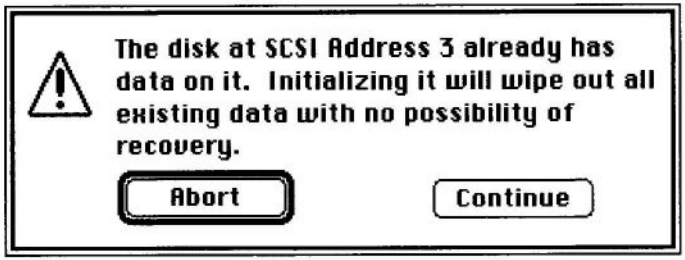
Initializing

Initialization removes any existing driver software in preparation for setting up new partitions and installing the HDT driver. It is used to allocate or reallocate partitions if you don't want or need to reformat the drive.

Initializing is also useful for drives that are having problems with data corruption due to software malfunctions, and for drives that have become very fragmented. You can back up all your files, re-initialize the disk (initializing will erase all data on the disk), reallocate partitions, and recopy the files onto the disk. This will eliminate fragmentation because the files will be recopied onto the disk in contiguous sectors.

Initializing will wipe out *all* previous partitions and the data in them. If you are re-initializing a drive because of data corruption, make sure you have backed up all your files.

During the Formatting process, initializing occurs as an automatic step. To access this feature at other times, choose **Initialize** from the **File** menu. A dialog box will appear asking you if you wish to destroy all data on the disk. Make sure that there is nothing on the disk that you want to save before continuing.



When you click on **Continue**, the partitioning options window will be displayed so that you can create partitions. (Please refer to the information above, under the "Partitioning" heading.)

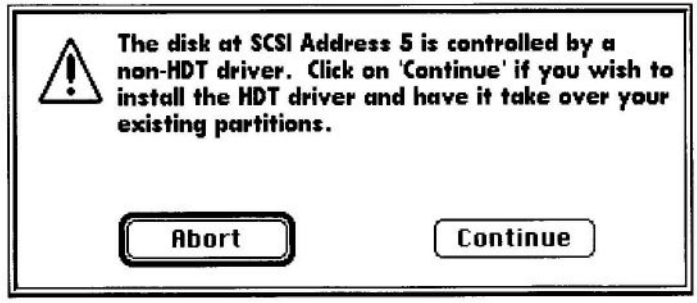
Installing the HDT Driver Without Reformatting

HDT Primer PE has a unique "intelligent update" feature that checks each SCSI ID and asks if you would like to automatically install an optimized HDT driver for the device. Installing the HDT driver is necessary to use many of the Personal Edition's special features. It is highly recommended.

Primer can 'take over' most drives that have been formatted by other programs without causing any data to be lost. However, as always, *all* data should be backed-up before trying this procedure, and *all* extensions should be disabled.

Important: you should first turn off *all* encryption, password protection, and special features and attributes of the old formatter.

When Primer is launched, it will automatically scan the SCSI bus for drives that are not using the HDT driver. This includes drives pre-formatted with Apple's HD SC Setup or using proprietary third-party software. If it finds any, Primer will display the following dialog:



Clicking on **Abort** will leave the drive untouched. Clicking on **Continue** will install the HDT driver. If the drive is using the obsolete *Inside Mac IV*-style partition map, Primer will automatically update the drive to the *Inside Mac V*-style and write the HDT driver to the disk.

Upon successful driver installation, you should quit all programs and restart your computer to allow the changes to take effect.

If a drive is converted, it will lose special proprietary attributes such as its partition expandability information.

It is possible that the drive may not have enough free disk space to accommodate a driver update. At this point it is necessary to back up all files and initialize the drive with Primer. Refer to the beginning of this chapter for information on initializing drives.

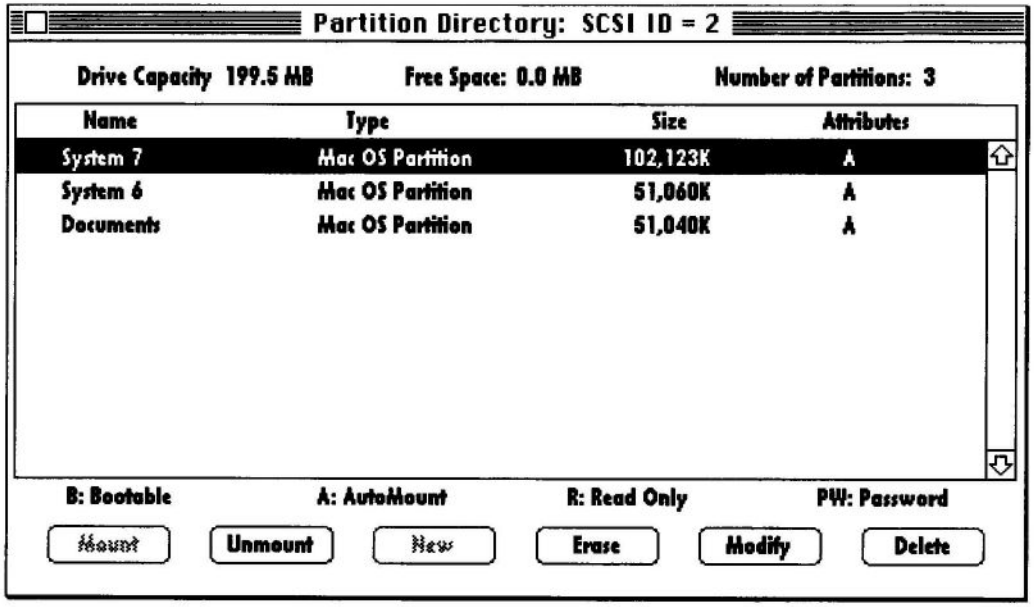
Partitioning

Clicking on **Partition** from the main drive selection screen or selecting **Partition Drive** from the **File** menu will allow you to partition the highlighted drive. You can inspect the current partition layout, create or delete partitions, and maintain partitions.

If you are attempting to partition a drive that was not formatted with Primer, it needs to be updated with the HDT driver before it can be partitioned. This can be done when you launch Primer. Primer will automatically ask you if you would like to update any obsolete drivers to the HDT universal drivers. See the "Installing the HDT Driver Without Reformatting" section for details. In addition, you can use the **Update Driver** command under the **File** menu.

If the drive *is* correctly partitioned for Primer, the following window will appear when the **Partition** command is chosen:

The Partition Directory



Here you can create new partitions, change the size of partitions, and secure partitions with passwords, as well as modify other attributes of partitions.

The Partition Directory is sorted according to a partition's location on the disk, not in alphabetical order. Primer will automatically optimize free space when creating partitions, making them contiguous.

At the top of the screen is the following information about the drive:

Drive Capacity: The total size of the drive in megabytes.

Free Space: The total amount of partitionable free space.

The free space on the disk cannot be accessed until it has been put into a partition. If you do not wish to have multiple partitions, a single partition can be created utilizing all free space.

The Number of Partitions: The total number of partitions.

The SCSI ID Number: The SCSI ID Number of the drive.

The Directory itself gives detailed information about individual partitions:

Name: If the partition is a Macintosh OS partition, this is the name of the partition when it shows up on the desktop. For non-Macintosh OS partitions, the name describes what it contains.

Type: The file system used by the partition. This will usually be Macintosh OS, but can be A/UX, ProDOS, or other file systems.

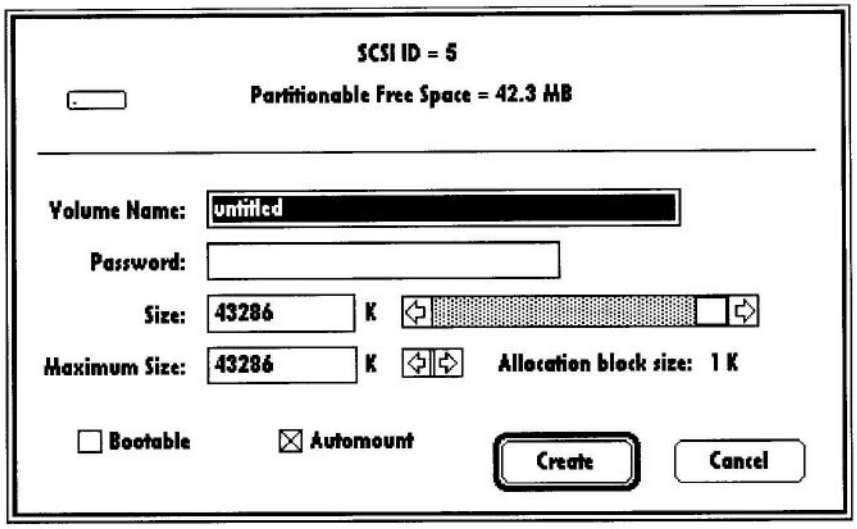
Size: The size of the partition in kilobytes (KB).

Attributes: This lists the attributes given to the Mac OS partitions when they are created or modified, such as (A) Automount, (B) Bootable, (R) Read-only, or (PW) Password protected.

Creating a Partition:

Follow these steps to create a new partition:

- First, select the drive in the main Drive Selection window on which you wish to operate.
- Click on **Partition** to bring up the Partition Directory of that drive.
- Click on **New** at the bottom of the Partition Directory. This will be accessible (black instead of gray) only if there is partitionable free space available.



Volume Name

This sets the name for a Mac OS partition that you will see when the partition's icon mounts on the Desktop. Type a name in the Volume Name box. Use any name you wish, but a name that reflects the purpose or user of the partition will be easiest to identify.

Password

To enable password protection, enter a password. The password *is* case sensitive and can be up to 24 characters in length.

Once the partition has been password protected, you cannot gain access without the password. Take precautions to remember your password. By using the **Modify** button in the Partition Directory, you can later eliminate this password if you wish. If this space is left blank, no password will be assigned.

Warning: Do not forget your password! We do not know of any way to defeat the password protection. If you forget your password, your data may be unrecoverable.

Size

Primer will show the amount of free space available for partitioning. (Next to Partitionable Free Space.) It automatically enters the maximum allowable size for the partition in the size field. You can edit the text in the size box or use the bar to the right to adjust the

partition size. Space is allocated in 0.5-kilobyte units. (1,024 kilobytes equals one megabyte.)

Maximum Size

Partitions can be expanded at any time without data loss, but their maximum size must be preset at creation time. Set the Maximum Size to the greatest size you think you may one day want the partition to be. This number is typically the size of the hard drive. You can edit the text in the size box or use the bar to the right to adjust the partition size.

The Maximum Size affects the amount of free space in the drive. For example, if you are setting up a partition that will contain approximately 11 MB of files, but you expect it to grow as you add to it, you might set the initial size to 12 MB and the Maximum Size to 40 MB, the size of the drive. The partition will occupy only 12 MB on the disk, but can be expanded up to 40 MB in size in the future if free space is available. The downside is that directory space for the Maximum Size will be allocated when the partition is created, so usable free space is slightly lower than an unexpandable partition.

The Maximum Size also affects the allocation block size (see below). The larger the Maximum Size, the larger the allocation block size of the partition.

Expandable partitions should be erased only from within Primer and should not be erased using the Finder's **Erase Disk** command. The Finder will erase all expandability information.

If you do not want the partition to be expandable, simply enter the same number as entered in the size box.

Allocation Block Size

The minimum storage unit that can be allocated in HFS is known as the allocation block size. If the allocation block size is 2KB, a file containing one character will occupy 2KB of disk space even though it's almost empty. This can cause an immense waste of space for drives with many small files. Allocation block size grows by .5KB for every 32,767KB a partition is in size or Maximum Size. One of the advantages of partitioning is reducing allocation block size; each partition has its own allocation block size which is smaller than the entire drive's. Primer displays the allocation block size for the currently entered partition, allowing fine tuning of this characteristic.

Other Options:

- **Bootable** Select this to use this partition as the start-up partition. This is useful if you use different operating systems, such as System 6, System 7, etc. Otherwise the Macintosh will boot off the first HFS partition listed in the Partition Directory, provided

that it has a System Folder. Please select only one partition as bootable, or else the first one with a bootable flag will be the boot-up partition.

- **Automount** The partition will automatically mount on the Desktop upon start-up. Otherwise, the partition will have to be mounted individually by Primer by selecting it in the Partition Directory and clicking on **Mount**.

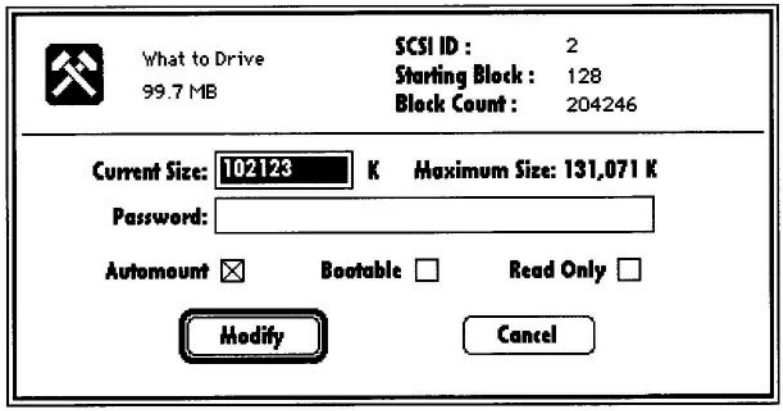
Clicking on **Cancel** will abort the creation process, leaving your drive unchanged; clicking on **Create** will create the partition with the currently entered parameters, initializing it if it is a Mac OS partition. Primer will then return to the Partition Directory window and list the partition you have just created, including its characteristics and attributes.

Modifying a Partition

Obviously, many of the attributes mentioned above in partition creation need to be accessed so that partitions can be modified at a later date. You can change the size and/or attributes of an existing partition on your drive at any time by clicking on **Modify**.

First, open the Primer PE Drive Selection window and select the drive you wish to modify. Either double-click there, press Return, or click on **Partition** to open the Partition Directory window.

Select the partition to modify from the list and click on **Modify**. If the partition is password protected, you will be asked to enter the password before you can modify the partition. Otherwise, the Modify dialog box will appear:



You can now add or remove the password from the partition or simply change it. You can also shrink or expand the partition. To expand the partition, click on the Current Size indicator and enter the new size. Remember, to increase the size of the partition, you must

have set a larger maximum size when you created the partition, and you must have available free space.

You can also shrink a partition down to the amount of data stored on it. A partition can be further reduced in size if all files within it are moved to the front of the partition with an optimizer. The starting block indicates where the partition resides on the disk and the block count refers to how many blocks the partition occupies.

The various partition attributes can also be edited. For information on the Bootable and Automount options see 'Creating a Partition' earlier in this chapter. Read Only will render the partition unable to accept written data. Once Read Only is set, nothing can be written to the partition until Read Only is disabled.

When you're through with your changes, click on **Modify**. Primer will immediately make your changes, and return you to the Partition Directory window. Clicking on **Cancel** will abort any changes.

Deleting a Partition

You can use this command to delete a partition from your drive. You can also choose to securely erase the data in the partition at the time of the deletion, preventing anyone - including yourself - from ever recovering that data.

Choose the target drive from Primer's main Drive Selection window. Double-click on the drive, or click on **Partition** to open the Partition Directory window. Choose the partition to delete from the list, and click on **Delete**.

If the partition is password protected, a dialog box will appear asking you to enter the password before you can delete the partition. Otherwise, this dialog box will appear, asking if you are sure that you want to delete the partition:

Make sure there is nothing in the partition that you wish to keep that has not been copied from the partition.

In addition to deleting the partition, you can go one step further and erase its entire contents. Just click on **Security Erase**. When you then click on **Delete**, Primer will take a few minutes to delete the partition and erase all the data. If you did not enable the Erase option, Primer will delete the partition and quickly return to the Partition Directory window. The Partition will then become free space that can be used to create new partitions on the disk.

Mounting/Unmounting Disks and Partitions

A partition must be mounted on the Desktop before it or any of its files can be opened. If you had enabled the Automount or Bootable attributes when you created the partition, they would have mounted automatically upon start-up. If you did not enable the Automount or Bootable attributes, you will need to use Primer to mount the partition before you can access it. You can also mount drives with removable media after the media have been installed. (For more information, see the Prober chapter.)

In Primer's main Drive Selection window, choose the drive you wish to mount.

To mount the entire drive, click on the **Mount** icon on the right side of the screen. To mount selected partitions on the drive, click on **Partition** to open the Partition Directory and select the partition you wish to mount or unmount, and click on the respective mount/unmount buttons at the bottom of the window.

Usually, either the **Mount** button or the **Unmount** button will be grayed. If the **Mount** button is grayed, the partition is already mounted. If the **Unmount** button is grayed, the partition is already unmounted. If **Mount** and **Unmount** are both grayed out, these options are not available for this type of partition.

Unmounting can also be done on the Desktop. Simply drag the partition's icon to the Trash. This operation will unmount the partition but not harm it in any way.

Testing a Drive

The Test Drive option will test the drive for bad blocks. Use this command whenever you question the integrity of the drive's medium.

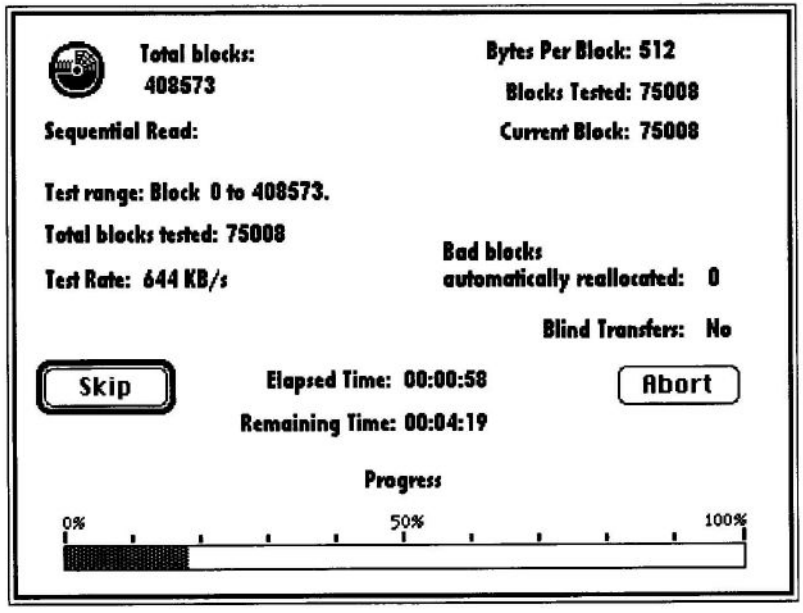
From Primer's main Drive Selection window, select the drive to test. Click on the **Test** button on the right side of the window or choose **Test Drive** (Command-T) from the **File** menu.

The Primer will automatically begin testing the computer's RAM. This is necessary to determine the reliability of the other tests. The time needed for a RAM test differs with the speed of the computer and the amount of RAM.

The Primer then performs three diagnostic tests: Sequential, Random, and Alternating Read.

- Sequential Read looks at the data on the disk, without changing it, in numerical ascending order (block 0, 1, 2, 3...)
- Random Read transfers data from random blocks on the disk. This tests both the data transfer and seek capabilities of the drive.
- Alternating Read accesses the data from alternating ends of the test range, switching from end to end, working in towards the center. This means it tests the first block and then the last, to the second block to the second to last, etc.

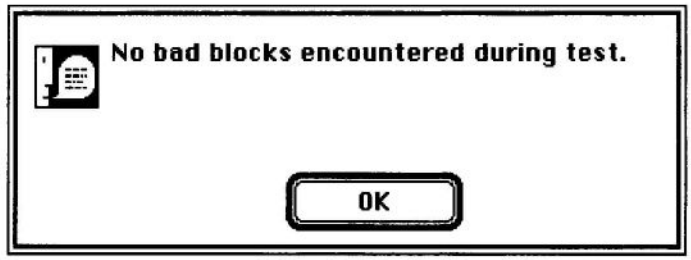
If a drive gets many (10+) bad blocks in a row, it likely has a media problem and should be reformatted. If, after reformatting, the drive exhibits the same problem, you may have a hardware problem beyond Primer's capabilities to repair.



The test information dialog box will appear. You can see the total number of blocks being tested, the bytes per block, the number of blocks tested thus far, and the current block being tested. The window also lists the test range, the total blocks tested, the test rate in

kilobytes per second, the number of bad sectors found thus far, and whether blind data transfers are enabled. At the bottom of the window are the elapsed-time and remaining-time figures, as well as a bar graph showing test progress. **Abort** allows you to stop all the tests, while **Skip** gives you the option of foregoing a particular test.

When the test is finished or has been aborted, a dialog box will appear informing you of any bad blocks encountered during the test:



If bad blocks are encountered, they will be automatically reallocated to prevent data loss. If no bad blocks are encountered and you continue to experience problems with the drive, please check the **Troubleshooting** section in the back of the manual.

Information Capabilities

Primer can provide information on the type and configuration of each of the drives as well as the computer running the system.

You can use the information provided on the drive to see how the drive and driver are set up. With this information, you could determine what, if any, changes you need to make to correct problems or increase performance, or to look for options and ideas, which could be useful in deciding how to format or configure a drive.

Drive Information

To get information on the drive, select the SCSI ID of the drive and click on the **Info** button on the right side of the main Primer Drive Selection Window. A window will open displaying the following information:

SCSI Device Information	
SCSI ID Number:	6
Drive Type:	Random Access Device
Drive Class:	SCSI-2 (ANSI X3T9.2/86-110)
Partition Style:	Inside Mac V
Total Partitions:	Unknown
Driver Name:	FWB SCSI #6 v04171f
HDT Driver Version:	5211
Block Size:	512 bytes per block
Creation Date:	Unknown
Backup Date:	Unknown
Mirroring:	No
Striping:	No
Free Partition Space:	0

- SCSI ID number. This is the SCSI address, from one to six, assigned to the drive.
- Drive type. Indicates what kind of SCSI device the drive is.
- Drive class. Shows whether the drive is SCSI-1, SCSI-1/CCS, or SCSI-2.
- Drive capacity. The size of the drive in megabytes.
- Partition style. Indicates the Apple partition style, either *Inside Mac IV*, or *Inside Mac V*.
- Total partitions. Total number of partitions on the disk.
- Driver name. Indicates the name or ID of the driver currently installed.
- HDT Driver Version. If the driver is a ToolKit driver, the version number will be listed.
- Block size. This is the number of bytes per block in the disk format. The standard is 512 bytes per block.
- Mirroring. Indicates whether the drive is being used for automatically duplicating data onto another drive.
- Striping. Indicates whether the drive is being used for storing pieces of information on more than one drive.
- Free partition space. The amount of space that has not been partitioned out.

Click to close this window.

Computer Information

To get information on the computer, select "Get Info" from the File menu. A window will open displaying the following information:

Computer Information	
Environment Version:	2
Computer Model:	Macintosh SE
System Version:	6.0.5
Processor:	68030
Floating Point Coprocessor:	Yes
Color QuickDraw:	No
Keyboard Type:	Standard ADB Keyboard
AppleTalk Version:	0
System VRefNum:	-32637
Total Memory:	4194304 bytes
Free Memory:	344606 bytes

This provides basic information on the Macintosh including its processor, keyboard, System version, and memory capacity.

Primer Menu Commands

The following is information on the commands found in Primer's pull-down menus.

Apple Menu

About HDT Primer

Displays the version number, as well as contact information for FWB Inc. Detailed information on upgrading to the complete Hard Disk ToolKit is also displayed.

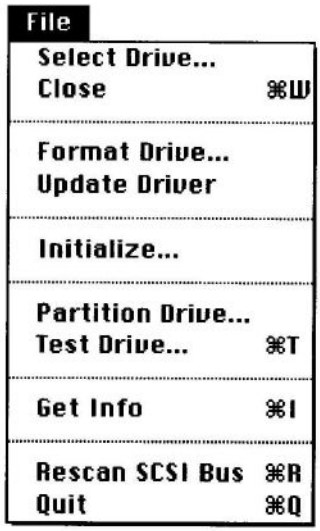
Help

An on-line help window is available through the **Apple** menu. Information on the various commands and features of Primer can be accessed here.

The Topic pop-up menu lists a variety of subjects. You can drag-click on the **Topic** item, and scroll to the desired topic. Primer will bring up the appropriate Help screen. Click on **Done** when you have finished with help. Primer also has extensive Balloon Help when used under System 7.

File Menu

For this menu, we'll only quickly discuss the commands not already detailed in this chapter.



Select Drive: Brings up the Drive Selection window if it has been closed.

Close: This command will close the front-most window.

Format Drive: Begins the disk formatting process.

Update Driver: This allows you to install the latest version of the ToolKit driver.

Initialize: Erases information on the drive so that it can be repartitioned.

Partition Drive: Brings up the Partition Directory window so that partitions can be created and maintained.

Test Drive: Tests the drive for defects and remaps them.

Get Info: Displays information on the computer.

Rescan SCSI Bus: If you have turned on a drive or loaded a removable media drive since launching Primer, this command will rescan the bus and add those drives to the Drive Selection window.

Quit: Quits the Primer application and returns you to the Desktop.

Edit Menu

This is included for use mainly with Desk Accessories.

HDT Extension

Quickly load drivers for removable media drives upon start-up

The HDT Extension is a uniquely intelligent start-up program for the Macintosh that gives you control over mounting of SCSI devices with removable media.

When installed, HDT Extension will automatically load a driver for any removable device if there is no cartridge in the drive when the computer is powered on. This will enable the drive to automatically mount a cartridge when one is inserted.

Installing HDT Extension

Simply drag the HDT Extension icon onto the icon of your active System Folder. The System will automatically place the Extension where it needs to go. In System 6, this is inside the System Folder. In System 7, this is in the Extensions folder within the System Folder.

Be sure you have removed any other INIT or Control Panel device that automatically mounts or loads drivers for removable drives. This includes any file within the System Folder that was included with any other formatting software or removable drive.

You must reboot before the Extension can be fully installed and loaded.

On startup, the Extension will search through the SCSI bus to find any removable devices that do not have a cartridge inserted. The Extension will then pre-load drivers for these devices, allowing cartridges inserted after bootup to automatically mount. If it loads a driver for a device, it will display an icon in the startup sequence with that device's SCSI ID number.

HDT Prober

Quickly mounts and inspects SCSI devices

HDT Prober is a control panel device designed to mount SCSI devices quickly and see what drives are on-line.

Probing the SCSI Bus

HDT Prober is an easy to use program that gives you quick access to the following functions:

- Scan or reset the SCSI bus
- Mount drives that were turned on after start-up or had been unmounted
- Mount removable-media devices if the cartridge was inserted after start-up
- Get detailed information on drives

Prober can be opened while running other programs. If you are experiencing SCSI communication problems, or have had a drive crash, Prober can reset the bus and possibly fix SCSI communications problems.

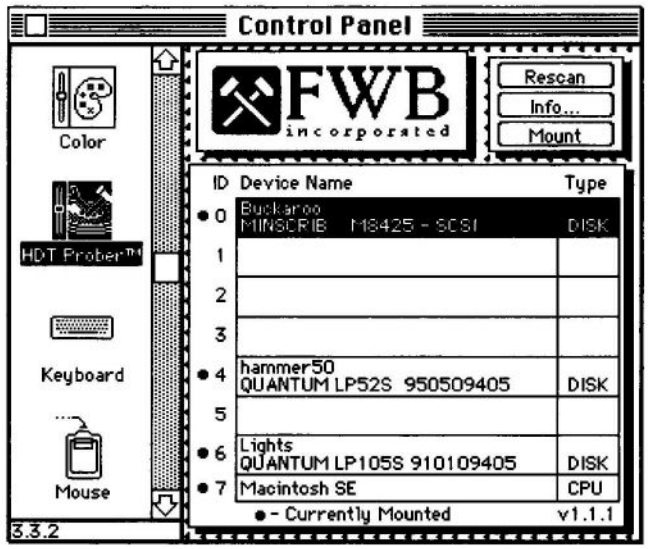
Installation

HDT Prober functions like any standard control panel device (cdev) under System 6. Simply place the HDT Prober icon into your start-up drive's System folder.

Under System 7, Prober goes into the Control Panels folder.

Using HDT Prober

Select the **Control Panel** desk accessory from under the **Apple** menu in the top left corner of your screen. Scroll down the list of cdevs to find the HDT Prober icon and click on its icon. Prober will open and automatically scan the SCSI bus. It then displays the IDs of the drives connected to your Macintosh, including any drives that did not mount correctly or are unmounted. Prober will list the drive by the name of its first partition.



Scanning the SCSI Bus

If a connected drive did not show up in the list of devices, click on **Rescan**.

If it still does not show up and the device is powered up, it may be in a hung state. You can reset the device by holding down the Option key, which causes the **Rescan** button to change to **Reset SCSI**. Clicking on this button will reset the SCSI bus.

If this fails, try shutting down your computer and checking all cables and termination. (For more information, see the Troubleshooting chapter.)

Drive Information

Click on the drive's name to highlight it. To get information on the highlighted drive, click on **Info...** in the upper right-hand corner of the Control Panel window, or double-click on the ID bar for that device.

Prober will give basic information on the drive, including:

- The SCSI ID number
- The manufacturer
- The type of drive (fixed, removable, optical, etc.)
- The block size and total capacity
- The Macintosh partition scheme it uses
- The total number of partitions

To close the information window, click on it anywhere. To get more specific information on the driver descriptors, their addresses, and the partition scheme of the drive, press the Option key. **Info...** will then change into **More Info**. Click on this button and a full probe of the drive will result.

Mounting a Drive

The dots next to the ID bars in the Prober control panel indicate whether the drive is mounted. To mount a drive, click on its ID bar to select it, and then click on **Mount** in the upper right-hand corner of the window.

Prober will mount all partitions that are defined as automounting. This program will also mount most drives even if they have not been formatted by Primer.

Device Driver Installed

If you hold down the Option key while in the main dialog, the dots for currently mounted drives will change to indicate whether a device driver is installed. This diagnostic function can determine if HDT Extension has correctly loaded a device driver for this SCSI ID. The device driver function can prove especially helpful with cartridge drives. If there is no cartridge in the drive but the device driver is installed, it will mount on the Desktop when you insert a cartridge into the drive.

Troubleshooting

Many things can happen to create errors and crashes on your hard drive; power surges or outages, viruses, and system errors are just a few. These errors can corrupt data the Macintosh uses to keep track of the contents of the drive. Depending on what data has been corrupted and how badly it has been corrupted, the result can be barely noticeable or could render your hard drive unusable.

Note: The **Read Me** file on the original program disk contains late-breaking information that was not available at press time. Please consult the **Read Me** file before continuing.

The following is a list of common problems, their probable causes, and what you can do to correct them. If the proposed solutions fail to correct the problem, reformatting the drive and reinstalling a clean System Folder may do the trick. Remember that formatting will erase *all* data on the disk. Make sure that the replacement System Folder is not corrupted and has no special INITs or System Extensions in it.

ToolKit Operation Problems

Symptom: HDT Primer PE does not accept the serial number on the back of the floppy disk, saying "The serial number you have entered is invalid."
Cause: Serial number not entered correctly.
Solution: Make sure you have entered the full serial number on the back of the floppy disk. The form is as follows: two capital letters, six numerals, one capital letter, one numeral, and one capital letter. There are no spaces in the serial number. Make sure that you have not entered the numeral "0" (zero) instead of the letter "O" or the numeral "1" (one) instead of the letter "I".

Symptom: Using System 6, System Heap space message appears while performing operations in HDT Primer PE.
Cause: System Heap space is not adequate.
Solution: Use MultiFinder in System 6, it can dynamically increase System Heap space. This will even work on a Macintosh with only one megabyte of RAM. Or, use System 7 instead.

Symptom: Message saying, "Cannot unmount volume" appears when attempting to test, format, or modify the partitions on a drive.
Cause: Busy files on disk, Primer cannot unmount volume.
Solution: Switch back to Finder and try to drag the icon of the drive to the trash in order to unmount it. If this does not work, restart with extensions disabled. In System 7, restart while holding down the Shift key until the "Extensions disabled" message is displayed in the "Welcome to Macintosh" screen. In System 6, drag the System and Finder into a folder by themselves and restart the computer.

Happy Mac Problems

Symptom: The Happy Mac appears briefly, then disappears, and a floppy disk icon appears with a question mark.
Cause: Bad boot blocks, corrupted System files, or disk data structures.
Solution: Run a recovery program; reinstall the Apple system software; update the driver on the hard drive.

Symptom: Happy Mac flashes on and off, and the drive does not boot.
Cause: The boot blocks or System files have become corrupted.
Solution: Run a recovery program; reinstall the Apple system software.

Symptom: Happy Mac appears but the drive seeks repeatedly before booting.
Cause: A "dirty" shutdown, due to a bomb or power outage. All data structures were not properly updated before shutdown. The Mac sees this upon start-up and reverifies these structures.
Solution: None needed, once the Macintosh has verified the structures. You may want to run Apple's Disk First Aid to verify that the disk is in good condition. Use Restart to reboot the computer and Shutdown to turn off the computer.

Sad Mac

The sad Mac appears when the Macintosh fails one of its diagnostic tests on start-up. The characters below the sad Mac indicate what has gone wrong. For Macintosh Plus and earlier, if the first two characters are "0F," there is a software problem. Any other two characters indicate a hardware failure. For Macintosh SE and later, if the first four characters are "000F," the problem is software, and the last four characters indicate the specific problem. (The error codes can be found in *Inside Macintosh* or in some public domain programs.)

Drive Problems

Symptom: The drive doesn't spin up and the LEDs don't light up.
Cause: No power or a blown fuse.
Solution: Check the power cable. Make sure the outlet is active. Check the drive's fuse. If it is burnt, replace it with a fuse having the same specifications. Make sure the fuse is the fast-blow type. If the problem continues or the fuses repeatedly blow, you may have a power supply problem; contact technical support of your drive's manufacturer.

Symptom: Multiple icons appear on the Desktop for the same drive. If you have partitioned your drive, there should be a separate icon for each partition that is mounted, but no more.

Solution: Make sure that no two SCSI devices share the same SCSI-ID, and that the ID numbers range between zero and six (seven is reserved for the Macintosh). Make sure cabling and termination are OK.

Symptom: The drive does not mount.
Cause: There are many software or hardware possibilities.
Solution: Make sure your drive is properly connected to the Macintosh and properly terminated. Check the SCSI ID of the drive as well as any other devices on the SCSI bus. Use Primer to test the media and update the driver.

Symptom: The drive starts to mount, but then crashes. This could have many causes. We explore possible Causes and appropriate Solutions below.
Cause: The hard disk's System Folder or the SCSI drivers may have been corrupted by a system crash or virus.
Solution: Replace the System Folder on the hard disk first by booting initially off a floppy disk and reinstalling using the Installer. If after the reinstalling the System Folder, the problem persists, use the Primer to update the drivers on the hard disk.
Cause: Multiple System Folders files on the drive.
Solution: Make sure you have only one System and Finder pair on your drive. Find any extra ones using Find File, and delete them. If you try to remove an active System/Finder, you will get an error indicating it is in use. Remove all inactive System and Finder files.
Cause: The Desktop file may be corrupt.
Solution: Rebuild the invisible Desktop file; hold down the Command (Open Apple key) and Option keys while the computer is starting-up; a dialog box will ask you if you want to rebuild it, click **OK**. This does not damage your data, but does remove any file comments.
Cause: The Desktop file may be too big. With System 6, disks with Desktop files larger than about 275KB would cause resource manager problems.
Solution: Upgrading to System 7 solves these problems as does partitioning the drive.
Cause: The Finder may not have enough memory. Under the System 6 MultiFinder, the Finder is normally allocated 160KB. You can see how much memory it is using by bringing up "**About The Finder**" from the **Apple** menu.
Solution: Increase the Finder's memory partition by doing a Get Info on the Finder. Try allocating 256K or more.
Cause: The directory on your hard disk may be damaged.
Solution: Repair the directory with Apple's Disk First Aid. Use a recovery program or restore the data from previous backups.
Cause: A virus may have infected your hard disk.
Solution: Check your hard disk with a virus detection and eradication program.

Symptom: A "Disk is full" message appears when the disk is not full.
Cause: Invisible or temporary files, or the directory is corrupted.
Solution: Run a recovery program or Disk First Aid.

Symptom: The drive mounts but cannot be used as a start-up disk.
Cause: Bad boot blocks on the disk, or a hardware problem with the drive.
Solution: Make sure drive is marked as start-up device in the control panel. Check the hardware connections. Reinstall the System software. Macintosh Plus will only start up off the device with the highest SCSI ID number.

Symptom: A dialog box appears saying "This disk is unreadable. Do you want to initialize it?"
Cause: Corrupted data structure on the disk.
Solution: Do *not* click on OK; this will erase the data on the disk. Run a recovery program.

Symptom: A dialog box appears saying "This is not a Macintosh disk. Do you want to initialize it?".
Cause: Corrupted data structure on the disk.
Solution: Do *not* click OK; this will erase the data on the disk. Run a recovery program.

Symptom: A dialog box appears saying "This disk needs minor repairs. Do you want to repair it?"
Cause: The Desktop file has become corrupted due to abrupt shutdown.
Solution: Click **OK**. The Macintosh will rebuild the Desktop file.

Removable Media

Symptom: The drive does not mount.
Cause: Incorrect SCSI ID, faulty cabling, or an inappropriate cartridge.
Solution: Make sure the cabling and SCSI ID of the drive are correct and secure. Make sure the cartridge is formatted for the Macintosh and contains valid data. If you have not installed the HDT Extension in your boot drive's System Folder and you booted up without a cartridge in the drive, you need to mount the cartridge by running Primer or from within the Prober control panel device.

Symptom: Light is flashing in the front of drive without media inserted.
Cause: Hardware problem.
Solution: If termination and cabling are correct, the drive may have a hardware problem Contact the drive manufacturer.

File Oriented Problems

Symptom: Errors reading or writing files in the Finder; "Some files couldn't be read/written and were skipped" message.
Cause: Cabling or termination problems. Bad blocks on the media.
Solution: Check for proper cabling and termination. Use Primer to test the drive for bad blocks and to remap them or reformat the drive. Try reformatting the disk.

Symptom: A file cannot be opened from within an application.
Cause: The file is corrupted. The application is the wrong version for the file. The file type code is incorrect.
Solution: Check the Get Info box on the file. Reinstall the application. Check the application for version compatibility.

Symptom: The parent application cannot be opened by double-clicking on the file icon.
Cause: The Desktop file is corrupted. The application is corrupted or missing. The file's type code is inconsistent with the application or its bundle information is erroneous.
Solution: Reinstall the application. Rebuild the Desktop file.

Symptom: A file cannot be thrown away or the trash cannot be emptied.
Cause: The file or folder is busy, locked, or protected. There is an invisible file in the folder. The directory is corrupted.
Solution: Close and unlock the file or folder. Rebuild the Directory. Restart and try throwing it away again. Run recovery program.

Symptom: A folder cannot be renamed.
Cause: A locked disk. The Directory is corrupted.
Solution: Unlock the disk. Run a recovery program.

Symptom: A folder takes a long time to open.
Cause: Too many files in folder. The Desktop file is corrupted.
Solution: Reorganize the folder hierarchy. Rebuild the Desktop file.

Symptom: Programs bomb when launched.
Cause: Corrupted application or INIT conflict.
Solution: Reinstall the application. Turn off all INITs and re-boot.

Symptom: The icons appear and then disappear or become generic icons.
Cause: The Desktop file has become corrupted.
Solution: Rebuild the Desktop file by restarting and holding down Command and Option keys until asked if you want to rebuild the Desktop.

Symptom: A file or folder disappears.
Cause: The directory has become corrupted.
Solution: Run Disk First Aid or a recovery program.

Symptom: Files and folders appear with garbage names.
Cause: Cabling and or termination problems.
Solution: Immediately **TURN OFF** the computer and check cabling.

System Bomb

Symptom: The Bomb System Error Dialog box appears.
Cause: This can be caused by many software problems including conflicts with an INIT, too little system heap, or another application.
Solution: Attempt to restart the system. If the bomb continues, check for free system heap space, disable INITs or System Extensions, and reinstall the software. System error code descriptions are available in public domain programs or in *Inside Macintosh.*

This concludes the Instruction Guide to Hard Disk ToolKit Personal Edition and, for that matter, the entire manual.

The Instruction Guide is intended as a clear explanation of the steps required to successfully utilize every aspect and option of the various modules.

We hope you find this manual informative, and that it and HDT Personal Edition will provide you with years of valuable service. If you have comments or suggestions, be sure to let us know.

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Glossary

Access Time: The time period from issuance of a command to access a single sector to the time when the disk drive's head reaches the sector. Access time equals latency plus seek time plus command overhead.

Actuator, Head: The physical device (a type of motor) that moves the armature and thus the read/write head(s) across the surface of the platter.

Address: The ID number of a device on the SCSI bus, or of a block of data in storage.

ANSI, or the American National Standards Institute: ANSI is a private, nonprofit membership organization that performs two functions: It coordinates the United States' voluntary consensus standards system, and; it approves American National Standards. ANSI ensures that a single set of non-conflicting American National Standards are developed by ANSI-accredited *standards-developers,* and that all interests concerned have the opportunity to participate in the development process. These requirements for due process have resulted in a high level of confidence and credibility, and thus broad acceptance, for American National Standards. But it is important to remember that ANSI does not *develop* standards. Rather, it provides the means for determining the need for standards, ensures that qualified organizations develop those standards, and coordinates standards approval. If you wish to contact ANSI, write or call: ANSI, 1430 Broadway, New York, NY 10018; (212) 354-3300.

Arbitration: An optional phase required for multiple-host systems. If supported, it is a protocol by which SCSI devices gain control of the bus.

Average Seek Time: The time in milliseconds to do all possible seeks on the drive divided by the number of seeks possible.

Backup, Back-up (verb, noun)**:** To make duplicates of files on a separate medium; the duplicated data itself.

Bit: Bit is a contraction formed of 'binary' and 'digit'; all computer information is represented as a unique combination of the binary digits 0 and 1, which are also called 'ons' and 'offs.'

Blind Data Transfer: Data transfer that forgoes request/acknowledge handshakes and thus is much faster than regular data transfer.

Block: The smallest "chunk" of memory accessed or transferred by the disk drive. Usually 512 bytes in size, it can be larger in multiples of 512. The number of bytes in a block is the same as block size.

Bootstrap, or Bootstrapping: A trigger (command or signal) that allows a device to start-up without outside aid.

Buffer: A temporary storage area for data being transferred from one place in the computer system to another. When accessing a single sector, the controller may read the entire track and store it in a buffer.

Bus: A means of transferring information usually referring to a set of wires.

Byte: A group of eight bits. The basic unit of information.

Cache: Similar to buffer but more configurable. Cache can reside in RAM or on the drive's controller. It is used to store and quickly transfer recently used data.

CD ROM (Compact Disk, Read-Only Memory): Data is stored as pits on the platter surface, which are read by a laser in the CD ROM drive. The data can only be read; data cannot be erased; new data cannot be added.

Central Processing Unit, or CPU: The brains or 'central switching station' of any computer.

Controller, or Controller Board: Circuitry, usually built into a drive, that interprets signals between the host and the peripheral; it acts upon these commands, thus providing the device with 'intelligence.'

Cylinder: In multi-platter hard disk drives, tracks of equal radius on different platters form a virtual cylinder.

Data Error: Any discrepancy between recorded data and recovered data.

Defragment: To reorder the files on a platter so that all the sectors of each file are contiguous, which results in improved access times. (See Fragmentation.)

Device-independent: Operating at the systems level and not requiring specific customization to run.

Direct-Access Device: Any device that allows you directly access blocks of data randomly. (See Sequential-Access Devices.)

DMA, or Direct-Memory Access: A means of data transfer that occurs without CPU intervention.

Drive, Hard Disk: A data storage device that employs one or more rigid disks as the medium.

Drive, or Disk Drive: The physical components necessary to transfer data to and from the recording medium.

Driver, or Device Driver: The software program that translates commands between the Macintosh's operating system and the Macintosh's SCSI Manager.

Encoding: The protocol by which data is written to the platter. Encoding provides timing marks for the head and a shorthand form of the data, which increases the platter's capacity.

Error Correcting Code: Additional data stored on the drive to help correct an error before the drive exhausts its allowable number of retries.

Errors, Hard Data: Data loss through physical damage to the hardware, usually the surface of the recording medium, which may not be recoverable. Hard errors are permanent and thus are likely to be repeatable.

Errors, Soft Data: Data misreads or miswrites due to poorly written software or viruses, which may not be repeatable. Soft errors can usually be recovered through reread attempts or a recovery program.

Firmware: An often-used microprogram or instruction stored in ROM. Usually refers to the ROM-based software that controls a drive.

Flag: In a Mode Page, a flag is a bit (either on or off) that tells the drive how to respond to a situation.

Form Factor: The physical diameter of a drive's platter.

Formatting: The process of preparing a disk for use. The drive maps the disk into blocks, sectors, and tracks. Bad blocks are marked and placed on a defect list.

Fragmentation: With use over time, the sectors of a file are written in different areas across the platter's surface. This slows access time.

Gigabyte (GB): 1024 Megabytes or 1,073,741,824 bytes.

Handshake: The SCSI Request/Acknowledge handshake signifies completion of a data transfer between the target and host across the SCSI bus.

Head, or Read/Write Head: The disk drive's electromagnet, directed by the controller, that creates and reads magnetic information on the surface of the platters.

ID, SCSI: A device's unique address on the SCSI bus is referred to as its ID, or identification.

Initialization: The process of laying down directory information the operating system needs to locate files and folders. Usually destroys only directory information, not the actual data, so that recovery program can still recover files from initialized disks.

Input/Output (I/O): The communication flow between the Mac and its peripherals.

Inside Mac IV and V: Technical manuals provided by Apple. Also used to denote partitioning schemes.

Integrated Circuits, or Chips: An IC performs a host of electronic functions. One IC replaces many discrete transistors. Because it resides on a silicon chip, these ICs are referred to as 'chips.'

Intelligent: Refers to a device capable of processing commands on its own.

Interface: The go-between that provides a common basis for communication between two otherwise incompatible devices.

Interleaving: The ordering of sectors on a track so that the next sector (in the file being read or written) arrives at the read/write head just as the computer is ready to access it. (See Latency.)

KB/s: Kilobytes per second.

Kb/s: Kilobits per second.

Kilobit: One thousand bits (actually 1024).

Kilobyte: One thousand bytes (actually 1024).

Latency: The time, in milliseconds, it takes for the spinning platter to bring around the desired sector to where the read/write head can access it. Does not include head positioning time. Contributes to access time. (See Interleaving.)

Logical block: Data is grouped in standard sizes known as logical blocks. 512-, 1,024-, and 2,048-byte blocks are common.

Logical unit number (LUN): The numerical representation of the peripheral's address. A SCSI device's address can have up to seven LUNs.

Logical Unit: A physical or virtual device that is addressable as a target.

Logical: An abstract representation of something that physically exists.

Magnetic Domain: The area on a platter that contains one bit of data.

Magnetic flux: The magnetic exchange between the read/write head and the platter, which allows the head to write and read data.

MB/s: Megabytes per second. Equal to 8 Megabits per second.

Mb/s: Megabits per second. Equal to 1/8 or 0.125 Megabytes per second.

Media: Another term for the platter, but more specifically the magnetic coating that covers the platter. The surface of the platter that holds the data.

Megabit: One thousand kilobits (actually, 1024 Kb).

Megabyte: One thousand kilobytes (actually, 1024 KB).

Mirroring: Writing data to two drives simultaneously. (See RAID.)

Mount: To appear on the Desktop; that is, to show an icon on-screen.

MTBF: Mean Time Before Failure. A vendor-supplied rating that indicates the longevity of a drive.

MTTR: Mean Time To Repair. Amount of time it takes a trained repairman to repair a device.

Nibble: A half-byte, or four bits, of data.

Noise: Reflected or distorted signals or voltages on the bus.

Nonproprietary: Refers to a device that implements shared or open technology and can communicate with other devices using the same technology. (See Proprietary.)

Notch: Each section or a range of the logical unit with a different number of blocks per cylinder. Also known as a zone.

Optical Drive: A method of storing data by encoding information data on a disk with a laser.

Overhead: The incidental command processing time that is necessary to complete a task.

Pages: Categories of command parameters that determine how a drive operates.

Parallel Data Transfer: Data bits travel simultaneously along eight parallel wires in the cable. (Also see Serial Data Transfer.)

Parity: A method of checking the accuracy of binary numbers. SCSI uses odd parity, which means the sum of all ones in a number plus its parity bit will always be even.

Parking, Head: When a drive is turned off, the read/write head is moved to a specified location on the disk that is not used for data storage - the landing or parking zone. Most modern drives have an autopark function.

Partition Map: A map detailing the layout of the medium, which the operating system and drivers use to find partition locations.

Partition: A portion of a storage area allocated to a particular use or user.

Peripheral: A device that is attached to the computer, either directly or via the bus.

Physical Path: The channel taken by SCSI communications.

Platter: The rigid disk that is used for storing memory on hard disk drives.

Prefetch: Similar to buffering, except prefetching can read ahead to the next track. These larger reads get more data ready for the CPU's next request, thus speeding up access time.

Proprietary: Vendor-unique technology or devices that are incompatible with other products in the industry.

RAID, or Redundant Arrays of Inexpensive Drives: A variety of back-up methods used to store data on multiple drives.

RAM, or Random Access Memory: Temporary memory usually found on single in-line memory modules (SIMMs) on the motherboard of the computer. RAM is lost when power is turned off.

ROM, or Read-Only Memory: Permanently stored data in the computer memory. Also refers to storage media that may only be read (not erased or written to.)

SCSI Manager: The SCSI Manager is part of the Macintosh Operating System that provides the interface between a program such as a driver or formatter and the actual hardware SCSI port.

SCSI: Small Computer Systems Interface. A standard interface via which computers and their peripherals communicate with each other.

Sector Skew: The sector offset from one platter to another in a hard drive.

Sectors, Alternate: Sectors set aside to replace bad blocks. Also called 'spares.'

Sectors: Sectors are the smallest subdivisions of tracks, and usually contain exactly 512 bytes of data.

Seek Time: The time it takes the read/write head to move back and forth in search of the appropriate track; does not include latency or command overhead. (See Access Time.)

Sense Data: Sense data is data returned by the Request Sense command. This data is used to diagnose the error that occurred on the proceeding command.

Sense Key: Error codes contained in sense data that indicate a particular classification of error.

Sense, Request: This command retrieves sense data.

Sequential Access Device: Any device, such as those using tape as a storage medium, that must pass through unwanted blocks of data to access the targeted block, and can only access one block at a time.

Serial Data Transfer: Data bits travel single-file along one wire in the cable.

Servo: See Voice Coil Actuator.

Shock Rating: A rating used to judge the ruggedness of a drive.

Spindle: The shaft that platters are mounted on.

Stepper Motor: A type of actuator that moves the head in discrete steps.

Tape Drive: A type of storage, similar to an audio tape recorder, that stores data on a magnetic tape. Tape drives are usually used for data back-up.

Time-out: SCSI devices operate under a definable time period beyond which they will 'time-out' and release the bus.

Tracks: Invisible magnetic "grooves," in the form of concentric circles that store data on a platter. Each track is a single line of magnetic domains.

Trap: A command trigger that causes automatic transfer of control to a trap-handler program.

Variable Zone Recording: A method of encoding that allows the outer tracks of the platter to hold more sectors than the inner tracks. Similar to notch.

Voice Coil: A type of actuator that moves the read/write head in increments of infinitely-controllable size. Uses servo information for positioning.

Volume: Also known as a partition. Represented by an icon on the Desktop and used to store files and folders of information.

FWB incorporated