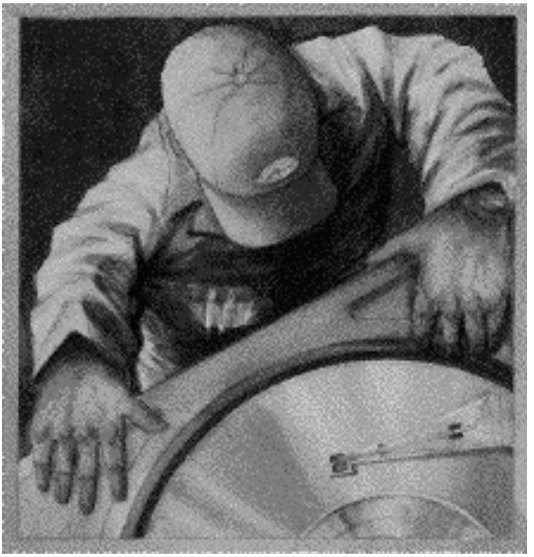
Software Architects Inc.

Disk Drive TuneUp™



Get the speed you want from the drive you have![sm]

User's Guide

Disk Drive TuneUp™ User’s Guide

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Please read the License Agreement in the Appendix carefully prior to using Disk Drive TuneUp. You will see the same agreement during the installation process. If you do not accept the terms of the agreement, you may cancel before Disk Drive TuneUp is installed on your computer’s disk drive. By installing the software, you acknowledge that you have read the License Agreement, that you understand it, and that you agree to be bound by its terms and conditions. If you do not agree to the terms presented, please return the package promptly to the place of purchase for a refund.

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INTRODUCTION

Congratulations on your purchase of Disk Drive TuneUp™! With Disk Drive TuneUp you will be able to optimize the performance of your hard drives and removable disk drives. Just as a car performs best when it is tuned up, so will your disks. The overall performance of your system will benefit too, since disk performance is critical to the speed of the entire system.

New features in Disk Drive TuneUp 2.0

Bootable CD

- You can now boot from the CD that Disk Drive TuneUp is shipped on to install the software and to format your drive. The CD can also be used to boot from in the event of a system crash.

Mac OS Extended

- Media can now be formatted with the **Mac OS Extended Format (HFS+)** to take advantage of the space savings and increased performance offered by this new file-system. Of course **Mac OS standard** (HFS) formatting is fully supported for backwards compatibility.

DOS Partitions

- In addition to Mac OS formats, Disk Drive TuneUp 2.0 lets users format media as DOS so you can use the media on DOS and Windows systems. After formatting the media as DOS it can be mounted on your desktop using Mac OS. If you want maximum performance accessing DOS disks you can purchase SAI's DOS Mounter 95 or other products from SAI.

Boot Partitions

- Any partition can be selected as the **Boot Partition** allowing different system software to be put on different partitions and choosing which partition to boot from.

Driver Load Option

- The **Disk Drive TuneUp init** can now be configured to always load, load if a drive is present, or not load for each device ID - giving custom control for individual needs.

RAM Cache HD's

- The caching capability has been expanded to include RAM caching for Hard Disk Drives.

Benefits of Using Disk Drive TuneUp

Performance

- Use **Caching** to enhance performance, by tuning your system for your particular mix of applications, computer and disk drives. Power Macintosh users will also benefit from the increased performance that comes from Disk Drive TuneUp's use of **native drivers.** Mac OS 8.1 users can take advantage of the new **Mac OS Extended** format.

Organization

- Create multiple **Partitions** on a disk. Each partition then appears on the desktop as a separate disk drive. Use partitions to organize your files or to reserve space for a specific application. You can even specify that an entire partition is to be **Locked,** which prevents any of its data or files from being modified or deleted.

Prevention

- Disk Drive TuneUp can **Test** disk drives to find and reassign faulty blocks. This saves you from finding them the hard way — through lost data, corrupted files or system crashes.

Media Integrity

- Use **Formatting** to test and reset the base-level infrastructure of your disks.

How to Use This Guide

This guide describes how to install and use Disk Drive TuneUp. Instructions and procedures detailed in the following chapters assume you have a working knowledge of Macintosh computers and applications. It is strongly recommended that you read this guide regardless of your level of Macintosh experience.

The *Disk Drive TuneUp User's Guide* is structured sequentially into chapters and a series of appendices. Following is a content summary of the major sections in this guide.

Chapter 1 • Getting Started

- Using the Bootable CD
- Installing Disk Drive TuneUp on your Macintosh
- Using Disk Drive TuneUp

Chapter 2 • Partitions

- The benefits of using partitions
- Creating or modifying partitions
- Choosing what partitions to use.

Chapter 3 • Caching

- Performance enhancement with caching
- Choosing cache parameters
- Cache setup and control

Chapter 4 • Formatting and Testing

- Formatting disks and drives
- Testing and verifying media

Chapter 5 • Driver Load Options

- Controlling the Disk Drive TuneUp Init

Appendices

If you encounter difficulty with any operation, you may find answers in the appendices.

- More About Caching
- Problem Solving
- Termination
- Working with Your Startup Drive
- Glossary
- License Agreement for Disk Drive TuneUp: **Please read this prior to using Disk Drive TuneUp.**

Terms and Conventions

This guide uses a few special terms and conventions.

- Items in **bold** type represent actual menu commands or dialog box items.

- The **Note:** icon draws your attention to important installation and operation information that might otherwise be missed.

- The **WARNING!** icon indicates that the step you are about to take will result in the irreversible loss of data or other serious consequences. Read all warning information carefully before proceeding.
- "Disk" and "media" are used interchangeably, except where noted.

Package Contents

The Disk Drive TuneUp package includes a sealed envelope, which contains the following.

- Disk Drive TuneUp CD
- Disk Drive TuneUp User's Guide
- Warranty Registration Card

Disk Drive TuneUp CD

The CD contains the Disk Drive TuneUp application and the software installer which installs the Disk Drive TuneUp application, the Software License Agreement and a SimpleText "Readme" file onto the disk you choose. **Please read the Agreement before using this product.**

User's Guide

This User's Guide is your documentation for Disk Drive TuneUp. You may also want to refer to the Online Help facility in Disk Drive TuneUp. To access Online Help, press ⌘-Shift-?.

Warranty Registration Card

The warranty registration card describes the warranty available for the Disk Drive TuneUp software. You must register to receive product support from Software Architects, Inc., so take a minute to fill out the card and return it to us.

As a registered user of Disk Drive TuneUp, you will be eligible to take advantage of special upgrade offers and discounted pricing on a variety of SAI's complete line of software solutions. To ensure that you receive notice of these special offers, please complete your registration card and return it to Software Architects, Inc. today.

System Requirements

Macintosh

- Any Macintosh with a 68030 or later processor, including Power Macintosh
- A minimum of 8 Mbytes of RAM
- System 7.0 or later; Disk Drive TuneUp is Mac OS 8 compliant
- System 8.1 or later is required to use the Mac OS Extended (HFS+) format.
- A CD drive to install the software. (If you do not have a CD drive and require a floppy disk to install this program, contact Software Architects.)

Disk Drives

Disk Drive TuneUp supports most third party storage systems including fixed drives, removable hard drives, rewritable optical, and removable disk drives.

- Supports over 300 of the most commonly-used types of drives. Disk Drive TuneUp also provides a Universal Driver, which supports almost every other removable or optical disk system.
- Supports removable disk systems using SyQuest, Bernoulli, Zip and Jaz drives.
- Supports rewritable optical disk systems (magneto-optical, phase-change and PD) including, but not limited to, Sony, Ricoh, Hewlett-Packard, Maxoptix, Olympus, Sharp, Matsushita, Panasonic, and Pioneer brand drives.

Unless otherwise noted, the application will operate consistently with all storage devices.

SCSI Manager 4.3

Disk Drive TuneUp lets you take full advantage of the increased performance of SCSI Manager 4.3 by automatically supporting asynchronous data transfer. Disk Drive TuneUp also supports older Macintosh models that don't use SCSI Manager 4.3.

License Agreement - *Important!*

Please read the software license agreement in the Appendix or on the disk. By accepting this software package, you are agreeing to the terms of the software license and disclaimer of warranty. If you do not agree to the terms presented please return the package promptly to the place of purchase for a refund.

CHAPTER ONE: GETTING STARTED

Preparing and Protecting Disks

For removable media, your system may have more than one driver. However, you should use only one device driver for removable media. Furthermore, a number of available Macintosh drivers are not written to Apple's specifications. Therefore, remove any existing drivers: the drivers, also called device init's, are stored in the Extensions folder in the System Folder.

Using the Disk Drive TuneUp CD-ROM

Unless you need to format or partition the startup drive it is easiest to startup your computer and then insert the Disk Drive TuneUp CD and install the software onto your startup drive. (See the next section "**Installing Disk Drive TuneUp**"). If, however, you do need to boot from the CD there are three different ways.

Hold down the "C" key at boot time

You can use this method with most Power Macintosh and Power Macintosh clone computers. Simply insert the Disk Drive TuneUp CD and hold down the "C" key when you boot up or restart your computer.

Select the CD in the Startup Disk control panel

If holding the "C" key down does not work and your computer boots from another drive, then you can select the CD drive as the startup drive. Make sure the Disk Drive TuneUp CD is mounted on the desktop then open the Startup Disk control panel found in the "Control Panels" folder under the "Apple Menu". Select the Disk Drive TuneUp CD in the "Startup Disk" window by clicking on it. Close the "Startup Disk" window and restart the computer.

Temporarily disable the internal drive

If the other methods fail you can try holding down the Command-Option-Shift-Delete keys when restarting. This temporarily disables booting from the internal drive and allows other drives to boot. The Macintosh will start checking each drive for a system starting with the highest SCSI ID and working its way down.

Installing Disk Drive TuneUp

To install Disk Drive TuneUp, insert the Disk Drive TuneUp CD in your CD drive.

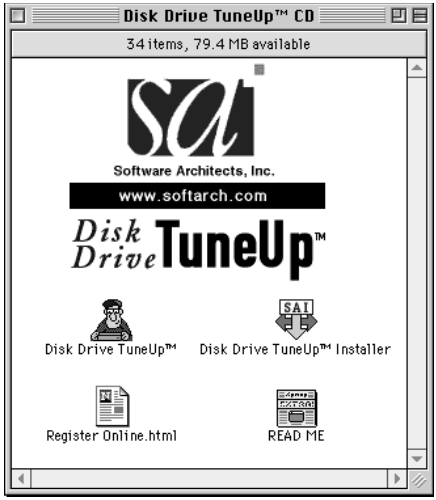


Figure 1.1: The CD Window.

Double-click the Disk Drive TuneUp Installer icon. An introduction screen will appear. Press **Continue** and a window appears containing the Disk Drive TuneUp License Agreement. **Please read the License Agreement before installing and using Disk Drive TuneUp. If you do not agree to the terms and conditions, press Decline.** Then eject the disk, and return the Disk Drive TuneUp package to the place of purchase for a refund.

If you agree to the terms of the License Agreement, press **Accept**. The Installer window then appears.

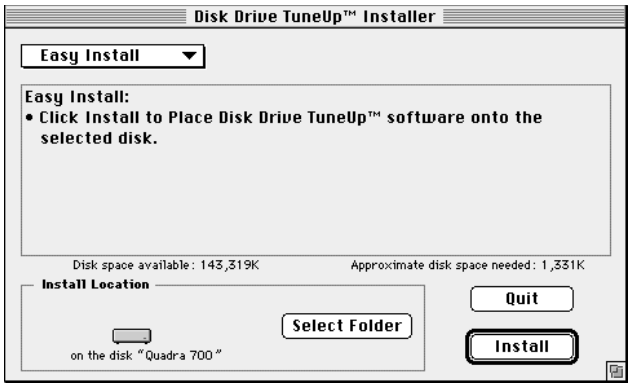


Figure 1.2: The Installer window.

The default installation method is **Easy Install.** This is the recommended choice, and will ensure proper and complete installation of Disk Drive TuneUp.

By default, all Disk Drive TuneUp files will be installed in the current directory. If you want to select another disk for the Disk Drive TuneUp installation, select **Switch Disks**. If you want to select a specific folder for the installation, select **Select Folder...** from the pop-up menu to the right of the disk icon in the window.

Users with advanced setup requirements may want to select individual files for installation: in that case, select **Custom Install** from the pull-down menu in the upper-left area of the window.

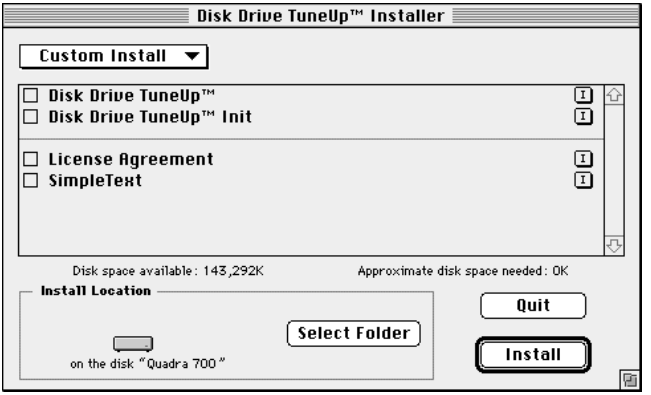


Figure 1.3: Custom Install.

Then — for either **Easy Install** or **Custom Install —** press **Install.**

*Figure 1.4: To close all open applications, choose **Continue**.*

After you press **Continue**, the Installer will close all open applications for you and begin the installation. If you want to close any open applications yourself, press **Cancel** to halt the installation process.

During installation, a progress indicator is posted, indicating which files are being installed:

Figure 1.5: The installation progress indicator.

When all the files have been installed, a window appears with a notification of successful installation.

Figure 1.6: Installation complete.

Disk Drive TuneUp is now installed. Because the installation process places new drivers in your system's Extensions folder, it is recommended that you now restart your Macintosh. Press **Restart** to restart or **Quit** to return to the Macintosh desktop.

The Disk Drive TuneUp Window

The installation process creates a Disk Drive TuneUp folder with three items in it.

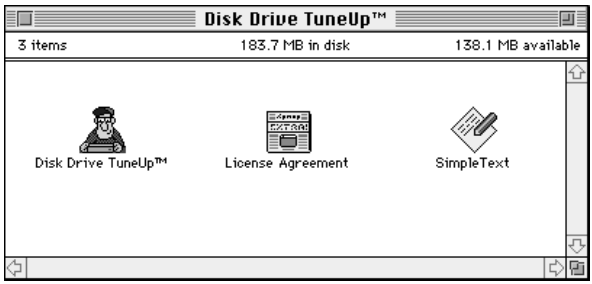


Figure 1.7: The Disk Drive TuneUp folder.

Open Disk Drive TuneUp by double-clicking on the Disk Drive TuneUp application icon.

Figure 1.8: The Disk Drive TuneUp icon.

The main Disk Drive TuneUp window then appears.

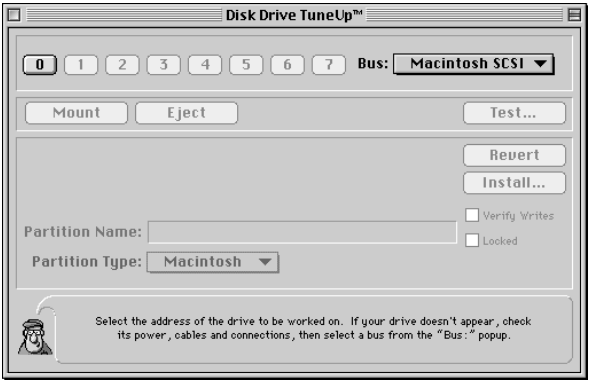


Figure 1.9: The main Disk Drive TuneUp window.

As you move the cursor over different areas of the Disk Drive TuneUp window, the Cursor-Sensitive Help in the bottom panel of the window changes to provide descriptive information, functional instructions and helpful suggestions associated with the area containing the cursor. It is especially important to read each help message carefully the first time you install partitions, format or test.

Note: You cannot use Disk Drive TuneUp to format or create partitions on high-density 3.5-inch floppy disks. Therefore, in this section "disk" does not refer to floppies.

Note: For Disk Drive TuneUp to work with Iomega drives you must remove previous Iomega drivers from the Extensions folder.

Selecting a Drive

If you have multiple drives, you must first select a drive to work on. When you select a drive, the content of the window changes to reflect the state of the drive.

The Drive ID Number

At the top of the window is a row of buttons representing the drive addresses and a pop-up list representing the buses in your computer.

Darkened text and a raised button appearance indicates the ID number of a drive you can select. Dimmed text next to a button indicates an ID number that has no device connected or a device that Disk Drive TuneUp cannot work with. If a device is connected you will always be able to see the device information by positioning the mouse over the correct ID number and the device information will show up in the Cursor-Sensitive Help.

The type and configuration of your Macintosh determine what items will appear in the **Bus** list. All Macintosh computers contain an internal SCSI bus with seven available drive ID numbers (also called "SCSI addresses"). Some Macintosh computers also contain an external SCSI bus, also with seven available drive ID numbers. In the case of Macintosh computers equipped with third-party SCSI adapters, the list would also contain the name of the third-party host adapter.

To determine the drive ID number, look on the back of the drive or consult your hardware documentation. Make sure each drive connected to your Macintosh has a unique drive ID number and that it is terminated correctly. For more information on SCSI termination, see "Termination" in the Appendix.

Note: If you cannot select any button, verify that your drives are turned on, properly cabled and terminated correctly and that the correct bus is selected.

Note: Third-party SCSI Host adapters must be SCSI 4.3 compliant to work with Disk Drive TuneUp. Both standard SCSI and SCSI wide adapters are supported.

The Logical Unit Number

Some devices allow more than one drive or disk to be represented by the same SCSI ID. In this case, each drive or disk has a unique Logical Unit Number (LUN). Disk Drive TuneUp provides a pop-up menu for selecting the LUN.

When you click a SCSI ID that contains LUNs, a pop-up menu appears. The pop-up menu contains numbers 0 through 7. Available LUNs appear in bold.

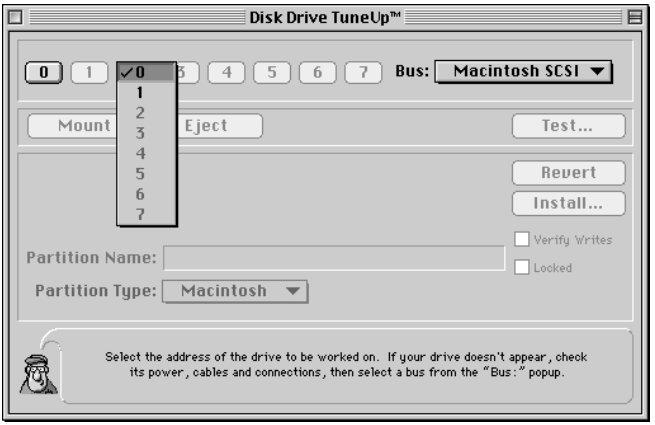


Figure 1.10: Disk Drive TuneUp window with LUN pop-up menu for SCSI ID number 2.

Note: Only devices that support LUNs will have a pop-up menu available.

Mounting and Unmounting Drives

You can remove a drive from the desktop by dragging it to the trash. Another way of doing the same thing is to select the drive and then use the **Unmount** command in Disk Drive TuneUp. In either case, the drive disappears from the desktop and is not available for use.

To restore a drive to the desktop, select the drive in Disk Drive TuneUp and press **Mount.**

CHAPTER TWO: PARTITIONS

Benefits and Uses of Partitioning

With Disk Drive TuneUp, you can divide your disk into multiple **Mac OS Standard** and **Mac OS Extended** partitions or one **DOS** partition. Each partition appears individually on the desktop and can be used just as if it were a separate disk drive. For instance, you might have only one disk drive on your Macintosh — but with partitioning, it would appear as if you had several drives.

Use partitions to organize your files, to dedicate space for a specific application or to set space aside for later use. By selecting the partition type you can choose the format that best meets your needs of performance and compatibility. To protect sensitive data from being changed or deleted, you can lock a partition. Also, choosing the right type and size of your partitions can improve the overall performance of your system. At the end of this chapter you can read about **Choosing the Type and Size of Partitions.**

For example, a single disk drive might be divided into three partitions. On the desktop, it would look as if there were three separate disk drives (of course, the total amount of storage remains the same; partitioning does not increase the size of your drive). When viewed in the Disk Drive TuneUp window, partitions are shown on a partition bar; see **Reading the Partition Status Bar.**

Note: If you are working with a new or unformatted disk, Disk Drive TuneUp will indicate that you must format the disk before you can install partitions.

WARNING! Creating or changing partitions can result in the destruction of some or all of the data on the disk. Make sure you back up your data before installing or changing partitions.

Reading the Partition Status Bar

Use the partition status bar in the Disk Drive TuneUp window to set up or modify partitions. Initially, the status bar shows the current status of partitions on the disk.

Figure 2.1: The Partition Status bar.

Select a specific partition by clicking on a section of the bar or on a size-indicator flag. An arrow then appears below the bar and the name appears in the **Partition Name** box.

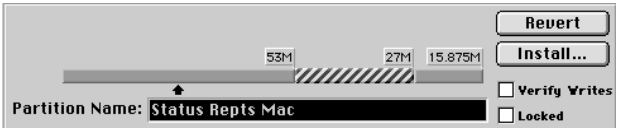


Figure 2.2: Status bar with first partition selected.

A dark gray section of the status bar indicates an installed and unchanged partition. A yellow-striped section on the status bar indicates a partition that is new or is being changed. At the right end of each section of the partition status bar is a size-indicator flag. The flag shows the size in Mbytes.

Note: If you are working with unformatted media, or media with partitions that are not recognized, Disk Drive TuneUp will choose an initial setting of a single Macintosh partition set to the maximum possible size.

Setting Partition Sizes

Now you are ready to set the partition size, by dragging the size-indicator flag. You can also set the size by clicking inside the flag and editing the number directly. Note that changing the size makes one partition bigger while making another smaller, since the total size of the disk can not be changed.

Figure 2.3: Reducing the size of the first partition increases the size of the second partition by the same amount. Yellow striped areas indicate that data will be destroyed when the new partitions are installed.

A partition can be split into two smaller partitions. To split a partition, hold down the Option key while clicking on a partition size-indicator flag. A new partition of 0 Mbytes appears. Edit the partition size by dragging the flag or by highlighting and modifying the number inside the partition size flag. To add a new partition, drag the size indicator flag at the right-most edge of the bar.

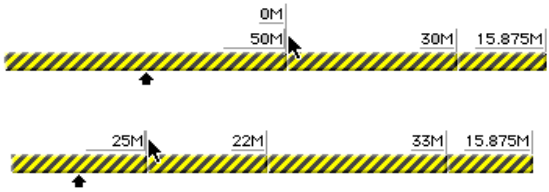


Figure 2.4: Splitting a partition.

Naming Partitions

You can name a partition by clicking on the **Partition Name** text entry box and typing in it.

You can also change the name (but not the partition size) from the Macintosh desktop. Just click on the name and type a new one, just as you would for any file or folder.

Note: Even though Macintosh allows 31 characters for file and folder names, you can use no more than 27 characters for partition names.

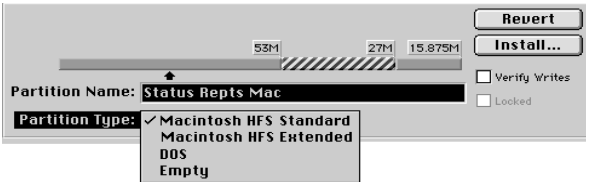
Using the Partition Type Menu

Using Disk Drive TuneUp, you can select from the three available partitions types; **Mac OS Standard**, **Mac OS Extended**, and **DOS**. The **Mac OS Standard** format (also known as HFS) is compatible with all Macintosh computers and Macintosh operating systems while the **Mac OS Extended** (HFS+) format has just been released as part of the new Macintosh operating system Mac OS 8.1. The most noteworthy benefit of the **Mac OS Extended** format is that it lets you reclaim lost space by increasing the number of file allocation blocks available.

The specific type of **DOS** format that is used by Disk Drive TuneUp is the DOS Super Floppy format. This is the same format used by Windows 95.

To change the partition type, select a type from the **Partition Type** pop-up menu. When you change the partition type, the partition bar changes to yellow stripes, indicating that data will be lost when you install.

WARNING! The **Mac OS Extended** Partition Type is not backwards compatible with Mac OS 8.0 or earlier. If you choose the **Mac OS Extended** type you will not be able to read any files unless you are running Mac OS 8.1 or later.



Partitions • Partition type pop-up menu.

Multiple **Mac OS Standard** and **Mac OS Extended** partition types can be created on one piece of media. In contrast Disk Drive TuneUp only supports one **DOS** partition by itself on one piece of media. This is because the DOS partition type used is the "DOS Super Floppy". To maximize performance accessing DOS partitions, including having the ability to mix multiple DOS and Mac OS partitions on the same disk, please contact Software Architects sales support for information on our other products.

For more information on determining the partition types and partition sizes to use see **Choosing the Type and Size of Partitions** at the end of this chapter.

Locking Partitions

You can lock a partition. This is similar to setting the "write-protect" tab on a floppy disk, and allows read-only access to the files on a partition. If you have files that you want to protect from deletion or modification, you can do so by locking the partition they are in.

To lock a partition, just click the **Locked** check box. Once a partition is locked, data cannot be changed until the partition is unlocked by running Disk Drive TuneUp and clicking the **Locked** check box to uncheck it.

Figure 2.5: The selected partition is unlocked.

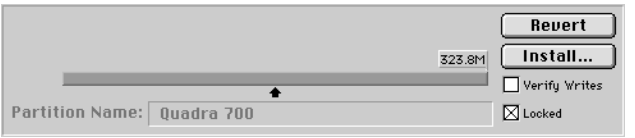


Figure 2.6: The selected partition is locked.

Note: Partitions must be installed before they can be locked.

WARNING! Locking a partition will **not** prevent data from being destroyed during a Destructive Test of the partition. See the "Testing Partitions" section, later in this chapter, for more information on data loss during destructive testing.

Verifying Writes to a Partition

You can specify that all data should be verified after it is written to a partition. This provides a high level of assurance that data will not be lost when it is sent to the drive. This can be useful if your drive has been generating errors, or you are working with critical data. However, overall performance will be lessened somewhat.

Use the Verify Writes check box to select whether all data is verified when it is written to the partition. After clicking on the check box you will need to press install to save your changes.

Creating Bootable Partitions

Your Macintosh can use a partition as a startup disk, if the partition is "bootable." You can create a bootable or startup drive by creating a partition for the placement of system startup files. Disk Drive TuneUp 2.0 and later allows any partition of a drive to be the startup partition. To select which partition to boot from use the **Startup Disk Control Panel** For more information on preparing and selecting your startup disk, see the Appendix on "Working with Your Startup Drive," or your Macintosh documentation.

Installing Partitions

The partitions you specify are not actually created until you **Install** them. This sets up the partitions and builds the high-level structure (or 'logical format') of each partition. The logical structure contains the directory that the Macintosh will use for recording the location of each file.

Disk Drive TuneUp also puts a driver on each disk: a driver is the software that the Macintosh uses for conducting reads, writes and all other disk operations. If you have not changed the type or size of any partition, Install simply updates the driver. Disk Drive TuneUp's drivers are highly efficient and are Accelerated for Power Macintosh, so updating the driver may improve the reliability and performance of your system.

If you have changed the size of any partition, then installing will destroy all the data in the changed partition(s). Before data on your disk is destroyed, a confirmation dialog box appears, giving you the opportunity to cancel the installation. Press the **Revert** button at any time during partition setup to restore the original partitioning information.

When you have set the partitions you want, press the **Install** button in the dialog box. A dialog box then appears. Press **Proceed** to install the partitioning or **Cancel** to terminate the process and return to the Disk Drive TuneUp window.

Figure 2.7: Changing the size of a partition will destroy all the data in the partition.

WARNING! Changing the size of a partition destroys all the data in the partition. Make sure you have all your data backed up.

Note: If you are not changing the size of a partition, clicking **Install** will update the driver without affecting the data.

Note: You cannot create or change partitions on a disk that contains open files. Before changing the partition, close all files, quit all applications and turn off file sharing using the **Sharing setup** Control Panel under the Apple menu.

WARNING! Once you begin the installation process, you will not be able to quit. If you wish to abandon installation you must press the **Cancel** button before the process begins.

During Partition Installation

As Disk Drive TuneUp installs a partition, a dialog box indicating progress is posted. The dialog box contains the name of the partition.

Installation time varies depending on drive size and partitioning information. When the installation is finished, the main Disk Drive TuneUp window reappears with the partition status bar updated to indicate the newly installed partition information.

Choosing the Type and Size of Partitions

The best way to partition any particular piece of media depends on what computers you will be using, how many files you will be storing, and your own personal preference. Changing partition types and sizes does cause all the files to be erased, so it is important to set each for the maximum size you will need. If you want to change a partition type or size that has files you do not want to lose, you will have to back up the files.

Following are two tables giving tips on what partitions to use. The first table recommends partitioning methods based on how you will use them. The second table describes each partition type and gives advantages and disadvantages.

Partitioning	When To Use
One Mac OS Extended	When you are planning to use the media with Mac OS 8.1 only and you do not need a separate partition for the added control. This is probably the best option for personal use by one user. You can always use folders to organize files.
Multiple Mac OS Extended	When using Mac OS 8.1 only and you need the control given by multiple partitions. For instance you can set a partition as locked, or put operating systems on different partitions and select which one to boot from. Also it is easier to change a partition if you have more than one because you have a place to put files while changing one partition.
One Mac OS Standard	When needing compatibility with Mac OS 8.0 or lower and you will not be creating lots of files compared to the size of the media. (See the partition descriptions for more info on what is “lots”.)
Multiple Mac OS Standard	When needing compatibility with Mac OS 8.0 or lower and you will be creating lots of files, or need multiple partitions for more control. If you have a larger drive (over 1 GB) the more likely it is a partition will be useful. Also older systems have maximum partition sizes that you may need to use. (See the partition descriptions.)

Mixed Mac OS types	If you will mainly be using the media with Mac OS 8.1 but will occasionally need to read files with older operating systems, then it may be useful to create one **Mac OS Standard** partition to put files on. The **Mac OS Standard** partition (only) will work on the older systems.
One DOS partition	When you need to be able to use the media with a computer running DOS or Windows this partition type will allow you to read the files on both computers. Disk Drive TuneUp does not support more than one DOS partition. If you need multiple **DOS** partitions or mixed DOS and Mac, please contact Software Architects for other products. Contact info is on page 2.

Partition Type	Description
Mac OS Standard	Otherwise known as HFS. This is the file system that Macintosh computers have used since System 6. The advantage of using the **Mac OS Standard** format is backwards compatibility with Mac OS 8.0 and earlier Macintosh operating systems. The most noticeable limitation is the limited number of "file allocation blocks". Because of this limit the media must be divided up into a limited number of "blocks". When a single one byte file is created it fills the whole block. This means that on a 1 Gbyte partition, a 1 byte file will take up 16 KBytes of space. Listed are the theoretical limits of **Mac OS Standard** and some other stats. Maximum file size - 2 Gbytes. Maximum number of files - 65 Thousand Smallest block size on a 256 MB partition- 4 Kb Smallest block size on a 2 Gbyte partition- 32 Kb
Mac OS Extended	This is Apples new file system also known as HFS+. It became available with Mac OS 8.1. If you use a **Mac OS Extended** partition with Mac OS 8.0 or earlier, you will only see a locked partition with one file on it that states you are using media that only works with Mac OS 8.1 or greater. If you will only be using Mac OS 8.1, then you can take advantage of the extended features of this file system. Maximum file size - 16 Million Terabytes. Maximum number of files - 2 Billion Smallest block size on a 256 MB partition - 512 bytes Standard block size on partitions >1 GB - 4 Kb For complete details refer to the information provided by Apple that comes with Mac OS 8.1

DOS	The **DOS** partition type used is called the DOS Super Floppy format and is compatible with computers running DOS, Windows 3.x and 95, and Windows NT.

Besides the partition types, you need to also consider other size limitations with Macintosh computers. The version of system software, and the kind of Macintosh you will use will limit the maximum size for a partition. For software prior to System 7.5, the limit is 2 Gbytes (1 Gbyte = 1024 Mbtyes). For System 7.5 through Mac OS 8.0, the limit is 4 Gbytes on most Macintosh computers. For PCI PowerMac computers with System 7.5 through Mac OS 8.0, the limit is 2 Tbytes (1 Tbyte = 1024 Gbytes).

CHAPTER THREE: CACHING

Performance Enhancement with Caching

Caching with Disk Drive TuneUp is a powerful method for enhancing the performance of your disks. When you use caching, the disk file or data you access is copied into a special area — the cache — at the same time as it is read into your software application. If you later need the same data, it is read directly from the cache instead of from the disk. Since it is faster to get data from the cache, this can significantly enhance performance.

Types of Cache

The cache uses Macintosh system memory, also known as random access memory (RAM). Fetching data from RAM can be thousands of times faster than fetching it from disk. But when RAM is allocated to the cache it is not available for any other use, so RAM cache is generally small. This means that data is continually being pushed out of the RAM cache to make room for the next data that has been fetched from disk.

As the data is pushed out of RAM cache, it can be stored in a secondary area called disk cache. This cache is not as fast as RAM cache, but may still be quite useful — especially if you have a removable drive. In this case, you probably have one drive that is much faster than the other. It then makes sense to use part of the faster disk as a cache for files on the slower disk.

A Cache Example

As an example, suppose you are using your word processor. You want to look at a file with a business letter in it, and your Macintosh reads it from the disk. On a typical disk, this may take 20 mS (one mS = one millisecond, or a thousandth of a second). You have created a RAM cache, so the file is also read into the cache at the same time as it is read into your word processor.

You find what you need, close the file and go on to another task. Then you remember something else you want to see in the file. You open it again. Since a copy of the file is still in the RAM cache, the system reads the cache copy instead of reading it from the disk. Reading from RAM cache is much faster and this time the system reads the file in less than 1 mS.

The total time savings then would be 20 mS. This is not much time as far as a human being is concerned, but it's a lot of time for a computer — long enough to execute many thousands of instructions. If this happens often enough, on enough different file operations, the result can be a very noticeable increase in overall performance of your system.

On the other hand, not every disk operation will lead to a cache hit (that is, to a successful use of the cache). The desired file may not be there because other files were read in and it was pushed out to make room. It may not have yet been read in to the cache in the first place. In those cases the cache is no help. In other cases a cache can actually slow a system down, because the resources used for the cache — especially in the case of RAM cache — are not available for other uses.

In summary, caching can enhance the overall performance of your Macintosh. In some circumstances it can have the opposite effect, and slow your system down. Read the following sections to learn when to use caching and how to determine the best settings.

When to Use Caching

The Application Mix

The way you use your files, and the type of applications you use, can also help determine whether to use caching. If you tend to work for a long time with a given file, caching may be a good idea — since any data you need from the file has a good chance of being cached.

The Disk Drive Mix

Disk caching is often useful if you use disks of different speeds. This is most often the case if you have a removable disk drive, since they may be slower than the internal drives used in most Macintoshes. In such a case, you may want to set aside some cache space on the faster disk.

When Not To Use Caching

There are some cases in which caching could actually slow the performance of your system.

- If you do not have enough RAM for your applications, creating a RAM cache will make the problem worse.

- Creating a very small cache is generally not useful. When the cache is small, data is always being pushed out to make room for incoming data. The result is that there are fewer cache hits.
- Some removable drives are actually faster than some internal Macintosh disks. In such a case, creating a cache on the internal disk would actually slow your system down.

Choosing the Cache Settings

Every system is different, so there are no 'right' settings. The best way to choose the settings is to make some initial estimates and then try them. After a while, you may want to make some changes; experimentation will help you find the best settings for your system.

Evaluating Your Disk Configuration

The most important factor — if you have multiple disk drives — is to determine whether they have different speeds. If one drive is much faster, use some space on it to create a cache.

Method 1: Manufacturer's Specifications

The most accurate way to find the speed of your disks is to determine the model and manufacturer and read the disk specs. The most significant spec is the seek time for each drive. If the seek times of the drives differ by more than 25%, caching is a good idea.

Method 2: Timing Test

You can also conduct a timing test. This is not as accurate as reading the manufacturer's specs for the disks, but may be easier to do. First, find a large file (say, one Mbyte or more) to use as a test file. Put a copy on your Macintosh's internal disk drive, and a copy on each other drive.

Find the copy of the test file on the internal drive. Copy the file to another location on the internal drive (drag and drop the file from one folder on the internal drive to another folder on the internal drive). Using a watch or a stopwatch, see how many seconds this takes.

Find the copy of the test file on the external drive. Copy the file to another location on the external drive. See how many seconds this takes.

If the difference in times is more than 25%, the faster drive is a good candidate for creating a cache.

Evaluating Your Application Mix

There are generally two broad categories of applications for which caching makes sense.

- **Text and data processing.** In this category, an individual file (or perhaps several files) is used extensively. While it is open, many changes are made to the file as elements are added, deleted or changed. Word processors, databases and spreadsheets are common applications in this category.
- **Image processing.** In this category also, an individual file is the focus of work for an extended period. Graphics design, photo processing and video editing are the most common applications in this category.

There is a third broad category, in which caching is less likely to be beneficial. This is the category of applications in which many files are accessed, each for a short time. File copying, media replication, Web servers and email servers are good examples.

Cache Setup and Control

To use caching, choose the **Cache Setup…** command from Disk Drive TuneUp's **Configure** menu. The setup window will appear.

Note: none of the cache settings will take effect until you restart your Macintosh.

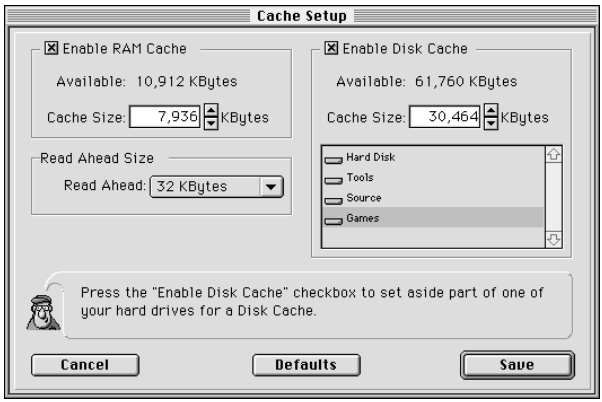


Figure 3.1: The Cache Setup window.

RAM Cache Controls

The RAM cache sets aside a portion of system memory as cache. This form of cache is exceptionally fast. In general, you will want to allocate as much RAM to this cache as you can spare without affecting the memory requirements of your other applications. The bigger the RAM cache, the more cache hits you will have.

To enable the RAM caching function, click on the box located at the far left of the RAM cache window. To change the size of the RAM cache, click on the Cache Size arrow buttons. For more information, see "More About Caching" in the Appendix.

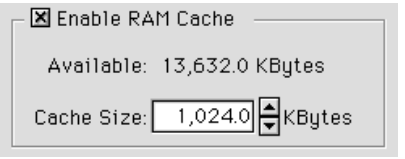


Figure 3.2: The RAM cache area of the Caching Setup window.

Note: The Macintosh system allows a maximum of 40% of its total Macintosh system memory to be used for caching.

Read-Ahead Buffer Controls

When you open a file, or go from one part of the file to another, the system fetches data from disk. With the 'read-ahead' feature, the system can anticipates future data requests by reading ahead in the file — that is, by fetching more data than is actually requested. Then, if the additional data is needed later, it can be taken from the cache instead of from the disk.

Set the Read-Ahead Buffer size from the pull-down list next to the Read-Ahead Buffer box.

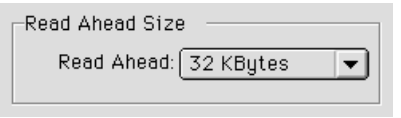


Figure 3.3: Control the size of the Read-Ahead Buffer with the pull-down list.

Disk Cache Controls

Check the Enable Disk Cache function. Then select the volume to store the cache on: available volumes are listed in the window. A disk cache can only be created on hard drives; you can not create a cache on a removable. The cache will be kept as a hidden file on this mounted volume.

Use the Cache Size setting to specify the size of the cache. Generally, the larger the disk cache, the better.

Other Controls

To restore the default settings that are supplied with the Disk Drive TuneUp, press **Defaults**. To exit the Cache Setup window without making changes, press **Cancel**. When you have the cache settings you want, press **Save**.

Enabling the Cache

When you have saved the cache controls, restart your Macintosh. Caching will then be in operation.

CHAPTER FOUR: FORMATTING AND TESTING

Benefits of Formatting and Testing

Formatting and testing are generally not necessary for new drives and new media. But over time, the surface of a disk can age and gather microscopic faults known as bad blocks. Bad blocks can cause loss of data, corrupted files or system crashes.

You can perform preventive maintenance on your disk by testing for bad blocks and logging or repairing them. You may want to test if your drive or media is old, especially if it has been generating errors. Disk Drive TuneUp's **Test** command can find bad blocks on your disk. These bad blocks can sometimes be repaired. If not, they can be reassigned so they will never be used for storing data.

The **Format** command can also find bad blocks, but is more thorough. In addition to testing the media, Format sets (or resets) the base-level structure of the media. The base-level structure, also known as the physical format, consists of assigning a number to every data block on disk. The advantage of the Format function is that it allocates bad blocks very efficiently, by leaving them out of the assigned block numbering altogether. The disadvantage is that the Format command takes longer than the Test command.

Note: If your drive or media is not already formatted, formatting is a necessary first step before anything else. You do not have to reformat if your drive or media is new and has been preformatted.

Formatting Drives or Partitions

To format a disk or a partition, select it in the Disk Drive TuneUp window. Then select **Format...** from the Configure menu.

WARNING! Formatting will destroy all the data on the disk or partition. Back up all your files first.

Note: Formatting is a lengthy process. It is generally done only when needed (if the media is not already formatted, or has been generating errors). Formatting can take five to ten minutes per 100 Mbytes, depending on the speed of the drive.

Figure 4.1: Format warning dialog.

Press **Proceed** to format the disk or press **Cancel** to return to the Disk Drive TuneUp window.

WARNING! Once begun, the only way to stop the formatting process is to turn off the Macintosh computer. Data will still be lost, so be sure you are ready to format the drive or disk before you press **Proceed** or **Format.**

Note: Disk Drive TuneUp formats disks and creates partitions which conform to the standard Apple format as described in *Inside Macintosh, Devices*. If you interchange your disks with other drives on other Macintosh computers, make sure that all their driver software and file formats adhere to Apple standard specifications.

Note: For drives that support disconnect, you can use applications other than Disk Drive TuneUp while the format is in process. However, if any application attempts to access the disk being formatted, the system will be frozen until the format is complete.

Testing Drives and Partitions

Choosing the Type of Test

Press the **Test...** button in the main Disk Drive TuneUp window to bring up the test window.

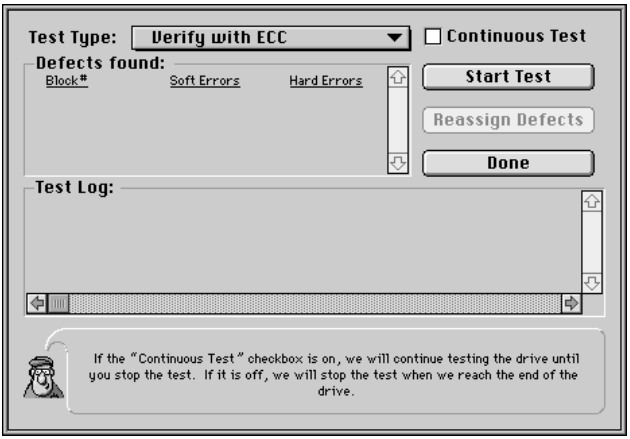


Figure 4.2: Test window.

From the **Test Type** pop-up menu you can choose from three types of test.

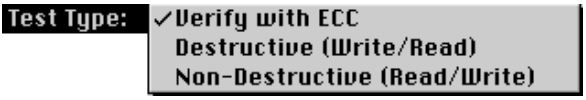


*Figure 4.3: **Test Type** pop-up menu.*

Verify with ECC

This test looks at each block on the disk and reports any blocks where the Error Correction Codes do not match. The advantages of this test are that it does not destroy data on the disk and it is relatively fast (though it can take a long time on large disks). It is not as thorough as the **Destructive (Write/Read)** test or as the **Format** function.

This test may not be supported on some older drives.

Non-Destructive (Read/Write)

This is the same as **ECC Verify**, except that the data from each block is read and reported. This test is provided for drives that do not support **ECC Verify**.

Destructive (Write/Read)

This test writes a pattern to each block on the drive, reads it back and compares the results.

WARNING! A **Destructive (Write/Read**) test erases *all* data on the drive.

WARNING! Locking a partition with Disk Drive TuneUp does not protect data from a **Destructive (Write/Read**). Be sure you have backed up any data you need before proceeding.

Note: You cannot perform a **Destructive (Write/Read)** test on a disk that has been locked using the write-protect tab on the disk.

Controlling the Test

Press the **Start Test** button to begin testing. Press the **Done** button to return to the Disk Drive TuneUp window without performing any tests on the media.

Once a test is running, you can press the **Stop Test** button to terminate any kind of test at any time. When you are through testing, press the **Done** button to return to the Disk Drive TuneUp window.

If you check the **Continuous Test** check box, testing will continue until you stop it. Otherwise, the test performs one complete pass through the disk and stops.

If you have selected **Destructive (Write/Read)**, an additional dialog box appears.

Figure 4.4: Destructive Test warning.

Press **Proceed** to continue with the test or **Cancel** to return to the text window.

The Test Log Report

When a test cycle begins, a notation appears in the test log, including the time, the type of test and type of device. Errors automatically display in the **Defects found** list as they occur. “Soft” errors are block reads where the data could be recovered with ECC error correction. “Hard” errors are those that could not be recovered at all.

When the test stops, Disk Drive TuneUp displays a test report.

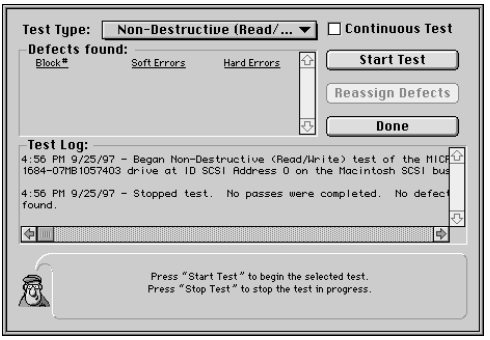


Figure 4.5: Example test report.

After the test is complete, you can save the results using the **Save Log** or **Save Log As** options in the **File** menu. You can also choose **Print** from the **File** menu to print the results. If you close the test window and quit Disk Drive TuneUp before saving or printing the test results, a dialog box is posted asking if you would like to save the log before quitting the application.

Saved logs appear as SimpleText documents that can be opened using SimpleText or most word processors.

Figure 4.6: Macintosh icon for a test log file.

Using the Reassign Defects Button

At the completion of a test, you can automatically reassign found defects by selecting the **Reassign Defects** button. You should always reassign “hard” errors. “Soft” errors may best be handled by other means. For example, moving the drive away from radio frequency (RF) interference may solve “soft” errors.

At the completion of a test or when the test is stopped, all blocks shown in bold in the **Defects found** list will be selected for reassignment. To choose blocks for reassignment, click on the blocks and press the **Reassign Defects** button.

When you are through testing, press the **Done** button to return to the Disk Drive TuneUp window.

CHAPTER FIVE: DRIVER LOAD OPTIONS

Controlling the Disk Drive TuneUp Init

The **Disk Drive TuneUp Init** is installed in the Extensions folder of the active System folder when you run the **Disk Drive TuneUp Installer.** The **Init** is responsible for loading a driver for any drive so that the Macintosh knows how to "talk to" the drive. The **Disk Drive TuneUp Init** will load at boot time in alphabetical order along with the other extensions in the Extensions folder.

The **Disk Drive TuneUp Init** can now be configured to **Always Load**, **Load if Device Present**, or **Never Load** for each device ID - giving custom control for individual needs. By setting **"Never Load"** for device ID's that do not have a drive, you can shorten the time the **Init** takes to load at boot time.

To open the "**Driver Load Options"** window run the **Disk Drive TuneUp** application and select **Driver Load Options...** from the **Configure** menu.

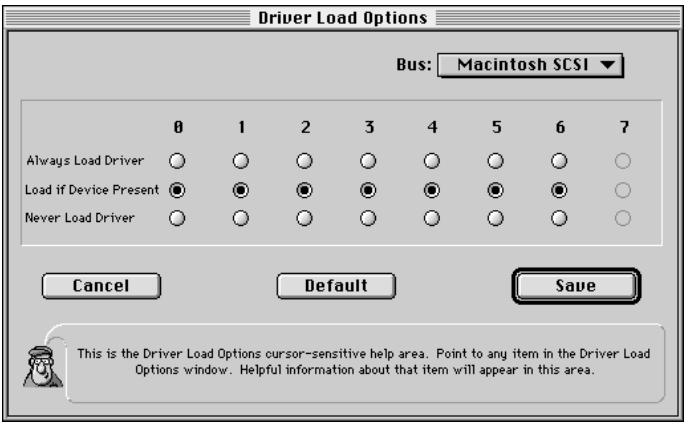


Figure 5.1: Driver Load Options Dialog

To select the option for each device ID simply click on the radio button indicating your choice.

To determine if you will need to use this advanced feature first read the description of each of the options.

Load Option	Description
Always Load Driver	When this option is selected the **Disk Drive TuneUp Init** will always load a driver at the specified device ID. If there is a driver already loaded for that drive ID the

	Init will not replace it. This option can be used if you are using a drive that does not appear at boot time. Many removable Hard Drive bays (that you can slide in a removable Hard Drive) do not appear to the Mac at boot time.
Load if Device Present (default)	If the device at this ID is present and a driver has not yet been loaded , the **Disk Drive TuneUp init** will load a driver for this device.
Never Load Driver	A Driver will not be loaded at this ID even if a drive is present. The setting can be usefull in speeding up boot time by allowing the **Disk Drive TuneUp init** to skip this device ID.

Note: If the **Driver Load Options** is set the to **Never Load Driver** at a device ID, the **Disk Drive TuneUp init** will not load for a device if sometime in the future you set the drive at that ID and connect it to the computer. Make sure to re-adjust your setting if you connect another device or change any device ID's.

APPENDIX A: MORE ABOUT CACHING

This appendix provides an overview of how caching works. This information will help you select optimum cache settings for use with your Macintosh system.

Caching Basics

Caching improves performance by keeping a copy of recently accessed data. There are two parts to the Disk Drive TuneUp's caching feature.

- The **RAM cache** feature enables you to set aside a portion of your Macintosh's system memory for use as a cache (system memory is commonly referred to as RAM, or Random-Access Memory).
- The **disk cache** feature allows you to use a portion of your hard disk as a cache for your removable drive.

When you access data from a disk, a copy is stored in cache. The next time you request that data, it is retrieved directly from the cache instead of copying the data again from the disk.

Cache example

You open a file called "To Mom" on a disk named "Letters" using your favorite word processing program. The contents of "To Mom" is copied into the cache at the same time that it is read (copied) from "Letters" to your word processing program on the Macintosh. After you finish the letter, you save it (which records all of the changes you made to the disk "letters" as well as to the copy in the cache) and close the file "To Mom."

Then you realize you need to add something to the letter, so you reopen it. This time, instead of taking the time to re-access the file from "Letters" on the disk, the file is transferred directly from the RAM and/or disk cache to your word processing program.

The application you are running — for example, a word processor — might also be in the cache. If it is, then the Macintosh does not have to go to disk to fetch parts of the application as you invoke the various commands.

The next section explains in detail the different cache setup options and their effect on the performance of your disk system. This will enable you to choose the cache settings that best fit your work environment.

Definitions

"Cache" is a portion of memory and/or a specified hard drive which is set aside to enhance the performance of your disk drives. When activated, the cache is used every time you read or write part of a file. Disk Drive TuneUp retrieves the part of the file you need and stores a copy of the data in the cache.

RAM Cache

Of the two available forms of caching—RAM caching and hard disk caching—RAM cache provides the quickest data access because your Macintosh can read data from RAM much faster than it can from a hard disk.

At first it may seem best to use the maximum amount of system memory available for the RAM cache. However, the memory set aside for a RAM cache reduces the amount of memory available for applications. If you set up a large RAM cache, you may not have enough memory left to use all your applications. This fact is particularly important to those who use memory-intensive applications such as Adobe Photoshop or CAD (Computer-Aided Design).

Read-Ahead Buffer

The read-ahead buffer is a feature of the RAM cache. It anticipates future data requests by reading more data from the drive than requested. Data that immediately follows the requested data is also read into the cache.

For example, you set the Read-Ahead size to 8 Kbytes and use your word processing program to open a file. Disks are commonly divided into blocks of 512 bytes. So when the word processor requests the first block of the file, the Read-Ahead buffer actually loads blocks 1-16 (16 blocks = 8 Kbytes). Later, when the word processing program asks for block 2 of the file, it is transferred directly from the cache without the need to re-access the disk.

The Read-Ahead size sets the smallest amount of data transferred from the disk to the cache. If you create too large a Read-Ahead Buffer, you can impede the performance of the cache. Using the previous example, if you set the Read-Ahead Buffer size to 128 Kbytes, the cache is filled with 128 Kbytes of data each time your word processing application requests a block that isn't in cache. Of course, it takes much longer to transfer 128 Kbytes of data

from the disk than it does to transfer 8 Kbytes. If the entire file is only 20 Kbytes, you're moving much more data than necessary and slowing down the system in the process.

The Read-Ahead size also affects the amount of Macintosh system memory required to run the cache. Disk Drive TuneUp keeps track of the cache using tables which are kept in system memory. These tables keep track of the Read-Ahead "blocks" which are in use. The smaller the size of the Read-Ahead, the more buffers there are to track and the larger the tables which control the Read-Ahead.

Hard Drive Size	# of Buffers
Read-Ahead Size: 8 Kbytes	
100 Mbyte	12,800
300 Mbyte	38,400
Read-Ahead Size: 16 Kbytes	
100 Mbyte	6,400
300 Mbyte	19,200

Table A.1: Number of read-ahead buffers.

Disk Cache

You can select any hard drive on which to put your cache file. You can make your cache file any size, up to the size of your hard drive. The maximum size is 2 Gbytes, a Macintosh operating system limit. While the hard disk cache is slower than the RAM cache, it is generally faster than a removable disk. Also, a disk cache is usually much larger than a RAM cache. The larger the cache, the more likely the requested data can be found without accessing the disk.

For example, if your Macintosh system has 16 Mbytes of RAM, you might choose to set aside 2 Mbytes as a RAM cache. Adding a 200 Mbyte disk cache increases the cache capacity by 100 times.

APPENDIX B: PROBLEM SOLVING

If you are experiencing difficulties, you may find the answer in this section. If you still cannot solve the problem after reviewing this section, contact Software Architects' Technical Support.

Note: To be eligible for complimentary technical support, you must register your product. If you have not done so already, please complete your registration card and return it to Software Architects, Inc. today.

Online Help

Online Help is available at any time in Disk Drive TuneUp, when you press ⌘-Shift-?. Cursor-Sensitive Help is also available for any part of the Disk Drive TuneUp window and menus; just put the cursor over the area in question.

Technical Support

Software Architects, Inc.
19102 North Creek Parkway #101
Bothell, WA 98011-8005
USA

Phone: (425) 487-0122 (9 a.m. to 5 p.m. PST)
Fax: (425) 487-0467

Internet: support@softarch.com
http://www.softarch.com/

Some Common Problems and How to Solve Them

"My computer doesn't recognize the drive."

A1: Possible SCSI ID conflict. Two SCSI peripherals set to the same SCSI address can cause your computer to crash or act erratically. Try changing the SCSI ID number of your external drive.

A2: Disk Drive TuneUp not installed. Check at startup to make sure that the Disk Drive TuneUp icon appears across the bottom of your screen (see **Startup Icons,** in this appendix). If Disk Drive TuneUp is installed but the system will not recognize the drive, refer to the next Troubleshooting question. If the Disk Drive TuneUp icon does not appear, reinstall Disk Drive TuneUp as described in "Installation," earlier in this guide.

"The Disk Drive TuneUp icon appears at startup, but my system does not recognize the drive."

A1: Probable init conflict. If you are using a removable media drive, you **MUST** remove any inits that came with the drive from your System Folder.

If there is an init conflict, the "Driver Preloaded" Error icon will appear on your screen at startup (see **Startup Icons**).

A2: Drive not supported. Scan SCSI bus, place cursor over SCSI ID number of the drive and read drive description in the help box. Contact Software Architects' Technical Support.

"My computer recognizes the drive sometimes and other times it doesn't."

A: Improper Cabling or Termination. Good cabling and termination determines whether or not your hardware will work consistently. For best results, use the cable that came with your Macintosh drive or PC SCSI Host Adapter Board. Twisted or improperly seated cables can cause problems, as can incorrect termination. Make sure power to each drive is turned on before starting the computer.

"I can't start my system from the startup partition I created with Disk Drive TuneUp."

A1: No valid System Folder on disk. Make certain you've installed the correct system for your Macintosh model using the system disks that came with your computer.

A2: Incorrect System Folder location. In order to boot from a partitioned disk, your System Folder must be located in the left-most partition as viewed on the Disk Drive TuneUp partition status bar. See the "Partitions" section, earlier in this guide, for more information.

"It says I can't format because there are files open on the device."

Turn off file sharing. Also make sure you are not trying to format the drive you booted from (Disk Drive TuneUp won't let you). Best of all, restart the machine with the extensions off. Disk Drive TuneUp does not need any extensions to format a device and this way you know that nothing will be interfering.

"I have removable disks formatted or partitioned on a number of different drives and sometimes I experience problems."

A: Possible disk driver conflicts. Always start the system without any disks in the drive. This will force the system to use the Disk Drive TuneUp driver and should eliminate most problems. If you still experience problems with a disk, back up the disk and reformat it using Disk Drive TuneUp.

"I get a red carat (^) over the icon at startup."

This means that there was already a driver preloaded at startup. Usually this means that there is either another extension that is getting control of the drive or that there is a disk in the drive and it already has its own driver. If it already has a driver written on the drive then you may want to make sure that this driver is an updated one. If the device ID for that drive shows that the drive is an internal Mac drive then there is no problem — your startup drive and internal Mac drives have their own drivers stored on them so that you can boot off of them.

Startup Icons

Once you have installed Disk Drive TuneUp, one of the following icons will appear in the lower portion of your screen at startup. If your system does not recognize your drive, or if you are having any other sort of problem, refer to these icons.

Driver Loaded

The Driver Loaded icon means that the Disk Drive TuneUp init loaded properly and should provide normal operation as described in this guide. The ID Number that the init is loading a driver for appears in the upper right corner of the init icon.

Driver Pre-Loaded

The Driver Pre-Loaded icon means that a disk driver loaded before the Disk Drive TuneUp init. The device ID Number that the disk driver loaded from appears in the upper right corner of the init icon.

Driver Load Canceled

This icon appears if you have turned off the Disk Drive TuneUp init at startup by holding down the mouse button as you turn on the system. If you did not intend to turn the init off, restart your Macintosh and make sure that the mouse button is not pressed.

No Devices Found

Disk Drive TuneUp was unable to locate a supported drive. Make sure that your drive is turned on and is properly cabled and terminated. It is also possible that the drive is not supported by Disk Drive TuneUp.

Load Error

The Load Error icon usually means that the Disk Drive TuneUp driver has become corrupted. Reinstall from the Disk Drive TuneUp installation disk. Another possibility is that there is an extension conflict. Turn off all extensions except Disk Drive TuneUp and restart. Then turn the extensions back on one at a time or in groups until you find the conflicting extension.

Memory Error

The Memory Error icon usually means that Disk Drive TuneUp requires additional system memory. Restart your Macintosh.

APPENDIX C: TERMINATION

In order for SCSI devices to perform reliably, the beginning and end of the "SCSI chain" must be identified with properly placed termination plugs or resistors. This process, known as **termination,** is necessary so signals will not be lost between the computer and devices connected to the SCSI port. When more than one external device is connected, you must install a termination plug on the last physical SCSI device on the SCSI "chain."

Your Macintosh user's guide, your drive user's guide and the manuals for your other SCSI devices will explain proper termination for each product. For your convenience, we have explained the basics of termination below. Most Macintosh computers follow the guidelines shown in the following chart. Consult your Macintosh reference manual for more specific details.

Note: Proper cabling is important for consistent hardware operation. For best results, use the cable that came with your drive. Remember that improperly seated cables can cause problems.

System Configuration	One Device	Two or More Devices
Macintosh with internal termination and external devices with terminators	No action needed	Have authorized dealer remove termination from all but last external device
Macintosh without internal termination and external SCSI devices without terminators	Add terminator to external device	Add terminators to first and last external devices
Macintosh with internal termination and external SCSI devices without terminators	Add terminator to external device	Make sure last external device is terminated
Macintosh without internal termination and external SCSI devices with terminators	No action needed	Remove terminators from all but the first and last external devices

Table C.1: Recommended termination for different Macintosh systems.

If one device is internally terminated and one isn't, place the terminated device at the physical end of the SCSI chain.

Note: For most Macintosh computers, both ends of the SCSI chain must be terminated. All other termination must be removed from all external devices. Some devices are internally terminated and must be placed at the end of the SCSI chain (or termination can be removed by a qualified technician.)

Macintosh IIfx: Some Macintosh models (including the IIfx) may require different types of SCSI termination plugs. If the wrong terminator plug is used, damage to data and/or hardware may result. Check your Macintosh user's guide for specific details on your configuration. The Macintosh IIfx requires a specific terminator when adding devices. Terminator plug and filter types for the IIfx include:

1. Apple SCSI Cable Terminator II: This is an updated external terminator for the *Macintosh IIfx*. It is *black*, so it is easily distinguishable from other terminator plugs.

WARNING! There should never be more than one Apple SCSI Cable Terminator II plug installed on an external SCSI chain. If more than one plug is used, damage to data and/or hardware may result.

2. Internal SCSI Termination Block: This internal block is provided for IIfx systems *without* internal hard drives. It is a gray, T-shaped block that is located on the internal SCSI port on the motherboard. Unless you have added an internal hard drive or otherwise internally changed your computer, your IIfx should already be internally terminated.
3. Internal SCSI Filter: This filter is installed in all IIfx computers *without* internal hard drives. It is also used on IIfx systems with internal hard drives that were shipped before March 19, 1990. It is a rectangular gray block located on the internal SCSI port on the motherboard (under the internal SCSI termination block). If your IIfx is not equipped with an internal SCSI filter, you should have one installed by an authorized Apple dealer.

Macintosh PowerBooks: Macintosh PowerBooks also have specific termination requirements. Because there is no termination power for these models, they require one of the following:

1. An internal or external SCSI device that is self-terminated
2. An external SCSI device which supplies termination power and has a terminator plug.

APPENDIX D:
WORKING WITH YOUR STARTUP DRIVE

Note: After creating a bootable partition, copy the System Folder from your Macintosh systems disks into the partition.

WARNING! Formatting or creating a new partition map will destroy all of the data on the disk. Back up your data.

When you turn on your Macintosh, it immediately finds the System Folder on your startup drive and loads the instructions it needs to function. Because formatting or repartitioning a startup drive results in the destruction of all data, including vital system data, the Macintosh operating system does not allow you to format or partition an active startup drive. If you want to format or partition your startup drive, you must provide an alternative System Folder for the Macintosh to use at startup.

For your convenience Disk Drive TuneUp is now shipped on a bootable CD. For instructions on using the CD see "Using the Disk Drive TuneUp CD" in Chapter 1.

Alternatives to booting from the Disk Drive TuneUp CD include using another drive or creating a bootable RAM disk.

Using another Drive.

If you have an alternative startup drive (a drive containing a System Folder and operating system designed for your Macintosh), use the **Startup Disk** Control Panel to select that disk as the startup drive. You may then work on the inactive startup drive.

Creating a Bootable RAM Disk

Although more involved than using the Disk Drive TuneUp CD or another drive, you can create a RAM disk to boot from. First use the **Memory** Control Panel to create a RAM disk of at least 1500K. Then copy the system folder from the Disk Tools disk (one of the system disks that came with your Macintosh) to the RAM disk. Finally use the **Startup Disk** Control Panel to select the RAM disk as the startup disk and Restart your computer. Your computer will boot from the System Folder you copied to your RAM disk.

NOTE: When you repartition or format the disk you use to "boot" or start up your Macintosh, you will need to reinstall the operating system using the system disks that came with your Macintosh.

Selecting which Partition to Boot from.

Disk Drive TuneUp 2.0 and later allows any partition of a drive to be the startup partition. To select which partition to boot from use the **Startup Disk** Control Panel. After opening the **Startup Disk** Control Panel you will see all partitions that are mounted on the Macintosh desktop. Simply click on the partition that you want to boot from to select it. When you restart your Macintosh that partition will be the first partition in the upper right corner of the desktop. Not all drivers support this feature so, you should make sure that the Disk Drive TuneUp driver is installed.

In order for a partition to be bootable it must have a valid system folder on it. You will need to make sure that a system folder that is compatible with your Macintosh is properly installed on the partition that you want to boot from. Use the Install disk(s) (either a set of floppies or a CD) from Apple made for your computer to install the proper system folder.

APPENDIX E: GLOSSARY

Alert dialog box • A box that appears on the screen to give a warning or to report an error during use of an application.

Backup disk • A copy of a disk made as to guard against the loss of files.

Bit • A contraction of the words binary digit and the smallest unit of information that a computer can hold. The value of a bit, 0 or 1 represents a simple choice, such as on or off, true or false, black or white, etc. Bits are combined to represent text characters, numbers, images, etc.

Bootable disk • Same as startup disk. A disk or partition that holds the necessary program files — such as the Finder and System files contained in the System Folder —to set the Macintosh into operation. Such partitions are said to be bootable.

Bus • Circuits inside the computer that transmit information from one part of the computer system to another. The SCSI Bus connects the storage components of a Macintosh system.

Byte • A unit of computer memory consisting of eight bits. A byte is the amount of storage used to represent a single character.

Cancel button • A button that appears in some dialog boxes. Clicking it returns you to where you had been without performing the command.

Certify media • The process of checking every block on the media to verify that it is usable.

Control Panel • A file placed in the Systems Folder of a Macintosh that is automatically opened and run by the System at startup.

Current startup disk • Contains the current System and startup information. The startup disk icon always appears in the upper right corner of the desktop.

Desktop • Your working environment on the Macintosh. The menu bar and the background area on the screen. You can have a number of documents open on the desktop at the same time.

Destination disk • The disk or folder that receives a copied or translated file.

Directory • A list of the contents of a folder or a disk.

Disk • A flat, circular, magnetic surface on which data can be recorded in the form of small magnetized spots.

Driver • A system program that allows the microprocessor to direct the operation of a peripheral device, such as a hard drive.

ECC • Stands for "Error Correction Code." A form of common error correction for data on storage devices. Some drives do not support error correction.

Empty partition • A partition not recognized as being designated for use by any operating system.

Filter • A file usually placed in the same folder or directory as an accompanying utility program for the use of stripping away unwanted data in the transfer of information from one format or type of computer to another. Example: Apple File Exchange: the filter would be DCA-RFT MacWrite.

Floppy disk • Used for storing programs and files. In this guide, the term floppy disk refers to 3.5-inch disks.

Format • To prepare a blank disk to receive information.

Hard error • Areas in the data on the disk that are damaged and unrecoverable. Reassigning hard errors will inform the SCSI drive to place data elsewhere when that particular block is requested.

Initialize • Performs a low level format, followed by a partition, followed by a high level format. These three steps are performed by the Format command.

Interleave • Changing the ordering of how data is physically stored by mixing in one data stream with another. Interleaving a hard drive refers to "spreading" out the data so that the drive isn't faster than the computer. Modern drives have on board caching which makes interleaving media obsolete.

Locked partition • An area on a disk that is write-protected and cannot be altered. Activated by using the Locked check box in the Partitions panel.

Logical block • Space on a drive is accessed by the Macintosh as a sequence of blocks. Logical block refers to the fact that the computer does not need to refer to the physical location of data on a drive, but simply refers to the logical sequence number of a block.

Mbytes • See **Megabytes**.

Media • The data recording surface of a storage device. In this guide it refers to removable hard drive disks, rewritable optical disks and the fixed platters inside a hard drive.

Megabytes • Approximately one million bytes of storage capacity. Typically one byte stores one character of text. Megabytes is abbreviated as "Mbytes" in this guide.

OS • An abbreviation of the words "Operating System." A group of programs that coordinate the functioning of computer hardware components and provide an interface for application programs and users.

Partitioning • Allocating data storage space to one or more defined storage areas on the media for different uses.

Partition • A defined storage area on a disk or disk.

SCSI • An abbreviation of "Small Computer System Interface." An American National Standards Institute (ANSI) specification for connecting peripherals to computers.

SCSI cable terminator • A device used at the end of a SCSI chain to maintain the integrity of the signals passing along the SCSI chain. A SCSI chain should always have two terminators, one at each end of the chain. On some drives, the terminator is built in.

SCSI chain • A group of SCSI devices linked to one another through SCSI peripheral interface cables and linked to the SCSI port on the computer through a SCSI system cable.

SCSI Host Adapter Board • A removable circuit board that plugs into expansion slots in PC computers. It enables the computer to use SCSI devices through the use of a built in SCSI port.

Soft error • Areas in the data on a disk that are damaged and recoverable by using error correction codes embedded within the data.

Startup drive • The disk drive from which your computer system will load operating system files when it is turned on or reset.

Volume • A general term referring to a storage device. Often used in reference to hard disks and file servers, it is used primarily in this guide to describe removable media and high-density 3.5-inch floppy disks. A volume can be an entire disk or only part of a disk (a partition). Each mounted Macintosh partition will appear as a volume on the desktop as a separate icon.

Write • To transfer information from the computer to a destination external to the computer such as a disk drive, or from the computer's processor to a destination external to the processor such as main memory.

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