Central Point Software INCORPORATED

COPY II®

For The Macintosh™ Computer

The Only Utility You Need...

New!
☑ **BACKUP** many protected programs and run them from your hard disk.

☑ **REPAIR** damaged disks.

☑ **UNDELETE** files - even on your hard disk.

New!
☑ **TREE DISPLAY** - see and change your disk's organization at a glance.

New!
☑ **SMART LOCATE** - find files anywhere on your drives by name or up to three "key words."

New!
☑ **TRACK EDITOR** - spot copy protections, repair damaged blocks.

New! Version 7.2

MACWORLD WORLD CLASS AWARD 1988

★ **A+ Magazine Readers' Choice Award**
★ **Mac User Magazine Editor's Choice Award**

SYSTEM REQUIREMENTS

Macintosh™, 512K or more Memory
One or two disk drives

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Table of Contents

Locate

The Copy II Disk

The Copy II disk is an 800K disk that contains <u>eight</u> separate application programs:

Note: If you have an older Macintosh with a 400K drive, you need to send us the 800K disk and we'll replace it with two 400K disks.

1. Copy II can make disk backups of 'copy–protected' software, as well as copying unprotected disks.

2. Copy II Hard Disk allows you to transfer some protected software to your hard disk, RAMdisk, or other Macintosh disk volumes.

3. MacTools is a general disk and file utility with a variety of useful options, including a hard disk undelete–files feature.

4. CPSTagFix is a special file (called an "Init" file) which fixes a couple of disk access problems on the Macintosh. It fixes disk "tags" so that accidentally deleted files on 3.5 inch disks can be reliably undeleted with MacTools, and it speeds up disk access on the upper drive of a two–drive Macintosh SE.

5. CPSSaveDeletes is another special "Init" file that is used in conjunction with MacTools to provide undelete capabilities on hard disks. (See the MacTools section for more information about both CPSTagFix and CPSSaveDeletes.)

6. Read Me contains additional useful notes about the latest versions of these applications. An option is provided to print the Read Me notes.

7. Backup List is a list of the applications which Copy II can back up, according to the most recent information available. Any special instructions for copying certain copy–protected programs

are also included in the Backup List. An option is provided to print the Backup List on your printer.

8. Locate is a new desk accessory that lets you quickly locate filenames or occurrences of specific text within files.

The Copy II applications work on any Macintosh with at least 512K of memory. Before using any of the applications, we suggest you start up the Read Me application first, to read any notes which may provide additional useful information about the applications on the Copy II disk.

The Copy II disk is not copy-protected in any way. You can make a backup of this disk using the Finder, Copy II itself, or any other standard Macintosh copy program. We encourage you to make a backup copy and put your original Copy II disk in a safe place.

About This Manual

The rest of this manual is divided into four 'mini-manuals', one each for Copy II, Copy II Hard Disk, MacTools, and Locate.

These manuals assume that you are familiar with the basic concepts of the Macintosh, including such things as windows, pull-down menus, selecting with the mouse, etc. If you need to know more about these things, you will need to refer to your Macintosh owner's guide.

COPY II®
for the
Macintosh T.M.

if you like. Copy II also makes use of whatever memory is available in your computer to speed up copying.

Copy II provides two copy options. The Bit Copy option is useful for making backups of most protected software as it makes very few assumptions about the format of the disk it's copying. The Sector Copy option can make fast, reliable backups of standard unprotected Macintosh disks, and is also designed to handle a few special but widely used copy–protection methods. (The Backup List has information about which option to use in backing up most applications.)

In a few cases, Bit Copy and Sector Copy can be used together to make a more reliable copy than either option can alone. A couple of other options are also available, which can help back up a few specific disks but otherwise slow the copy process down. All of this is explained in better detail in Chapter Three and Chapter Four.

Copy II cannot copy onto hard disks. Hard drives store and retrieve information in a different way than floppy drives. Disk copying from one to the other simply doesn't work. If you want to copy individual applications and documents onto a hard disk, you can use either the Copy II Hard Disk application or the Copy Files option found in the MacTools application. (See the manual sections on Copy II Hard Disk and MacTools.)

Chapter Two – Using Copy II

To start using Copy II, turn the Macintosh on and insert the Copy II disk into the disk drive. After a few seconds, the usual Macintosh 'Finder' desktop will appear, with a window for the Copy II disk. One of the icons in the window shows the name 'Copy II' with a disk. Open this icon by either clicking on the icon and choosing Open from the File menu, or simply double-clicking the icon. The disk will whir as the Copy II application is loaded into the computer.

After showing an important notice, Copy II will display a screen similar to the following:

✐ Control Options

COPY II® for the Apple Macintosh®

```
  ┌─────────┐   ┌─────────┐      ◉ Bit Copy
  │  Start  │   │  Stop   │      ○ Sector Copy with Format
  └─────────┘   └─────────┘      ○ Sector Copy no Format
  Original Drive :  ◉ Internal   ○ Track Editor
                    ○ External
                                 Start Track : [ 0 ] ◉ A  ○ B
  Duplicate Drive : ○ Internal
                    ◉ External   End Track :  [ 79 ] ○ A  ◉ B

  Messages:                      ☒ 800K Copy
  ┌─────────────────────────────────────────────┐
  │                                             │
  └─────────────────────────────────────────────┘

               Copy Status
```
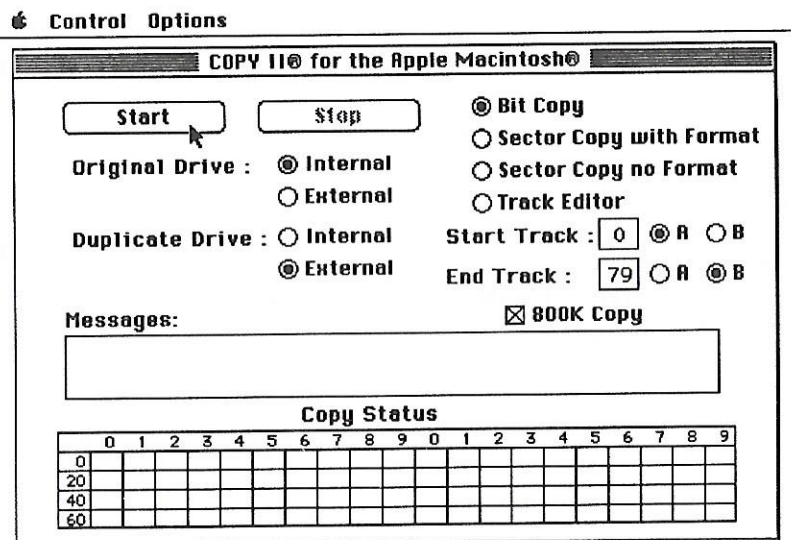
(Note: The exact options you see will depend on how many and what kind of drives (400K or 800K) you have. The details are discussed in the next chapter.)

The first thing to notice is the menu bar at the top of the screen. If you choose the "Apple" pull-down menu, you can see that all of the usual Macintosh desk accessories are available. You'll also see two other options. The first option is called About Copy II, and provides a brief description of the Bit Copy and Sector Copy options. The second option, Copyright Notice, is simply a copyright message for Copy II.

By choosing the Control menu, you'll find that the only option available here is Quit. Choose Quit from the Control menu whenever you want to quit out of the Copy II application and return to the Finder desktop.

The last menu is called Options. In most cases, you won't need to use this menu. It gives you options to help you back up disks which are more difficult to copy. The Options menu is explained in Chapter Three.

Making a Backup

Copy II works by 'reading' some of the information from the original disk it's copying, then 'writing' that information onto the duplicate disk. It alternates this reading and writing process until the entire disk is copied. How much it reads and writes at any one time depends on how much memory you have in your computer.

Before Copy II will back up a disk, it will first insist that the disk be 'locked' or write-protected (which is not the same as 'copy-protected'). To lock a disk, slide the small tab in the corner toward the edge of the disk, uncovering the hole. To unlock a disk, slide the tab back so the hole is covered again.

Locking a disk guarantees that the computer cannot write or change any information on the disk. Suppose that while using Copy II, you accidentally inserted the original disk at the wrong time or into the wrong drive. Even if this happens, the information on your original disk can't be hurt because the disk is locked.

Start Copy

In the top of the Copy II window, you'll see two buttons, labeled Start and Stop. The Start button starts the copying, and the Stop button stops it. (The Stop button is 'dimmed' right now because there isn't any copying to stop.) The copying doesn't begin until you click on the Start button. You can click all other areas without hurting anything.

Copy II is already set up for you to begin copying most disks. When you want to copy a disk, click on the Start button with the mouse. Copy II will eject any disks that are already in the drive(s). What happens next depends on whether you have one or more drives.

Copying (one drive)

If you have one drive, a message will appear in the 'messages' box near the bottom of the screen: "Insert Locked Original Disk In Internal Drive." Make sure the disk you want to back up is locked, then insert it into the built–in disk drive. The drive will whir as Copy II reads some of the information from the original disk.

Copy II will then eject the disk and print a new message: "Insert Duplicate Disk In Internal Drive." Insert a blank disk or a disk you don't mind erasing into the drive. (This disk should be 'unlocked', so that Copy II can write new information onto it.) The drive will whir again as the information is written onto this disk.

This original–disk/duplicate–disk cycle will continue a few more times until the entire disk is copied, then Copy II will eject the duplicate disk and display the message: "Backup complete!"

Copying (two drives)

If you have two or more drives, messages will appear in the 'messages' box near the bottom of the screen telling you where to insert the original and duplicate disks.

Make sure the disk you want to back up is locked, and insert it into the built–in disk drive (the lower drive on a Macintosh SE with two internal drives, or the right drive on a Macintosh II). Insert a blank disk or a disk you don't mind erasing into the other drive. (This disk should be 'unlocked', so that Copy II can write new information onto it.)

The two drives will then whir as Copy II alternately reads information from the original disk and writes it to the duplicate disk. When the entire disk is copied, Copy II will eject both disks and display the message: "Backup complete!"

When copying is finished, the disk or disks are ejected. You can either make another copy, or Quit out of Copy II in order to try the copy you just made.

Stop Copy

If you want to stop the copying before it's finished, click and hold on the Stop button. Copy II may continue for a couple of seconds more if it's busy reading or writing, then it will stop and display the message "Copy stopped!"

Copy Status

The information stored on a Macintosh disk is divided into 80 circular tracks, numbered track 0 to track 79. (On 800K disks, each track is further divided into two sides, which we call side A

and side B.) You'll notice that as Copy II backs up a disk, it displays in the messages box "Reading track..." or "Writing track..." with the track number it's currently reading or writing. This keeps you informed of what Copy II is currently doing.

If any errors or problems occur during the copy, an error message is also displayed in the message box. The message will tell you what kind of error occurred and what track or block the error occurred on.

In addition, information about all the tracks copied so far is kept in the Copy Status box. The Copy Status box has positions for all 80 tracks: 4 rows with 20 tracks per row. For every track which is copied successfully, a dot appears. (When copying 800K disks, two dots appear for each track, one for each side of the track.) If there was an error copying a track, a letter appears instead. The letter indicates what kind of error.

The possible error letters are:

R   Read error
W   Write error
V   Verify error
L   Track Length error
S   Synchronize Tracks error

For example, if tracks 0 through 23 have been copied so far and there was a read error on track 17, the Copy Status box would look like this:

Copy Status

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	R	.	.
20	.	.	.	.																
40																				
60																				

If you do get errors during a copy, there are some recommended ways of handling them. These are discussed in Chapter Four.

Chapter Three – Other Backup Options

This chapter describes the other options available in Copy II and what they're used for. (The notes in Chapter Four talk about when to use them in backing up a disk.) Additional options become available if you have one or two 800K (double–sided) drives. These extra options are discussed at the end of this chapter.

Bit Copy and Sector Copy

As mentioned in the Introduction, there are actually two methods available for copying a disk with Copy II, called Bit Copy and Sector Copy. You can see these options in the upper right part of the screen.

```
  🍎  Control  Options
┌─────────────────────────────────────────────────────────┐
│ ▒▒▒▒▒▒▒ COPY II® for the Apple Macintosh® ▒▒▒▒▒▒▒          │
│ ┌──────────────┐  ┌──────────────┐  ◉ Bit Copy            │
│ │    Start     │  │    Stop      │  ○ Sector Copy with Format │
│ └──────────────┘  └──────────────┘  ○ Sector Copy no Format  │
│ Original Drive :  ◉ Internal        ○ Track Editor         │
│                   ○ External                               │
└─────────────────────────────────────────────────────────┘
```
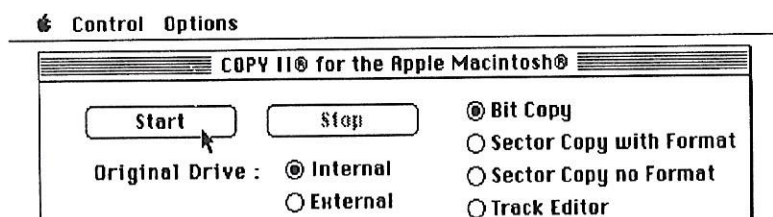
When Copy II is first started, the Bit Copy method is already selected. You can switch to the Sector Copy method by clicking on either Sector Copy with Format or Sector Copy no Format. Clicking on Bit Copy will switch back to the Bit Copy method. Whenever you click on the Start button, Copy II will use the method you've selected.

Sector Copy matches the way the Macintosh usually reads and writes to the disk in everyday use. Because it 'assumes' that what it's copying is in a normal Macintosh format (with no funny copy–protection), it can make a special effort to be sure that everything on the disk is exactly as it should be. This makes for very reliable copies. It will copy some protected disks, but it cannot backup disks that differ too far from the normal Macintosh format. Sector Copy can also copy a disk faster than Bit Copy.

Since Sector Copy can write only onto formatted disks, you can select Sector Copy with Format or Sector Copy no Format. If you're sure that the duplicate disk you want to copy onto is already formatted, selecting 'no Format' will speed up the copy process a little. Otherwise you should select Sector Copy with Format, so that Copy II will format the duplicate disk before it copies.

Bit Copy is designed for copying nearly all copy–protected disks. Because of the widely varying protection schemes possible, Bit Copy makes very few assumptions about the information it's copying. It simply 1) reads the information from the original disk, 2) makes enough sense of it so that it can write it correctly, then 3) writes it to the duplicate disk. Bit Copy can copy many more disks than Sector Copy.

Bit Copy formats the duplicate disk as it copies, so the disk does not have to be formatted ahead of time.

Original Drive and Duplicate Drive

Below the Start and Stop buttons are options for "Original Drive:" and "Duplicate Drive:". The original drive is the drive in which you will put the original disk you're making a copy of. The duplicate drive is where your copy will be made. What appears in the window depends on how many drives you have.

If you have one drive, then only one option labeled "Internal" will appear on each line. Since only the internal (built–in) drive is available, Copy II will use it for both original and duplicate disks. Clicking on the options has no effect; they both remain selected.

If you have more than one drive, you'll see choices for each drive, Internal and External (Internal Lower and Internal Upper on a Macintosh SE with two internal drives, or Internal Right and Internal Left on a Macintosh II). Copy II displays options only for the drives that are actually connected to your Macintosh. Generally, Internal will be selected for Original Drive, and External will be selected for Duplicate Drive. This means Copy II will copy from the internal (built-in drive) to the external (second) drive. If you want to change this, just click on the options you want for original and duplicate drives.

Start Track and End Track

The next two options are Start Track and End Track. As mentioned earlier, the information stored in Macintosh disks is recorded in 80 circular 'tracks', numbered 0 through 79. With a Start Track of 0 and an End Track of 79, Copy II will copy all 80 tracks of the disk. You can also copy a range of tracks if you want, though you usually won't need to do this. (There are a few exceptions and they are explained in Chapter Four.)

To change the Start Track and End Track values, click the mouse in the box you want to change. The number will become highlighted (displayed white in a black box). Type in the new track number you want, then either press the Return key or click the mouse somewhere else in the window.

If you type a bad number, then the original value (either 0 or 79) will reappear, the speaker will beep, and a message will tell you what was wrong (for example, if you typed a number greater than 79 or typed something other than a number). The Start Track must also be less than the End Track. If the Start Track is greater, you'll get an error message when you click on the Start button.

If you want to copy a single track, simply set both Start Track and End Track to that track number.

The Options Menu

By choosing the Options menu, you can see that several extra options are available:

The Keep Track Length and Synchronize Tracks options are available only when you use the Bit Copy method for copying a disk. You'll see a checkmark beside an option if it's selected.

Keep Track Length

Because disk drives will not spin at exactly the same speed all the time, the number of 'bytes' of information that can fit on a track (called the 'track length') will vary slightly. When Copy II copies a disk, the track length on the duplicate disk it makes may be a little different than on the original disk. This is usually no problem, because normal reading and writing takes these slight variations into account.

However, there are a few protected programs that check for the exact track length on one or more tracks of the disk. If the track length is changed, then the protected program 'knows' that this is a copy and not the original disk, and refuses to run.

If you choose the Keep Track Length option before doing a Bit Copy of the disk, Copy II will make subtle changes to the information as it writes, so that the track length will be correct

even if the disk drive speeds are not exact. This will help copy those programs that check track length.

Choosing Keep Track Length slows the copy process down a little, and the minor changes it makes could conceivably affect other copy protections (though this would be rare). In other words, you may not want to use the Keep Track Length option all the time. (See the note below, under "800K Drive Options", about using Keep Track Length with Apple–brand 800K drives.)

Synchronize Tracks

Another thing that a protected program can check for is the positioning or alignment of the information from one circular track to the next. Most copy programs copy all of the information on a track, but do not maintain the alignment from one track to the next. A change in alignment is never noticed unless a protected program specifically checks for it.

If you choose the Synchronize Tracks option then do a Bit Copy of a disk, Copy II will maintain the track–to–track alignment as it copies. This will help copy those programs which check the alignment. The Synchronize Tracks option also slows down copying somewhat, but does not cause any problems otherwise.

Clear Copy Status

The Clear Copy Status option simply clears out all of the status information from the Copy Status box. You may want to clear the Copy Status before copying a range of tracks, so that you're not confused by status information from a previous copy.

800K Drive Options

Copy II can accommodate any combination of 400K (single–sided) and 800K drives. If you have one or more 800K drives, additional options will appear on the Copy II display which are not available if only 400K drives are connected:

14

```
Start Track : [  0  ]  ◉ A   ○ B
End Track :   [ 79 ]   ○ A   ◉ B
            ⊠ 800K Copy
```

A distinction must be made here between 800K drives and 800K disks. An 800K drive is capable of reading, writing, and formatting both 800K disks and 400K disks. A 400K drive can work only with 400K disks. (Currently, most copy–protected applications sold are on 400K disks, so that they can work in both 400K and 800K drives.) Since Copy II makes a 'carbon-copy' of a disk (including its size), the duplicate disk will always be the same size as the original.

When Copy II first starts up, it determines which drives are 800K drives. If you have at least one 800K drive, then the 800K options appear on the screen. However, the additional options may be dimmed, depending on your settings for Original Drive and Duplicate Drive. If you have only one 800K drive, then to make an 800K backup, you'll need to use the one 800K drive for both Original and Duplicate.

If you have two 800K drives, the 800K Copy box will already be checked for you to copy 800K disks. If you want to make a copy of a 400K (single–sided) disk, you should click on the box to remove the check. Otherwise, Copy II will take twice as long, copying twice as much as it needs to. (Copy II always warns you if the size of the copy doesn't match the size of the disk.)

15

Similarly, you should never need to do a 400K copy of an 800K disk. The resulting duplicate disk would be missing much of the information it needs to work correctly.

Note: Because of hardware differences, Apple's 800K drives cannot carry out Copy II's Track Length adjustments as readily as 400K drives or most third–party 800K drives. If you're using the Keep Track Length option or if you're getting "L" errors when copying a disk, we suggest you use something other than an Apple–brand 800K drive as the Duplicate Drive if at all possible. This will produce a more accurate, reliable backup.

If you need to recopy just a portion of an 800K disk, notice that the Start Track and End Track options include selections labeled A and B. As mentioned earlier, on 800K disks, each of the 80 circular tracks is further divided into two sides, which we call side A and B. When doing an 800K copy, Copy II must back up both sides of each track. Copying an entire 800K disk involves copying with a Start Track of 0–A and an End Track of 79–B. To copy just a portion of an 800K disk, you can select which track and side to use for Start Track and End Track.

Note: A common misconception about 800K disks is that you can disk–copy two 400K single–sided disks onto one 800K double–sided disk, one onto the top and one onto the bottom of the disk. The Macintosh drives don't work this way. For each physical disk, only one disk icon can appear on the Finder desktop. The Macintosh can't recognize "two–disks–in–one". It's better to think of double–sided disks simply as disks that can hold twice as much information, and not be concerned with when the top and when the bottom of the disk is being accessed.

If you instead want to copy two or more application files onto a single disk, the Copy II Hard Disk application can back up a number of popular copy–protected applications onto hard disk, RAM disk, 400K or 800K floppies. (See instructions on Copy II Hard Disk for more information.)

16

Chapter Four – Notes on Backing Up Disks

When backing up a protected disk, the copy may run normally even if an error occurred while copying. Conversely, it's possible for a backup to fail even if there were no errors during copying. This is because of the complicated protection methods used on some disks. The best test in every case is to simply try running the program to see if it works.

Possible Errors

When the Sector Copy method is selected, a Read error on every track means the original disk is probably blank. If you get this error on only one or two tracks, then a portion of the disk may be copy–protected, or there may simply be a problem on that part of the disk. A Write error means the duplicate disk probably isn't formatted correctly on every track. Try Sector Copy with Format. A Verify error or "Unable to format" error usually indicates some kind of problem with the duplicate disk. You should try a different disk.

When the Bit Copy method is selected, a Read error means that Copy II is having difficulty making sense of this track. Copy II will do its best to correctly write the track onto the duplicate disk anyway. A Read error also occurs if the track is completely blank (has never had any information written onto it). A Verify error means that either there's a problem with the duplicate disk, or the track that it read from the original disk contains 'unreliable' information.

The other two possible errors are rare. A Track Length error means that Copy II could not maintain the track length on the duplicate disk after several tries. A Synchronize Tracks error will occur only if the Synchronize Tracks option was selected. This usually means that track 0 hasn't been copied onto the duplicate disk yet. If you're copying different ranges of tracks, and using the Synchronize Tracks option, be sure to copy the range that includes track 0 first.

17

Using Sector Copy with Bit Copy

Most Macintosh applications on the market today use a strange copy–protection format on only a few tracks of the disk. The rest of the disk is usually in a standard Macintosh format. Then when you start up the application, it begins by checking those strange tracks to make certain they haven't been changed at all.

What this means is that you can often use the Sector Copy method to make a fast, reliable copy of most of the tracks on a disk. If you copy a protected disk with Sector Copy and get Read errors on only one or two tracks, first try the backup. If that doesn't work, then go back and use Bit Copy to recopy just the bad tracks back onto the same duplicate disk. The backup may now work, and the copying was faster since Sector Copy was used for most of the disk.

A Checklist

A few commercial software products use particularly nasty protection schemes which a straightforward Bit Copy may not duplicate correctly. Here is a checklist of things to try in backing up these disks.

1. Refer to the Backup List on your Copy II disk to see if there are any special instructions for the program you are copying. Often these special instructions provide the only way to successfully make a backup of that particular program.

2. Next try copying using Bit Copy, without changing any options.

3. If that copy doesn't work correctly, try Sector Copying the disk. Then if there are errors on any tracks, recopy just those tracks onto the same duplicate disk using Bit Copy. (The Start Track and End Track options let you select a single track or a range of tracks to copy.)

4. Try recopying those same tracks again using Bit Copy, after selecting Keep Track Length from the Options menu.

5. Try copying the entire disk using Bit Copy, after selecting Synchronize Tracks and/or Keep Track Length from the Options menu.

If none of these suggestions work, you might want to write us a quick letter about it, so we can continue to improve our product. Also, if one method for backing up a disk worked particularly well for you, you might want to let us know about that too. Include 1) the name of the program you were copying, 2) the publisher's name, 3) the version number if any, 4) what you tried, and 5) exactly what happened instead if the backup didn't work. Address your letter to:

Central Point Software, Inc.
15220 NW Greenbrier Parkway, Suite 200
Beaverton, OR 97006

Chapter Five – Track Editor

The Track Editor is a new Copy II program option which enables you to repair damaged sectors, and allows more technical users to find and examine copy protected sectors. The Track Editor reads and displays data contained on each track of a disk.

About Recovering Using Resource Forks

Use the Track Editor to repair damaged sectors or to find and examine copy protected sectors. All levels of users can easily use the Track Editor to repair damaged sectors and to recover data on those damaged sectors. More advanced users may want to use the Track Editor as a way to find and examine copy protected sectors and to perform additional sector repairs beyond the scope of the built in checksum recalculator.

The Track Editor documentation has two parts:

1. Repairing Damaged Sectors and Recovering Data. This section gives the basic steps for repairing damaged sectors and recovering data from those sectors.

2. The Track Editor (for Technical Users). This section is for the more technical user who wants to perform additional sector repairs and wants to know how Macintosh disks are recorded.

Although you can use the options and features described below to repair damaged program and data files or to inspect copy protection, we recommend you use the Copy II software only on a copy of the original program disk, not the original program disk itself.

Note: Do not use the Track Editor to "repair" copy protected tracks. Attempting to "repair" a copy protected track will likely modify the data in the track and make the disk unusable.

Using Resource Forks to Recover Data

Repairing Damaged Sectors and Recovering Data

Finding and repairing damaged sectors is very easy with Copy II's Track Editor. To find and repair damaged sectors you perform the following tasks:

- Determine the damaged block, track, and sector number
- Start the Track Editor
- Read the track that contains the damaged block
- Doublecheck that the error is on that track using the Inspect Track command
- Display the block
- Correct the error
- Write the corrected information to the disk

The following example walks you through the procedures for finding and repairing damaged sectors.

Example – Repairing a Damaged File

Note: Performing the following operation on an 800K (double sided) disk and saving the results to a 400K disk will make the 400K disk unreadable, as will the reverse procedure. Moving track data from one disk to another is possible only when both disks are of the same type (400K to 400K, or 800K to 800K.)

In this example, let's suppose an important file on one of your disks has become unreadable. You would perform the following steps to repair the problem:

To find the damaged block:
1. Start MacTools.
   • Double click on the MacTools icon.

2. Insert the disk with the damaged block.

3. Select the **Verify** command from the Disk Menu.
   This command scans the disk for errors.

As MacTools verifies the disk, you see a message similar to:

```
┌─────────────────┐
│  Error on Block │
│       286       │
│ the error is -72│
└─────────────────┘
```

This tells you on which block the error occurred and the type of error.

4. Using the "Track Sector Lookup Table" in Appendix A, find the corresponding track and sector numbers for the block with the error. For this example, block 286 is track 24, sector 6.

5. Exit MacTools.
   • Choose the **Quit** command from the Control Menu.

Note: The following procedures describe how to correct error ID numbers –69 and –72 only. If you get a different error ID number, see the section "The Track Editor (for Technical Users)."

To Start the Track Editor:
1. Start the Copy II program.
   • Double click on the Copy II icon.

2. Select the **Track Editor** option on the Copy II startup screen.

3. Click the Start button.
   When the track editor begins, the display shows the first track and side of the disk in the original drive. The default for the track editor display is the last track number and side selected. For information about relating tracks

22

to sectors and blocks, see the "Track Sector Look up Table" in Appendix A.

```
 Control  Options  View Commands  Edit Commands      ▸
┌────────────────────────────────────────────────────┐
│ ▤□              Track Editor                        │
│ ⟰ Vol:System Disk    Size:800K  Drv:Internal   Spd:8mHz │
│ ┌──────────────────────────────────────────┬──┐    │
│ 0000: 9C B7 D7 B9 EF E9 AD FF 97 BD 94 F3 F6 96 F7 F9 ⬆│ Track: 0│
│ 0010: A5 BB EB AB AD FF FF 9D CE CF 9E F5 F6 FC F6 F5 │  Side:A │
│ 0020: B3 CE BC AD FE FD F6 CE FB E5 9E F6 CF FB FA B7 │         │
│ 0030: AD BF D3 DF CD FD FF DF CB CF D3 E9 BC B7 B3 DA │  Track  │
│ 0040: CF FA CF FD 9B B3 BC BC 97 AD F9 CD B9 FD DE DF │  Length:│
│ 0050: 9D B3 E6 A6 ED F6 FD EE FB 9A 9E F7 B3 F3 96 9A │    0    │
│ 0060: F5 FC E9 B3 FD DF AB F9 D6 A7 9F F6 B2 BD EE BD │         │
│ 0070: F7 EB B9 AC BA EC F5 CB EB EC B2 EC 97 B2 D7 F4 │  Track  │
│ 0080: 9E 9D FC CD BB D6 BF BC BE DD 96 ED B4 D7 DC BE │  Start: │
│ 0090: DA AF E5 AB 9F F6 FD BD 96 F6 E6 AB A6 F7 E5 D7 │   0000  │
│ 00A0: B2 F7 E6 97 CF FA E6 9F BF DB DA B6 FA E9 E7 B4 │  Track  │
│ 00B0: E7 ED E7 EF B9 CB F4 EC AD DF AB CF E7 D7 CB F2 │  End:   │
│ 00C0: BD B5 AB BF EA BF B3 B9 B4 E6 F6 BA AE B9 FF A7 │   7130  │
│ 00D0: B6 DB A7 DA FC BF CE B3 B5 F2 B2 F3 EB E6 E5 CB │  Write  │
│ 00E0: EA 9D B6 DF EA ED B7 DA 9F 9E 96 96 B9 BF D3 A7 │  Track  │
│ 00F0: 9B AC F6 B6 CB 9E FC DC D3 BA CB A6 EC EF A7 A7 ⬇│  From:  │
│ └──────────────────────────────────────────┴──┘   0000 │
└────────────────────────────────────────────────────┘
```

Track Editor Screen

The Track Editor screen shows the raw data read off the disk. For more information about the screen display, see the "Track Editor for Technical Users" section.

To read the track that contains the damaged block:
1. Select the **Read Specific Track** command from the View Commands menu.

2. Type the track number in the edit box. In this example, 24.

23

Type in TRACK NUMBER (0-79) and select the
SIDE you wish to read.

24   ◉ A   ○ B

[OK]   [Cancel]

Read Specific Track dialog box

3. Click OK.

4. Select the **Analyze Track** command from the View
    Commands menu. The track editor selects the beginning
    and the end track length and marks it for the track.

Track Editor

Vol:Copy II Demo   Size:400K   Drv:Internal   Spd:8mHz

0D10: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	Track: 24
0D20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	Side:A
0D30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	
0D40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	
0D50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	Track
0D60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	Length:
0D70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	8491
0D80: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF	
0D90: FF FF FF FF FF FF FF FF D5 AA 96 BD 96 96 9A BF	Track
0DA0: DE AA FF FF FF FF FF FF D5 AA AD 96 96 96 96 96	Start: 0D98
0DB0: 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96	
0DC0: 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96	Track
0DD0: 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96	End: 2E38
0DE0: 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96	
0DF0: 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96	Write Track
0E00: 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96	From: 0D0D

Track Editor screen after Analyze Track

To double check that the error is on that disk:

1. Select the **Inspect Track** command from the View
    Commands menu.

Copy II displays a screen verifying the error and its location.
Make sure that the sector number you got from the "To find the
damaged block" procedure is the bad sector.

```
┌─────────────────────────────────────────────────────────┐
│ ▦▦▦▦▦▦▦▦▦▦▦▦▦▦  Track Inspection  ▦▦▦▦▦▦▦▦▦▦▦▦▦▦ │
│                                                           │
│                                                           │
│          Address Field                    Data Field      │
│                                                           │
│  Track Sector Side Interleave Sides Checksum  Sector Checksum │
│   24    0    A     2          DS               0    OK    │
│   24    6    A     2          DS               6    BAD   │
│   24    1    A     2          DS               1    OK    │
│   24    7    A     2          DS               7    OK    │
│   24    2    A     2          DS               2    OK    │
│   24    8    A     2          DS               8    OK    │
│   24    3    A     2          DS               3    OK    │
│   24    9    A     2          DS               9    OK    │
│   24    4    A     2          DS               4    OK    │
│   24   10    A     2          DS              10    OK    │
│   24    5    A     2          DS               5    OK    │
│                                                           │
│                     ┌──────────┐                          │
│                     │    OK    │                          │
│                     └──────────┘                          │
└─────────────────────────────────────────────────────────┘
```

Inspect Track dialog box

2. Click OK to exit the display.

To display the specific block:
1. Select the **Find Sector** command from the View Commands menu.

2. Type the sector number in the edit box. In this example, 6.

3. Click OK.

```
┌─────────────────────────────────────────────┐
│ ┌───────────────────────────────────────┐   │
│ │                                       │   │
│ │  What sector do you wish to find? (0-10) │   │
│ │                                       │   │
│ │        ┌────────────────────┐         │   │
│ │        │ 6                  │         │   │
│ │        └────────────────────┘         │   │
│ │   ┌──────────┐      ┌──────────┐      │   │
│ │   │    OK    │      │  Cancel  │      │   │
│ │   └──────────┘      └──────────┘      │   │
│ │                                       │   │
│ └───────────────────────────────────────┘   │
└─────────────────────────────────────────────┘
```

Find Sector dialog box

To correct a Data Checksum error (error #–72):
1. In the track editor display, position the cursor on any d byte in the sector (anywhere after the D5 AA AD—refer the Sector Diagram in the "Track Editor for Technical Users" section).

```
╔═══════════════════ Track Editor ═══════════════════╗
║ 🔒 Vol:Copy II Demo      Size:400K   Drv:Internal        Spd:8mHz  ║
╟────────────────────────────────────────────────┬──────────╢
║ 1010:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96  ↑│ Track: 24 ║
║ 1020:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Side:A    ║
║ 1030:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │           ║
║ 1040:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Track     ║
║ 1050:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Length:   ║
║ 1060:  96 96 96 96 96 96 96 96 96 96 96 DE AA FF FF FF   │ 8491      ║
║ 1070:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   │           ║
║ 1080:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   │ Track     ║
║ 1090:  FF FF D5 AA 96 BD 9F 96 9A CD DE AA FF FF FF FF   │ Start:    ║
║ 10A0:  FF FF D5 AA AD 9F 96 96 96 96 96 96 96 96 96 96   │ 0D98      ║
║ 10B0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Track     ║
║ 10C0:  96 96 96 96 96 96 96 96 96 96 A7 96 96 96 96 96   │ End:      ║
║ 10D0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ 2E38      ║
║ 10E0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Write     ║
║ 10F0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Track     ║
║ 1100:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96  ↓│ From:     ║
║                                                          │ 0D0D      ║
╚════════════════════════════════════════════════╧══════════╝
```

Cursor in data area

2. Select the edit mode by clicking the mouse button on the data byte.

3. Select the **Recalculate Checksum** command from the View Commands menu.

Copy II recalculates the data checksum and places the correct value in the buffer. Now you need to write the corrected data to the disk, skip ahead to page 29.

To correct an Address Checksum error (error #–69):
1. In the track editor display, position the cursor on any byte in the sector ID, or address (anywhere after the D5 AA 96—refer to the Sector Diagram in the "Track Editor for Technical Users" section).

```
╔═══════════════════ Track Editor ═══════════════════╗
║ 🔒 Vol:Copy II Demo      Size:400K   Drv:Internal        Spd:8mHz  ║
╟────────────────────────────────────────────────┬──────────╢
║ 1010:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96  ↑│ Track: 24 ║
║ 1020:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Side:A    ║
║ 1030:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │           ║
║ 1040:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Track     ║
║ 1050:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Length:   ║
║ 1060:  96 96 96 96 96 96 96 96 96 96 96 DE AA FF FF FF   │ 8491      ║
║ 1070:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   │           ║
║ 1080:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   │ Track     ║
║ 1090:  FF FF D5 AA 96 BD 9F 96 9A CD DE AA FF FF FF FF   │ Start:    ║
║ 10A0:  FF FF D5 AA AD 9F 96 96 96 96 96 96 96 96 96 96   │ 0D98      ║
║ 10B0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Track     ║
║ 10C0:  96 96 96 96 96 96 96 96 96 96 A7 96 96 96 96 96   │ End:      ║
║ 10D0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ 2E38      ║
║ 10E0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Write     ║
║ 10F0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96   │ Track     ║
║ 1100:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96  ↓│ From:     ║
║                                                          │ 0D0D      ║
╚════════════════════════════════════════════════╧══════════╝
```

Cursor in address area

2. Select the edit mode by clicking on one of the bytes in the sector ID.

3. Select the **Recalculate Checksum** command from the View Commands menu.

Copy II recalculates the address checksum and places the correct value in the buffer.

To write the corrected information to the disk:
1. Select the **Write the Track** command.

2. Check to see that the drive specified in the message box is the correct drive. If not, change it to the correct drive.

3. Click OK.

Note: You could also save the corrected data to a different drive and disk. This is useful in that you can save to a different disk and avoid changing your original disk.

To save to a different disk:

1. Insert another disk.

2. Select the **Toggle Drive** command.

3. Select the **Write the Track** command.

The Track Editor (for Technical Users)

This section is for more technical users of Copy II who want additional information about finding and examining damaged tracks. This section is also for users who want to better understand diskette encoding and different copy protections.

How Data is Stored on Macintosh Disks

The data on a Macintosh disk is stored on 80 circular tracks numbered 0 to 79. Most Macintosh 3.5" disks are formatted double–sided, meaning they contain information on both the bottom and top surfaces of the disk media. Each of these 80 circular tracks is therefore divided into two "sides". The Macintosh 3.5" drive has two read/write heads, one for the top surface and one for the bottom. The drive can position these heads – as a unit – over and under any track on the disk.
The top and bottom surface of each circular track is further divided into several sectors, much like slices of pie. Each sector stores 512 bytes of usable data. The number of sectors per track is not constant across the disk, but varies depending on the track number.

Each sector actually holds 524 bytes of data: the 512 data bytes are adjacent to 12 "tag" bytes. These tag bytes contain information about the file using the sector.
Because the outer tracks on the disk have a greater circumference than the inner tracks, more media area is available for storing data. The tables in Appendix A list sectors (or blocks) per track for 400K single–sided and 800K double–sided disks, starting at the outside—largest circumference—track on the disk.
Blocks and sectors are actually the same thing, but numbered differently. A double–sided Macintosh disk contains a total of 1600 blocks or sectors. When thought of as sectors, they are numbered within each track and side When thought of as blocks, they are numbered for the entire disk: 0 to 1599 (0000 to 063F in hex). For example, block 0000 is the same as track 00, side A, sector 0. Block 12 (000C) is the same as track 00, side B, sector 0. Because the number of sectors per track varies, the conversion from block numbers to equivalent track, side, and sector numbers is less than obvious. For details in converting block numbers, see the "Track Sector Lookup Table" in Appendix A.

The following sector diagram shows how sector data is organized on a Macintosh disk.

Sector Diagram (left)

Sync Bytes — FF FF FF FF ... (40 or 50 sync bytes) →

Address Header

D5 AA 96	Track Number	Sector Number	High–Byte Track Number	Side/ Interleave	Address Checksum	DE AA
3 bytes	1 byte	1 byte	1 byte	1 byte	1 byte	2 bytes

Sync Bytes — FF FF FF FF ... (Approx. 10 sync bytes) →

DataHeader

D5 AA AD	Sector Number
3 bytes	1 byte

↗ Data Prolog

Sector

Sector Data

Data Checkum 4 bytes	DE AA 2 bytes

↗ Data Epilog

Sector Diagram

It's important to note here that you can't view the actual data written on a Macintosh disk. Since not all possible byte values can be read correctly, information being written to the disk must first be "encoded" in some way so that only valid bytes are written. Data is encoded and written to a Macintosh disk using a procedure called 6–and–2 encoded storage. For details on this encoding procedure, see the "Byte Encoding Methods" tables in Appendix B.

Overview of the Track Editor

Below is the Track Editor screen. The following describes the screen and its components.

```
      Control  Options  View Commands  Edit Commands

 ╔══════════════════ Track Editor ══════════════════╗
 ║ Vol:Copy II Demo    Size:400K  Drv:Internal   Spd:8mHz ║
 ╟───────────────────────────────────────────────────╢
 09E0: A6 96 97 BC A6 96 9A BC A6 96 9D BC A6 96 A7 BC   Track:  0
 09F0: A6 96 B4 BC A6 96 D6 BC A6 B4 96 BC A6 D6 96 BC   Side:A
 0A00: A6 96 97 BD A6 96 9A BD A6 96 9D BD A6 96 A7 BD
 0A10: 96 BD A6 A7 DE AA FE FF FF FF FF FF FF FF FF FF   Track
 0A20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   Length:
 0A30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   9228
 0A40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
 0A50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   Track
 0A60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF D5 AA   Start:
 0A70: 96 96 96 96 D9 D9 DE AA FF FF FF FF FF FF FF FF   0A6E
 0A80: FF FF D5 AA AD 96 96 96 96 96 96 9B 9B 96 FC FF   Track
 0A90: FD 96 96 9A 9A 97 B4 AC 9E E7 F6 AE B2 AF DC DB   End:
 0AA0: BD D7 B9 AB AB F3 BF 96 FA EB 9E FE 9A DF F4 BD   2E29
 0AB0: EC A7 9F B4 B3 DF E6 96 EC EB AB AD FF FF 9D CE
 0AC0: CF 9E F5 F6 FC F6 F5 B3 CE BC AD FE FD F6 CE FB   Write
 0AD0: E5 9E F6 CF FB FA B7 AD BF D3 DF CD FD FF DF CB   Track
                                                        From:
                                                        0A1D
 ╚═══════════════════════════════════════════════════╝
```

Track Editor screen

The Track Editor screen displays the bytes of information read off the disk. The bytes displayed in inverse are called Sync bytes. Sync bytes are unusual because they are 10 bits long, not the normal 8 bits.

The top of the screen displays the following information:

- Lock icon: displays whether or not the current disk is write protected.

- Vol: displays the name of the current disk in the drive.

- Size: displays whether the current disk is 400K or 800K disk.

- Drv: displays what drive the next Read or Write command will affect.

- Spd: displays what the Reference Clock speed is set to.

The right side of the Track Editor display shows track location and size information.

- Track: displays the current track number.

- Side: displays the current track side; A or B (400K disks will always be side A.)

- Track Length: displays how many bytes are on the track if an Analyze has been performed.

- Track Start: displays the track start address if an Analyze has been performed.

- Track End: displays the last byte of the track if an Analyze has been performed.

- Write Track From: displays where the write routine will write from if an Analyze has been performed.

The Edit Mode

Use the edit mode to edit selected bytes. You can also use the edit mode to:
- Set the start and end of the track
- Set where the track is written from
- Change a sync to a data byte

- Change a data byte to a sync

Once edited, the track can be written to a disk in any drive.

To edit the track data:
1. In the track editor display, move the cursor into the track display and select the byte you want to change by clicking on it. The selected byte is displayed in reverse video. Notice that the data is shown in hexadecimal numbering system format.
2. Edit the byte by typing any 0 – 9 or A – F text character. Any other character is ignored. For help in translating hexadecimal to decimal, see the "Number Conversion Table" in Appendix C.

To undo your edits:
- Select the **Re-Read This Track** command.
  This command re-reads the track. As long as you have not yet rewritten the track, you can undo any edits you have made.

Scrolling in the Edit Mode

In the edit mode, editing the last byte in the display causes the screen to automatically scroll down a line. The screen scrolls up a line when you press the backspace key with the cursor on the first byte in the display. When you select the Find String command, the first byte of the found string flashes when displayed.

Saving Edited Track Data

The track data you edit is saved in the track editor display buffer, but is not written to the disk. You have to save the edited track to disk with the Write The Track command.

To save an edited track to disk:

1. Select the **Write The Track** command.
   Selecting this command displays a message asking if you want to write the track to the disk in the source drive.
2. Click OK to write the edited track to the drive it was read from.

To write the edited track to a different drive:
1. Select **Toggle Drive**.
   This changes the selected drive (shown in the track editor display.)

2. Select the **Write The Track** command.

3. Click OK to write the edited track to another drive.

Note: Editing the data in a sector causes the data checksum to be incorrect (bad.) For information on checking the condition of data and header checksums, see the Inspect Track command. For information on correcting a bad checksum, see the Recalculate Checksum command.

Exiting the Edit Mode

To exit the edit mode:
   • Press Return or Enter.

Track Editor commands

The Track Editor commands are contained in two menus: View Commands and Edit Commands. The commands and functions described in the following section enable you to find, view, edit, and write the data on any track of a program disk.

View Commands

The following section gives information about the specific View commands.
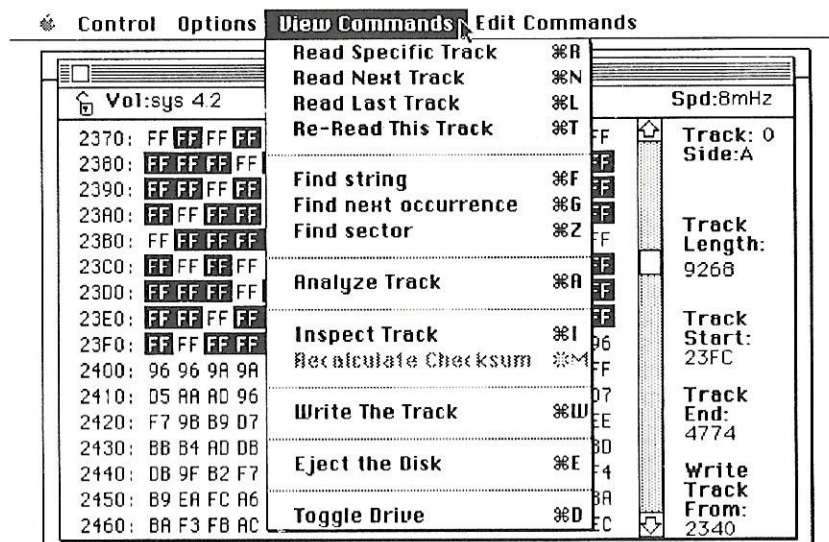
View commands

Read Specific Track

Reads any side of any track on the disk when you specify a track number, 0–79 decimal, and side, A or B. When reading 400K (single–sided) disks, the B–side selector button is disabled.

Note: The Read Specific Track command defaults to the last track read.

Once you specify the track number and select a side, the track editor reads the track into the display buffer and displays track data as raw data. Use the scroll bars to move through and display the track data.

Read Next Track

For 400K disks, this command reads the next track on the disk.

For 800K disks, this command reads the next side on the disk.

Read Last Track

For 400K disks, this command reads the previous track on the disk.

For 800K disks, this command reads the previous side on the disk.

Re-Read This Track

Reads and displays the current track. When you select this command, the track editor re-reads the current track and positions the display at the beginning of the display buffer.

Find String

Searches for a hexadecimal text string on the displayed track. The Find String command defaults to the last text string found.

Find Next Occurrence

Finds the next occurrence of the string found with the Find String command.

Find Sector

Finds and displays any sector on the track when you specify a sector number. The track editor displays the sector specified, or notifies you that it can't find the sector.

Analyze Track

Uses Copy II's Analyze routines to find the beginning and end of the track, the track length, and where the track is written from.

Copy II locates the beginning of a track by searching for the data bytes immediately following the largest group of sync bytes on the track. Copy II then searches for a pattern matching these data bytes. When it finds the match, Copy II defines it as the end of the track.

When you select the Analyze Track command, the track editor performs the analysis and displays the track information. Track Length specifies the length of the track analyzed. Track Start and Track End specify the start and end of the track in the buffer. You may use the editing mode to set the start and end of the track and where the track is written from. For detailed information on editing track data, see the section titled The Edit Mode.

Inspect Track

Selecting this command displays the following information for the current track:

- track number
- side
- a list of all sector numbers
- sector interleave
- type of disk (single or double sided)
- condition of the address header and data checksums for each sector. The condition will be either "ok" or "bad."

Track Inspection

| Address Field | | | | | | Data Field | |
Track	Sector	Side	Interleave	Sides	Checksum	Sector	Checksum
24	0	A	2	DS		0	OK
24	6	A	2	DS		6	BAD
24	1	A	2	DS		1	OK
24	7	A	2	DS		7	OK
24	2	A	2	DS		2	OK
24	8	A	2	DS		8	OK
24	3	A	2	DS		3	OK
24	9	A	2	DS		9	OK
24	4	A	2	DS		4	OK
24	10	A	2	DS		10	OK
24	5	A	2	DS		5	OK

OK
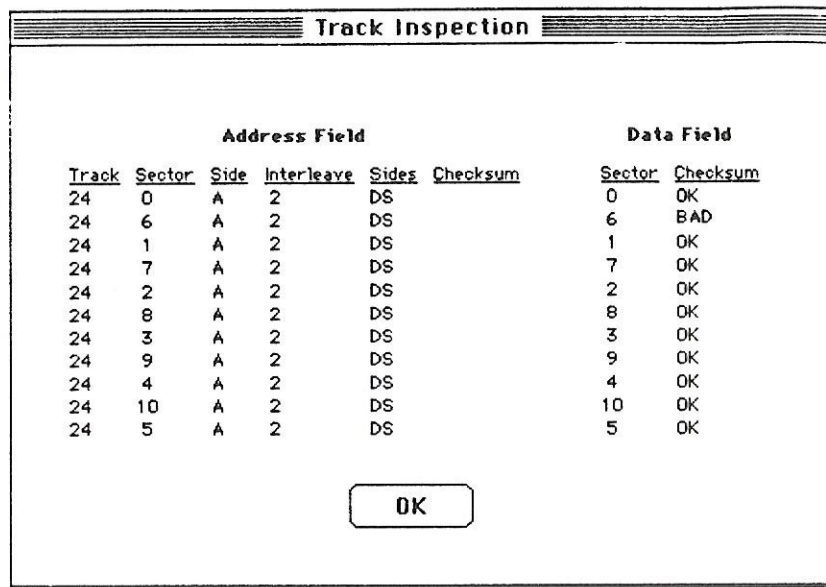
Inspect Track screen

If the track editor is unable to locate a data field sector (for example, if a protection scheme has changed the data header), the condition of the data checksum will be flagged as "bad."

The Inspect Track command allows you to quickly inspect a track for incorrect checksums. Inspect Track also enables you to verify a disk error without having to exit Copy II and start the Verify option in MacTools.

Recalculate Checksum

Recalculates a bad checksum. If you have edited the data in a sector, or if the data on the disk has been electronically

40

damaged, the checksum will be bad. Some applications won't load a file if it contains a bad checksum, or it will only load the data that isn't affected by the bad block. The Recalculate Checksum command enables you to repair the bad block and to recover most of an otherwise unloadable file.

The Recalculate Checksum command is most useful for recovering data for which MacTools has displayed error ID numbers −69 and −72. The Recalculate Checksum command minimizes the task of replacing bad data by enabling you to recover the entire file—possibly including some of the data in the bad block. For more information on error ID numbers, see the Error ID Numbers section in the back of the Copy II manual.

For example, you have a file comprised of five blocks and an error occurs in the fourth block. You can use the Recalculate Checksum command to recover the data up to the error, possibly some of the data around the error, and all of the data in the fifth block.

File comprised of Data Blocks

Data Block — Data Block — Data Block — Data Block — Data Block
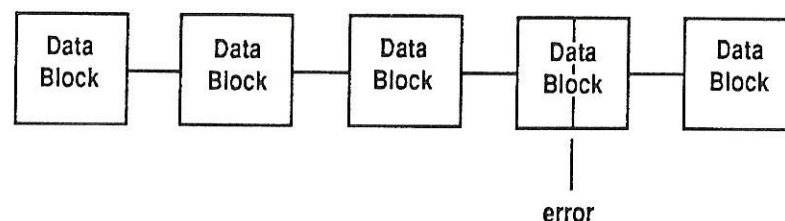
error

Use the Recalculate Checksum command to recover data before and after the error.

41

To correct a Data Checksum error (error #–72):
1. In the track editor display, position the cursor on any data byte in the sector (anywhere after the D5 AA AD—refer to the Sector Diagram.)

2. Select the edit mode by clicking the mouse button on the data byte.

3. Select the **Recalculate Checksum** command from the View Commands menu.

Copy II recalculates the data checksum and places the correct value in the buffer.

To correct an Address Checksum error (error #–69):
1. In the track editor display, position the cursor on any data byte in the sector ID, or address (anywhere after the D5 AA 96—refer to the Sector Diagram.)

2. Select the edit mode by clicking the mouse button on one of the bytes in the sector ID.

3. Select the **Recalculate Checksum** command from the View Commands menu.

Copy II recalculates the address checksum and places the correct value in the buffer.

Write the Track

Writes the modified track to the drive specified at the top of the display. After making changes to a track, this command lets you copy the track to another drive. Once copied, changes can be tested without corrupting the original version of the program.

To write the track:
1. Select the **Write the Track** command.

Selecting the command displays a message asking if you want to write to the specified drive.

2. Click OK.

To write the modified track to a different drive:
1. Select the **Toggle Drive** command.

This changes the selected drive.

2. Select the **Write the Track** command.
3. Click OK to write the track to the new drive.

Eject the Disk
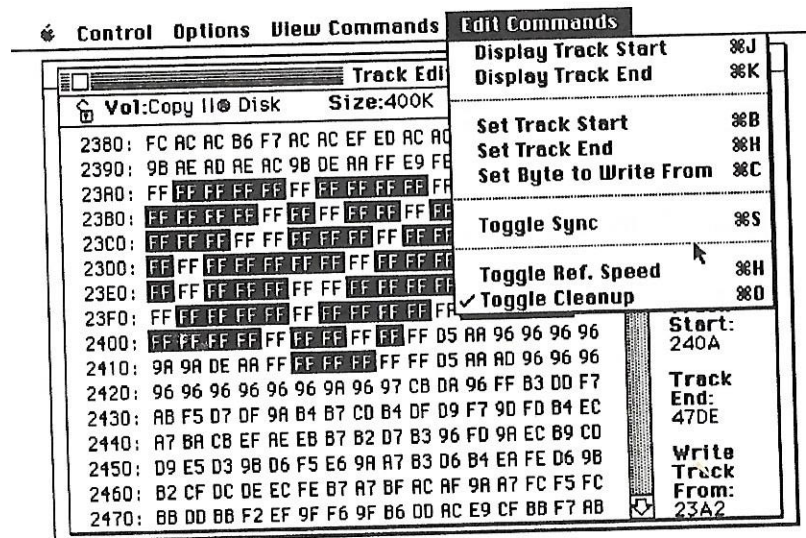
Ejects the disk in the selected drive.

Toggle Drive

Changes the drive selected for reading and writing data.

Edit Commands

The following section gives information about the specific edit commands.

Display Track Start   ⌘J
Display Track End   ⌘K

Set Track Start   ⌘B
Set Track End   ⌘H
Set Byte to Write From ⌘C

Toggle Sync   ⌘S

Toggle Ref. Speed   ⌘H
✓Toggle Cleanup   ⌘O

Track Edi[tor]
Vol:Copy II® Disk   Size:400K

```
2380: FC AC AC B6 F7 AC AC EF ED AC AC
2390: 9B AE AD AE AC 9B DE AA FF E9 F
23A0: FF FF FF FF FF FF FF FF FF FF FF
23B0: FF FF FF FF FF FF FF FF FF FF F
23C0: FF FF FF FF FF FF FF FF FF FF F
23D0: FF FF FF FF FF FF FF FF FF FF F
23E0: FF FF FF FF FF FF FF FF FF FF F
23F0: FF FF FF FF FF FF FF FF FF FF
2400: FF FF FF FF FF FF FF FF FF D5 AA 96 96 96 96
2410: 9A 9A DE AA FF FF FF FF FF FF D5 AA AD 96 96 96
2420: 96 96 96 96 96 96 9A 96 97 CB DA 96 FF B3 DD F7
2430: AB F5 D7 DF 9A B4 B7 CD B4 DF D9 F7 9D FD B4 EC
2440: A7 BA CB EF AE EB B7 B2 D7 B3 96 FD 9A EC B9 CD
2450: D9 E5 D3 9B D6 F5 E6 9A A7 B3 D6 B4 EA FE D6 9B
2460: B2 CF DC DE EC FE B7 A7 BF AC AF 9A A7 FC F5 FC
2470: BB DD BB F2 EF 9F F6 9F B6 DD AC E9 CF BB F7 AB
```

Start:
240A

Track
End:
47DE

Write
Track
From:
23A2

Edit commands

Display Track Start

Moves the display window to the beginning of the track. When you choose this command, you see the address field and the first part of the data field for the first sector on the track.

Display Track End

Moves the display window to the end of the track. When you choose this command, you see the bottom half of the data for the last block on the current track followed by the sync bytes.

Set Track Start

Manually sets the start of the track. Technical users can use this command to mark a track for writing only a part of the track to a disk.

Set Track End

Manually sets the end of the track. Technical users can use this command to mark a track for writing only a part of the track to a disk.

Set Byte to Write From

Enables you to determine where a Write will begin.

Toggle Sync

Changes the current byte from 8 bit to 10 bit (sync bits are 10 bit bytes), or vice versa. Selected sync bytes appear reverse video – white on black.

Toggle Ref Clock

Allows you to change the reference clock rate and then read or write using the new setting.

The Diskette Controller chip (IWM) inside the drive has an "internal data separator" which needs a "reference clock" to properly read data from the disk. The Macintosh allows setting this reference clock to either 7mHz or 8mHz. Normally, the Macintosh sets the reference clock in the IWM to 8mHz, however some protected programs have one track (usually track 79) written with the IWM reference clock set to 7mHz. When a normal – 8mHz –read is then attempted, the information on the track has many incorrect values. Use the Toggle Ref Clock command to change the reference clock speed in the IWM and then read or write at that speed.

Note: This reference clock rate is different than the disk drive speed. Also, as this option toggles an internal Copy II flag, it will have no effect on the displayed information for the track until you do a read or a write command.

Toggle Cleanup

Cleans the buffer after you perform a read.

While doing a read, the Copy II read routine decides if the byte read off the disk is an 8 bit byte or a 10 bit byte (sync byte) and then flags the byte in the buffer. Sometimes, due to the limits of the Macintosh hardware for measuring such small periods, the read routine makes a mistake in flagging a byte. Copy II has a built-in routine which clears these errors.

To see the track data as it was read from the disk without the cleanup, turn this option off.

Examining Protection Schemes

The following is an example procedure for examining a copy protected disk. Also included are some examples of various protection schemes you may come across while examining copy protections.

Example procedure for examining a protected disk

The steps in the following example outline one approach you can take to examine copy protection.

1. Start MacTools and verify the protected disk.

2. Locate all errors on the disk, and note the error numbers and block locations.

3. Exit MacTools and start the Copy II Track Editor option.

4. Choose one of the errors and convert its block number to a track and sector location. See the "Track Sector Lookup Table" in Appendix A.

5. Use the track editor to read and display the track and sector.

Now, compare the sector with one from a file that you know to be correct.

Protection Schemes

Following are some examples of various protection schemes:

Example #1: MacTools gives error #–67 on every block on track 79

Performing a Read Specific Track of track 79 shows a track with no sync gaps, and no address or data headers.

```
╔══════════════════ Track Editor ═══════════════════╗
║ No Volume in drive              Drv:Internal        Spd:8mHz ║
╠═══════════════════════════════════════════════════╣
║ 0000: 9F FF FF FF FF D9 BE B4 9B B5 BC B7 FB FD FE FF    Track: 79   ║
║ 0010: FF DB FA D2 DD A9 F2 DF EF F3 FD FE FF DB FA D2    Side:A      ║
║ 0020: DD A9 F2 DF EF F7 FB FD FF B6 FA D2 DD A9 F2 DF                ║
║ 0030: E7 F9 FE FF FF DB FA D2 DC D4 BC B7 FB FD FE FF    Track       ║
║ 0040: FF DB FA D2 DD A9 F2 DF E7 FB FD FE FF DB FA D2    Length:     ║
║ 0050: DD A9 F2 DF EF F3 FC FF FF DB FA D2 DC D4 BC B7    0           ║
║ 0060: F9 FE FF FF FF DB FA D2 DD A9 F2 DF EF F7 F9 FE                ║
║ 0070: FF D9 BE B4 9B B5 BC B7 FB FC FF FF FF D9 BE B4    Track       ║
║ 0080: 9B B5 BC B7 FB FD FE FF FF DB FA D2 DD A9 F2 DF    Start:      ║
║ 0090: E7 F9 FE FF FF DB FA D2 DD A9 F2 DF EF F7 FB FD    0000        ║
║ 00A0: FF B6 FA D2 DD A9 F2 DF EF F3 FD FE FF DB FA D2    Track       ║
║ 00B0: DD A9 F2 DF E7 FB FD FE FF DB FA D2 DD A9 F2 DF    End:        ║
║ 00C0: EF F3 FC FF FF DB FA D2 DD A9 F2 DF EF F7 F9 FE    7130        ║
║ 00D0: FF DB FA D2 DD A9 F2 DF E7 FB FC FF FF DB FA D2    Write       ║
║ 00E0: DD A9 F2 DF EF F3 FC FF FF DB FA D2 DD A9 F2 DF    Track       ║
║ 00F0: EF F7 F9 FE FF DB FA D2 DD A9 F2 DF EF F3 FD FE    From:       ║
║                                                         0000        ║
╚═══════════════════════════════════════════════════╝
```

8mHz track read

If you change the Reference Clock speed and then Re–read the track, you will see a repeating pattern throughout the read buffer.

```
╔══════════════════ Track Editor ═══════════════════╗
║ No Volume in drive              Drv:Internal        Spd:7mHz ║
╠═══════════════════════════════════════════════════╣
║ 0000: B7 D4 BC B7 F9 FE FF FF FF D9 BE B4 9B 9A 97 96    Track: 79   ║
║ 0010: FF FF FF FF FF D9 BE B4 9B 9A 97 96 FF FF FF FF    Side:A      ║
║ 0020: FF D9 BE B4 9B 9A 97 96 FF FF FF FF FF D9 BE B4                ║
║ 0030: 9B 9A 97 96 FF FF FF FF FF D9 BE B4 9B 9A 97 96    Track       ║
║ 0040: FF FF FF FF FF D9 BE B4 9B 9A 97 96 FF FF FF FF    Length:     ║
║ 0050: FF D9 BE B4 9B 9A 97 96 FF FF FF FF FF D9 BE B4    0           ║
║ 0060: 9B 9A 97 96 FF FF FF FF FF D9 BE B4 9B 9A 97 96                ║
║ 0070: FF FF FF FF FF D9 BE B4 9B 9A 97 96 FF FF FF FF    Track       ║
║ 0080: FF D9 BE B4 9B 9A 97 96 FF FF FF FF FF D9 BE B4    Start:      ║
║ 0090: 9B 9A 97 96 FF FF FF FF FF D9 BE B4 9B 9A 97 96    0000        ║
║ 00A0: FF FF FF FF FF D9 BE B4 9B 9A 97 96 FF FF FF FF    Track       ║
║ 00B0: FF D9 BE B4 9B 9A 97 96 FF FF FF FF FF D9 BE B4    End:        ║
║ 00C0: 9B 9A 97 96 FF FF FF FF FF D9 BE B4 9B 9A 97 96    7130        ║
║ 00D0: FF FF FF FF FF D9 BE B4 9B 9A 97 96 FF FF FF FF    Write       ║
║ 00E0: FF D9 BE B4 9B 9A 97 96 FF FF FF FF FF D9 BE B4    Track       ║
║ 00F0: 9B 9A 97 96 FF FF FF FF FF D9 BE B4 9B 9A 97 96    From:       ║
║                                                         0000        ║
╚═══════════════════════════════════════════════════╝
```

7mHz track read

The repeating pattern in this example is:

$9B 9A 97 96 FF FF FF FF FF D9 BE B4

This is the pattern the copy protection is looking for.

This is a case where the copy protection scheme uses the 7mHz reference clock on a track. When you try to read it with the normal 8mHz rate, the data is bad. But when you change the rate to 7mHz, it reads OK.

Copy II's bitcopy option automatically reproduces this track.

Example #2: MacTools verify option shows error #-70 on one or more blocks

In this scheme, the normal data prolog bytes ($D5 AA AD) are replaced by some other bytes. You will find the address prolog (D5 AA 96) and address epilog bytes (DE AA) followed by sync bytes (FF FF FF) followed by non-normal header bytes. (In the example shown, an AB CD AD.)

Copy II's bitcopy option automatically reproduces these reversed data headers.

Example #3: MacTools verify does not detect any errors

In the example shown, the normal sync bytes (FF's) have been replaced with a different byte: AA's. This makes the sectors slightly unreliable (because the AA, as a sync byte, violates the GCR 6-and-2 encoding scheme) and the read routines on the protected disk simply double check that the bytes before the address and data prologs are AA's.

 Control Options View Commands Edit Commands

```
                    Track Editor
 No Volume in drive           Drv:Internal      Spd:8mHz
ODF0: EB EC BD F9 BC CD AC DB DB A7 AC D7 E5 FA F5 F2   Track: 49
OE00: E6 F4 B6 E6 F5 DD 9E F9 9A E5 97 B4 BC DB CF 97   Side:A
OE10: D9 CE DB AF FF FD DF FE 9D E9 96 DE B3 FF D9 DD
OE20: 9F 9D AC BF F2 AD FB F9 EA D9 9B F9 97 AF A6 9D
OE30: DC AB EB DA F2 E7 FB B2 FB BE AE DC 96 BC BC B5   Track
OE40: 9F EE F6 BE D6 EB F2 96 FD E5 B9 E5 F9 EE DE AA   Length:
OE50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF   6922
OE60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
OE70: FF FF FF FF FF FF FF FF FF D5 AA 96 EE 97 96      Track
OE80: 9A EF DE AA FF FF FF FF FF FF FF FF AB CD AD 97   Start:
OE90: 96 96 96 96 AC BD CB 9B 96 96 D7 DC EB F5 DB D6   087C
OEA0: EC FA 96 EA ED E6 DD FF CE E6 AE FF F2 BA DB F9
OEB0: CB CB 96 F7 F4 9F CF CE FF CD B6 E7 E7 E7 AC DB   Track
OEC0: FC AF 96 FA E9 BC A6 BC D7 EC EB BD AB BA AC B6   End:
OED0: DE AF B7 B4 CB 9D 9E EA AE FE FA FE FD BA E9 A7   2352
OEE0: F7 E5 E7 EC EF AD DA B5 EA D3 ED BC F4 EC F5 DC
                                                        Write
                                                        Track
                                                        From:
                                                        0848
```

Reversed Data bytes

Reversed Data Prolog bytes

 Control Options View Commands Edit Commands

```
                    Track Editor
 No Volume in drive           Drv:Internal      Spd:8mHz
1720: F3 AC AB AE F3 A7 B6 AE DF AE F3 B6 DE AA FF B8   Track: 1
1730: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA   Side:A
1740: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA
1750: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA   Track
1760: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA   Length:
1770: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA   9233
1780: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA
1790: AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA   Track
17A0: AA AA AA AA AA AA AA AA AA AA D5 AA 96 97 96 96   Start:
17B0: 9A 9B DE AA FF AA AA AA AA AA D5 AA AD 96 96 96   17AA
17C0: 96 96 AC 9F A6 97 96 96 CD 9B AC DA E7 FF B5 A7
17D0: BE AF D7 B4 BE AF 97 D7 BF AF B5 9A BF AF D7 9D   Track
17E0: BF AF 97 AB CB AF 97 B6 CB AF 97 DB CB AF B5 A7   End:
17F0: CB AF D7 B4 CB AF 97 D7 CD AF B5 9A CD AF D7 9D   3B49
1800: CD AF 97 AB CE AF 97 B6 CE AF 97 DB CE AF B5 A7
1810: CE AF D7 B4 CE AF 97 D7 CF AF B5 9A CF AF D7 9D   Write
                                                        Track
                                                        From:
                                                        1738
```

AA's in sync gaps

Example #4: MacTools verify does not detect any errors

Using the normal Macintosh ROM format routines, the gap between the address header and the data field are usually 10 – 16 bytes long. In the example shown, the gap fields are all exactly 6 bytes long.

```
     Control  Options  View Commands  Edit Commands
┌─────────────────────────────────────────────────────┐
│░░░░░░░░░░░░░░░░░░░░ Track Editor ░░░░░░░░░░░░░░░░░░░░░│
│ No Volume in drive          Drv:Internal    Spd:8mHz │
│ ┌──────────────────────────────────────────┬─────────┐
│ │1A20: AD 9E B9 B7 AE 9E DB DD AE 9E B9 AF AF 9E DB BF│ Track: 1 │
│ │1A30: AF 9E 9D F4 B2 9E B9 E6 B2 9E F3 B9 B2 9E DB E5│ Side:A   │
│ │1A40: B3 9E B9 B7 B4 9E DB DD B4 9E B9 AF B5 9E DB BF│          │
│ │1A50: B5 9E 9D F4 B6 9E B9 E6 B6 9E F3 B9 B6 9E DB E5│ Track    │
│ │1A60: B7 9E B9 B7 B9 9E DB DD B9 9E B9 AF BA 9E DB BF│ Length:  │
│ │1A70: BA 9E 9D F4 BB B4 BB 9E F4 DE AA FF FF FF FF FF│ 9250     │
│ │1A80: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF│          │
│ │1A90: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF│ Track    │
│ │1AA0: FF FF D5 AA 96 97 9F 96 9A 9E DE AA FF FF FF FF│ Start:   │
│ │1AB0: FF FF D5 AA AD 9F 96 96 96 96 AC 97 9A 9B 96 96│ 17A6     │
│ │1AC0: 9B B6 B4 F5 EE BE BB A7 FC BD DB DE CD F2 AE BE│ Track    │
│ │1AD0: DE B4 AC 9F 97 CB B4 AE E6 F3 D9 EA B2 D3 AC BA│ End:     │
│ │1AE0: BA FC 9E 97 CD 9F EC 9A F5 EB AF B4 B9 A7 F4 DF│ 3B5A     │
│ │1AF0: CF E7 FF DB F5 EE E5 AD D7 EB F6 EA FF B5 DE DB│          │
│ │1B00: FB EC DE F6 FA DE BD DA 96 B6 E7 F5 9B E7 DE BC│ Write    │
│ │1B10: FC E7 FB CF 9D DA DC FF FD DA BC FE FD DA F6 FC│ Track    │
│ └──────────────────────────────────────────┴ From:   │
│                                               1738     │
└─────────────────────────────────────────────────────┘
```
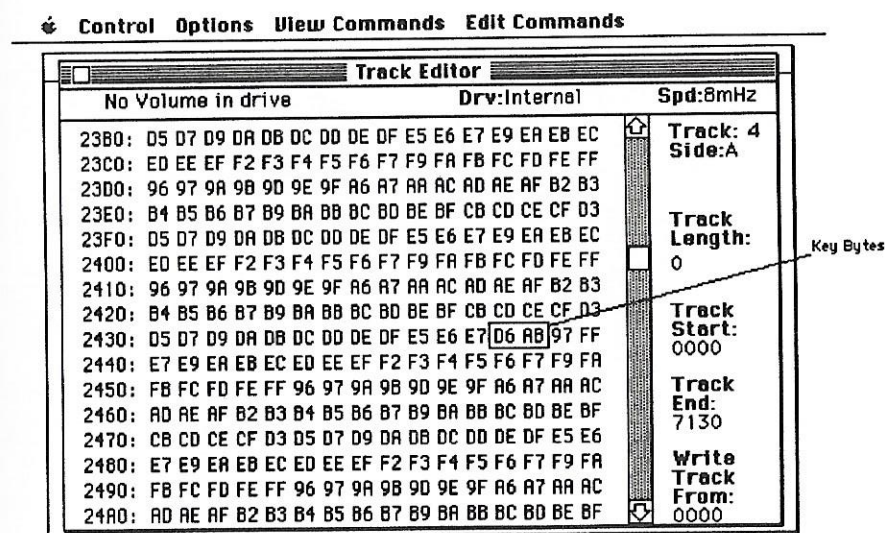
Small gap

When the copy protected program runs, it checks that all the gaps before data headers are exactly 6 bytes long.

Example #5: MacTools verify shows –67's on every sector on a track

When the protected disk was created, a 64 byte pattern was written to cover the entire track. (All the valid 6&2 encoded byte values in ascending order.) The protection uses special "Key" bytes to mark where they started writing the track and where they finished writing the track. In the example shown the "key" bytes for the last bytes written to the disk are "D6 AB".

```
     Control  Options  View Commands  Edit Commands
┌─────────────────────────────────────────────────────┐
│░░░░░░░░░░░░░░░░░░░░ Track Editor ░░░░░░░░░░░░░░░░░░░░░│
│ No Volume in drive          Drv:Internal    Spd:8mHz │
│ ┌──────────────────────────────────────────┬─────────┐
│ │23B0: D5 D7 D9 DA DB DC DD DE DF E5 E6 E7 E9 EA EB EC│ Track: 4 │
│ │23C0: ED EE EF F2 F3 F4 F5 F6 F7 F9 FA FB FC FD FE FF│ Side:A   │
│ │23D0: 96 97 9A 9B 9D 9E 9F A6 A7 AA AC AD AE AF B2 B3│          │
│ │23E0: B4 B5 B6 B7 B9 BA BB BC BD BE BF CB CD CE CF D3│ Track    │
│ │23F0: D5 D7 D9 DA DB DC DD DE DF E5 E6 E7 E9 EA EB EC│ Length:  │
│ │2400: ED EE EF F2 F3 F4 F5 F6 F7 F9 FA FB FC FD FE FF│ 0        │
│ │2410: 96 97 9A 9B 9D 9E 9F A6 A7 AA AC AD AE AF B2 B3│          │
│ │2420: B4 B5 B6 B7 B9 BA BB BC BD BE BF CB CD CE CF D3│ Track    │
│ │2430: D5 D7 D9 DA DB DC DD DE DF E5 E6 E7 D6 AB 97 FF│ Start:   │
│ │2440: E7 E9 EA EB EC ED EE EF F2 F3 F4 F5 F6 F7 F9 FA│ 0000     │
│ │2450: FB FC FD FE FF 96 97 9A 9B 9D 9E 9F A6 A7 AA AC│ Track    │
│ │2460: AD AE AF B2 B3 B4 B5 B6 B7 B9 BA BB BC BD BE BF│ End:     │
│ │2470: CB CD CE CF D3 D5 D7 D9 DA DB DC DD DE DF E5 E6│ 7130     │
│ │2480: E7 E9 EA EB EC ED EE EF F2 F3 F4 F5 F6 F7 F9 FA│          │
│ │2490: FB FC FD FE FF 96 97 9A 9B 9D 9E 9F A6 A7 AA AC│ Write    │
│ │24A0: AD AE AF B2 B3 B4 B5 B6 B7 B9 BA BB BC BD BE BF│ Track    │
│ └──────────────────────────────────────────┴ From:   │
│                                               0000     │
└─────────────────────────────────────────────────────┘
                                        Key Bytes
```

Repeating – Splice marked by key bytes

It is very hard to determine the track start and end. Copy II has been hard-coded to handle many protection schemes.

Example #6: MacTools verify shows error #–71

In this scheme, the sector starts out looking normal – D5 AA AD data prolog bytes, followed by what looks like normal bytes. But then the sector hits some unusual bytes. What happened is that when the block was originally written, there was a zero byte written out. When the drive tries to read that byte back in, it will read it in different ways on different reads. Reading it as a zero byte will cause the hardware to "lose sync" since it violates the GCR encoding rules. The protection scheme checks to make sure that if it reads the block several different times, it gets several different checksum values returned.

Zero in sector

Example # 7: MacTools verify shows no errors

A normal data field is the D5 AA AD prolog, followed by the sector number, followed by 698 bytes of encoded data, followed by 4 checksum bytes followed by a DE AA. In this scheme, two

extra bytes are attached to the end of every data epilog. (DE AA BB AA) Then when the program runs, it double checks that the extra bytes are at the end of every sector it reads.

Extra bytes after data epilog

Copy II's bitcopy option automatically reproduces these extra bytes.

Example #8: MacTools verify shows no errors

The very last block of this disk contains a very special set of bytes. When you read it in the Track Editor, you will see 96 bytes, then at the end of the sector you will see about (150) bytes of E7's. The protection scheme is complicated in that the first part of the E7's are not all 8–bit bytes. They are sometimes 10–bit bytes(Sync) and 9–bit bytes(short sync). The Track Editor

```
=========== Track Editor ============
  No Volume in drive        Drv:Internal      Spd:8mHz
24D0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96    Track: 79
24E0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96    Side:A
24F0:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96
2500:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96    Track
2510:  96 96 96 96 96 96 96 96 96 96 96 96 96 96 96 96    Length:
2520:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    6455
2530:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7
2540:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    Track
2550:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    Start:
2560:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    0D1B
2570:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    Track
2580:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    End:
2590:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    25C3
25A0:  E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7 E7    Write
25B0:  E7 E7 E7 E7 E7 E7 BC ED B4 EF DE AA FE FF FF FF    Track
25C0:  FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF    From:
                                                          0C8C
```

96–E7 on last sector of disk

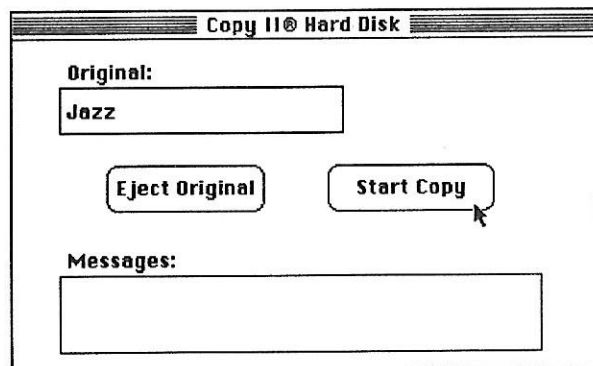Copy II is hard–coded to handle this scheme.

COPY II®
HARD DISK

Copy II Hard Disk

COPY II HARD DISK is an application on your COPY II disk that allows you to transfer some copy-protected software to your hard disk, RAM disk, 800K HFS disk, or 400K MFS disk. All hard disk and RAM disk brands are supported. Not all protected software, however, can be transferred. Copy II Hard Disk is updated often to support additional protected programs. You can choose the option "Copyable Programs" from the Information menu to see what programs Copy II Hard Disk can transfer.

Using Copy II Hard Disk

Before starting Copy II Hard Disk, you must have already turned on the Macintosh and your hard disk, and performed whatever steps are required for the Macintosh to recognize and work with the hard disk. We recommend that you create a new folder for each program you wish to transfer to the hard disk. (Some older MFS hard disks are segmented into "volumes". If your hard disk is one of these, you may want to create a new volume for each program, and make sure it is "mounted".) You can start up Copy II Hard Disk from the Copy II disk, or you can copy it to your hard disk and open it from there. Either way, after showing an important notice, Copy II Hard Disk will display a screen similar to the following:

```
┌─────────────────────────────────────────────┐
│ ▨▨▨▨▨▨▨ Copy II® Hard Disk ▨▨▨▨▨▨▨           │
│  Original:                                    │
│  ┌──────────────────────────────────────┐    │
│  │ Jazz                                 │    │
│  └──────────────────────────────────────┘    │
│                                               │
│    ╭───────────────╮   ╭───────────────╮     │
│    │ Eject Original │   │  Start Copy   │     │
│    ╰───────────────╯   ╰───────────────╯     │
│                                      ▷        │
│  Messages:                                    │
│  ┌──────────────────────────────────────┐    │
│  │                                      │    │
│  │                                      │    │
│  └──────────────────────────────────────┘    │
└─────────────────────────────────────────────┘
```

The first thing to notice is the menu bar at the top of the screen. In the "Information" menu is an item called "Copyable Programs". To see a list of the programs that can be transferred to hard disk, choose the Copyable Programs item from the Information menu. When you later want to leave the Copy II Hard Disk application, choose the "Quit" option from the "Control" menu.

If you started Copy II Hard Disk from your Copy II disk in the internal drive, the Original Volume will display "Copy II Disk". If you started it from the hard disk, the Original Volume will most likely be blank, or will contain the name of whatever disk is in the internal drive.

The disk to be copied needs to be in the Mac's internal drive. If another disk is already in the drive, remove it now by clicking on the "Eject Original" button. Insert the new disk into the internal

drive. The disk's name will be shown in the Original Volume box. In the above example, this is the Jazz program disk.

Once this is done, click the "Start Copy" button. (The Macintosh may ask you to swap disks. Don't worry; Copy II Hard Disk will make sure it has the correct disk before it begins the copy.) A dialog will appear for you to choose where to transfer the protected application. The actual appearance of the dialog depends on which file system (HFS or MFS) you are working with. You'll notice that it is similar to the usual "Save" dialog you see in many other applications, except that there is no space to enter a filename. This is because Copy II Hard Disk will be copying a number of files, keeping their original names.

Click on the "Drive" and "Eject" buttons to select which drive or volume you want to copy to. (If you're using HFS, you can also select which folder to copy into.) If you want to copy to an 800K diskette, simply select it as the destination volume. When you have the proper volume/folder selected, click on "Continue".

The copy process itself will take from a few seconds to a couple of minutes as it moves all the application and data files from the Original Volume to the destination volume or folder you've selected. When it is done, you will see the message "Copy Complete!".

Important Considerations

Copy II Hard Disk will not automatically transfer files normally found in the system folder (i.e. System, Finder, Desktop, Imagewriter, Clipboard, Scrapbook, etc.). This is done to conserve space (as it is not necessary to have many copies of the same files on the hard disk) and to avoid problems with certain brands of hard disks that get upset about having "unpatched" versions of the system files around.

However, in some cases it is helpful to transfer these files to the hard disk volume. Some applications, such as Jazz, require their

own "patched" system files in order for certain features of the application to work right. If an application does need a special system file, hopefully a note in its manual will mention this. You can then use either the Finder desktop or MacTools' Copy Files option to copy system files from the original disk to the hard disk volume if necessary...except that: Some hard disks also need their own special system files to operate correctly. If you replace the hard disk's system file with another, the hard disk may develop problems working with files.

In the case of Jazz, you can get around this problem: After you've used Copy II Hard Disk to move Jazz to a new hard disk volume or folder, copy the hard disk's system files into the volume or folder. Then use the "Jazz System Update " application (as described in the "Jazz Update Sheet" that accompanied your Jazz package) to modify the system files on the new hard disk volume or folder.

There are a few applications which Copy II Hard Disk can back up to another 3.5 inch disk, but not to a hard disk. These applications have inherent disk–access limitations, which unfortunately prevent them from working correctly from a hard disk.

Occasionally you may find that Copy II Hard Disk won't successfully transfer a program to hard disk, even if the program is listed as one of the "Copyable Programs". Keep in mind that the software publishers who copy-protect their products will sometimes – without fanfare – change the protection scheme used on the disk. When this happens, the methods used by Copy II Hard Disk may not work with the new scheme. Central Point Software periodically updates Copy II Hard Disk to work with new programs and new protection schemes.

If there is a program you'd like to transfer to hard disk that Copy II Hard Disk cannot handle, you might want to write us a quick letter to let us know about it, so we'll know which products are in demand. If it was listed as a "Copyable Program", also let us

know what happened when you tried to use the hard disk backup. Address your letter to:

Central Point Software, Inc.
15220 NW Greenbrier Parkway, Suite 200
Beaverton, OR 97006

MAC TOOLS®

Introduction

This manual describes MacTools, a disk and file utility program for the Macintosh computer. MacTools does many of the same things the Finder does, including copying, renaming, and deleting files (documents and applications) or entire disks. MacTools provides these features as pull-down menu options. To select which files you want to work with, you can click on the files with the mouse, or use the Select Files option to select a number of files at once.

In addition, MacTools provides several useful features not found in the Finder. MacTools can often recover files that have been accidentally deleted, and can repair some damaged disks. It can make files "invisible", so that they don't appear at all when you're in the Finder, and can "lock" files so they can't be renamed or deleted.

MacTools includes these features:

* Copy files
* Copy disk
* Rename files
* Rename disk
* Verify that a file has no errors
* Verify that a disk has no errors
* Format a disk
* Delete files
* Lock and unlock files
* Make files visible or invisible to the Finder
* Protect or unprotect files from normal copying
* Change the 'startup' application on a disk to something other than the Finder
* Recover deleted files and repair some damaged disks
* Look at or change the information stored on disk
* Print a list of files on the disk

The manual is divided into several sections. "Using MacTools" tells you how to start up MacTools and describes the disk window that appears on the screen. "Disk Options", "File Options", "Control Options", "ViewEdit Options", and "Miscellaneous Options" correspond to the five menus in MacTools, and explain each menu option step-by-step. The more in-depth ViewEdit and Undelete Files options are discussed next. The "Notes" section at the end gives you a few helpful hints about MacTools, including information about hard disks.

A short note about the two file storage systems for the Macintosh – the original Macintosh File System (MFS) and the Hierarchical File System (HFS): On the original MFS system, folders were a convenient illusion created and maintained by the Finder. The Finder was responsible for storing the names and positions of the folders in an invisible file called "DeskTop". These folders were "transparent" to most Macintosh applications, including MacTools. On the newer HFS system, folders are real. You are able to store documents inside a folder, and unless you open the folder, you never "see" the document. Applications recognize these folders and allow you to open or close them to select where you wish to store your file.

A few words need to be said about copy-protected files. Under the copyright law, you are allowed to make backups of software for your own use, so that if a disk is damaged or accidentally erased, the information is not lost. You are not allowed to give or sell copies of copyrighted software to others. Some software companies, to prevent illegal duplication, "protect" their disks or files so that they cannot be copied using normal copy methods. MacTools is capable of copying some of these disks, or "unprotecting" the protected files. These features were provided only to help you make useful backups of protected disks, not for illegal copying.

Using MacTools

To start up MacTools, turn the Macintosh on and insert the Copy II disk into the built-in disk drive. After a few seconds, the Copy II disk window will appear on the screen. One of the icons in the window is called MacTools, and shows a disk under a magnifying glass. Open this icon by either clicking on the icon and selecting Open from the File menu, or double-clicking the icon. The disk will whir as the MacTools application is loaded into the computer.

The Disk Window

You'll see a display similar to the following:

```
 Control  Disk  File  Misc
```

Size	Name	Modified Date	Prtct	Lckd	Invis
	Amt. Used: 320K	Amt. Free: 71K			
23K	Backup List	Tue, Apr 1, 1986	☐	☐	☐
0K	Clipboard File	Wed, Apr 10, 1985	☐	☐	☐
37K	Copy II®	Tue, Apr 1, 1986	☐	☐	☐
29K	Copy II® Hard Disk	Tue, Apr 1, 1986	☐	☐	☐
2K	CPS TagFix	Tue, Oct 27, 1987	☐	☐	☐
2K	CPSSaveDeletes	Mon, Nov 16, 1987	☐	☐	☐
7K	DeskTop	Tue, Jul 12, 1988	☐	☐	■
46K	Finder	Mon, Apr 8, 1985	☐	☐	☐
25K	Imagewriter	Wed, Mar 6, 1985	☐	☐	☐
57K	MacTools☺ ☞	Tue, Apr 1, 1986	☐	☐	☐
2K	Note Pad File	Sat, Apr 21, 1984	☐	☐	☐
10K	Read Me	Tue, Apr 1, 1986	☐	☐	☐

Window title: Copy II® Disk

This is the main MacTools display, which shows you information about the disk currently in the drive. In this case, the disk in the drive is the Copy II disk.

The title bar of the window shows three things:

1) which drive the disk is in. The icon just left of the title indicates either an internal or external 3.5 inch drive, any hard disk volume, or an open folder on an HFS disk.
2) the name of the disk or the name of the open folder.
3) whether the disk is an HFS disk or an MFS disk. If there is a box around the title, then the disk is an HFS disk. If the title appears without a box around it, then the disk is MFS. (See section later on Open Folder for more information about the HFS title box.)
4) whether or not the disk is write-protected.

66

5) the amount of space that is used.
6) the amount of space that is free.

Below the line of disk information is a list of all the files and folders on the disk or inside the folder. Each line includes:

1) the size of the file. (Note: folders do not take up separate space on the disk, so the size field is replaced by "--".)
2) an icon representing whether the entry is a folder, an application, or a document.
3) the name of the file.
4) the date the file was last modified.
5) boxes to show if the file is currently protected (Prtct), locked (Lckd), or invisible (Invis). (Note: these status flags make no sense when applied to a folder, so they have been replaced with "--".)

When the mouse is pointing inside the window, the pointer appears as a hand. With the hand pointer, you can select which files you want to work with. Outside of the window, the pointer becomes the usual arrow.

If you want, you can move the entire window by pointing at the title bar, pressing the mouse button, and dragging the window to a new position. Using the grow box in the lower-right corner, you can change the size of the window. If there are more files on the disk than will fit in the window, the scroll bar on the right will become active so you can scroll through the window to see all the files.

There are a few other things to notice about the information in the window. You can see there is a file on the disk called DeskTop. The "Invis" box for this file is blacked out, which means that this file is invisible. If you look at other disks with MacTools (We'll tell you how to do this shortly), you will find that most normal Macintosh disks have an invisible file called DeskTop. The Finder uses this DeskTop file to keep track of how the icons and windows for the disk are supposed to be arranged

67

on the screen. However, the DeskTop file itself doesn't appear when you're in the Finder, because it's marked as invisible.

If the Protect (Prtct), Locked (Lckd) or Invisible (Invis) boxes for any files are blacked out, it means those files have that status flag set.

Protect (Prtct): A protected file cannot be copied either from the Finder or with the Macintosh Disk Copy application. However, MacTools can copy these files using the Copy Files options.

Locked (Lckd): A locked file cannot be renamed or deleted (thrown in the Trash) from the Finder. It must be unlocked first. (You can lock or unlock files one at a time when you're in the Finder, using the Finder's Get File Info option.)

Invisible (Invis): An Invisible file cannot be seen from the Finder, or by Macintosh's Standard File Package. As discussed earlier, the Finder uses the invisible "DeskTop" file to keep track of where the icons, windows, and folders appear on the screen. If you make this file visible with MacTools, it will show up as another icon from the Finder.

You can set or clear these status flags by pointing to the box with the "Hand" pointer and clicking the mouse button. The status will be set to the reverse of what it was. (i.e. If the prtct box is blacked in – protected – then it will become just an outline box, which means the file is no longer protected.) Note: The Macintosh will not let you protect/unprotect files on the disk that you started up from.

To work with disks other than the MacTools disk, you simply eject the MacTools disk and insert the disk you want to work with. There are three ways to eject a disk:

1) click the Close box in the window,
2) select the Eject option from the Disk pull-down menu, or
3) hold down the command key and type the letter "e".

All three methods do the same thing: They eject the disk from the drive and remove the disk's window from the screen. When you insert another disk, a new disk window for that disk will appear.

If you have two or more disk drives connected to your Macintosh, you can insert disks into any drive. If, for example, there are disks in two drives at the same time, there will be two windows on the screen, one for each disk. Only one window can be "active" at a time. The active window is the one MacTools uses when you select to rename, delete, eject, etc. You can bring any window to the front and make it active simply by clicking on it. Remember that the icon to the left of the window title shows you which drive the disk is in. See the example.

	Control Disk File Misc					
	Write/Paint Disk					
	Amt. Used: 104K	Amt. Free: 675K				
Size	Name	Modified Date	Prtct	Lckd	Invis	
3K	Clown picture	Mon, Dec 7, 1987	☐	☐	☐	
6.5K	Desktop	Tue, Jul 12, 1988	☐	☐	■	
3K	Doggie picture	Thu, Dec 10, 1987	☐	☐	☐	
3K	Happy Birthday	Tue, Dec 22, 1987	☐	☐	☐	
2K	Horse picture	Thu, Feb 4, 1988	☐	☐	☐	
3.5K	Letter to Mom	Thu, Feb 4, 1988	☐	☐	☐	
58.5K	MacPaint	Fri, Apr 5, 1985	☐	☐	☐	
--	MacPaint Docs	Tue, Jul 12, 1988	--	--	--	
--	MacWrite Docs	Tue, Jul 12, 1988	--	--	--	
24.5K	Option Menu	Tue, Feb 16, 1988	☐	☐	☐	

Disk Options

By choosing the Disk pull-down menu, you can see what disk options are available.

```
  Control  Disk  File  Misc
┌─────────────────────────────────────────┐
│          Verify Disk                     │
│ ▤□▶      Format Disk    │█ Disk │        │
│     Amt. Copy Disk      │Amt. Free: 57K  │
│ 🗑        Rename Disk    │                │
│ Size   N               lodified Date  Prtct Lckd Invis │
│ 23K  ⬧ Ba              ue, Apr 1, 1986   □   □   □  ⬆ │
│ 37K  ⬧ Co  ViewEdit Disk  ue, Apr 1, 1986  □  □  □  │
│ 29K  ⬧ Co  UnDelete Files  ue, Apr 1, 1986 □ □ □  │
│ 2K   □ Cr              ue, Oct 27, 1987  □  □  □   │
│ 2K   □ Cr  Eject Disk   ⌘E on, Nov 16, 1987 □ □ □  │
│ 6K   □ De              ue, Jul 12, 1988  □  □  ■   │
│ 46K  □ Fi  Create New Folder  on, Apr 8, 1985 □ □ □ │
│ 100K ⬧ M   Open Folder  ⌘O ue, Jul 12, 1988 □ □ □  │
│ 10K  ⬧ Re  Tree Display ⌘T ue, Apr 1, 1986 □ □ □  │
│ 79K  □ System         Tue, Jul 12, 1988  □  □  □  ⬇ │
│                                                  ▤ │
└─────────────────────────────────────────┘
```

Verify Disk

The first option, Verify Disk, lets you verify that all of the information on an initialized Macintosh disk is readable. Sometimes a disk, or the information on the disk, can become damaged. If you accidentally turn off the Macintosh (or the power fails) while the Macintosh is writing data to the disk, a portion of that data can become unreadable, even though the disk itself is not damaged. If you drop a disk into a pot of hot coffee, however, the entire disk is most likely ruined forever. The Verify Disk option cannot determine whether just the information is bad or the disk itself is damaged; it simply tells you whether or not all of the information was readable. (Verify Disk does not work with uninitialized disks, because there is no information to read.)

To use Verify, make sure the disk you want to verify is in the drive, then choose the Verify Disk option. (Point at the Disk menu, press and hold the mouse button while dragging the pointer to Verify Disk, then release the mouse button.) The pointer changes to a wristwatch and the disk whirs for several seconds as MacTools verifies the disk.

If there are no errors in reading the disk, a dialog box appears, saying "The verify action was successful!". Click the "OK" box to continue. If any part of the disk is unreadable and an error occurs, a dialog appears giving the "block number" of the error, and an error ID number. (The errors are rather technical in nature. A list of possible error numbers appears at the end of the manual.) You can choose to either continue verifying, or cancel the verify option.

If a disk that doesn't verify contains any important files, you should try to copy the files onto another disk using the MacTools Copy Files option. Then try to re-format the bad disk. If the format fails, then the disk itself is probably damaged and should be discarded.

Note: Many copy-protected disks contain errors and will not verify. The errors are part of the copy protection and are normal.

Format Disk

The Format Disk option is used to reformat (or "initialize") a Macintosh disk, completely removing any old information and preparing the disk for storing new files. Any normal disk which does not verify (see above) should be reformatted with the Format Disk option, so you won't be plagued with disk errors later.

To use Format Disk, make sure the disk you want to format is in the disk drive, then choose Format Disk from the Disk menu. A dialog box will appear, asking what size you want to format the disk. If the disk is in an 800K drive, you will have the option to format the disk as a 400K or 800K disk. Click on "Cancel" if you don't want to format the disk. (Note: 400K disks are formatted MFS and 800K disks are formatted HFS.) The disk will keep the same name it had before it was formatted. You can use the Rename Disk option if you want to give it a new name.

Note: If you want to format a brand new unformatted disk, simply insert it into the disk drive. MacTools will notice that the disk is unreadable, and ask you if you want to initialize the disk. If you want to reformat an already formatted disk, then use the Format Disk option from the Disk menu.

Copy Disk

You can make backups of entire disks with the Copy Disk option. The copied disks are given the same name as the original disk (unlike copies made with the Finder, which keep the name they had), and copying takes fewer disk swaps than with the Finder. In addition, Copy Disk can make backups of many protected disks. When a copy of a protected disk is made, the copy is still protected in the same way as the original disk. The directions for copying a disk vary slightly, depending on whether you have one disk drive or two.

Note: If you have one 400K drive and one 800K drive and you insert an 800K disk in the 800K drive and ask it to do a Copy Disk, you will be doing a one–drive copy. The reason is that the 400K drive cannot read or write an 800K disk!

Copy Disk (one–drive)

To use Copy Disk with one–drive systems, insert the disk you want to make a copy of, then choose Copy from the Disk menu. MacTools will briefly read the disk and eject it, then display a

dialog box asking you to insert the disk you want to copy to. Insert this new disk. If the disk has never been used, MacTools will begin copying immediately. If the disk is already initialized, another dialog box will appear, asking you to confirm that it's OK to completely replace the old information with the new.

As copying progresses, MacTools will tell you when to insert the original disk you're copying and when to insert the copy disk.

To speed up copying, MacTools makes use of as much memory in the Macintosh as possible by "purging" everything it doesn't need. When the copy is finished, the Macintosh will ask you to insert the MacTools disk so that it can reload this information. If you were copying a disk other than the MacTools disk, you should then choose Eject from the Disk menu, and reinsert the disk you want to work with.

Copy Disk (two–drive)

To use Copy Disk on a two–drive system, insert the disk you want to copy into either drive and, if necessary, click on that disk's window to make it the active window. Then choose Copy Disk from the Disk menu. MacTools uses both drives when copying disks. If there is no disk in the other drive, MacTools will first display a dialog box asking you to insert the disk you want to put the copy onto. If this disk has never been used, MacTools will begin copying immediately. If the disk is already initialized, a dialog box will appear asking you to confirm that it's OK to completely replace the old information with the new.

To speed up copying, MacTools makes use of as much memory in the Macintosh as possible by "purging" everything it doesn't need. If you've copied a disk other than the MacTools disk, the Macintosh will ask you to insert the MacTools disk so it can reload the purged information. You should then choose Eject from the Disk menu, and reinsert the disk you want to work with.

Rename Disk

To rename a disk, insert the disk and choose the Rename Disk option from the Disk menu. A dialog box appears asking what you want to name the disk. The current name of the disk is also shown.
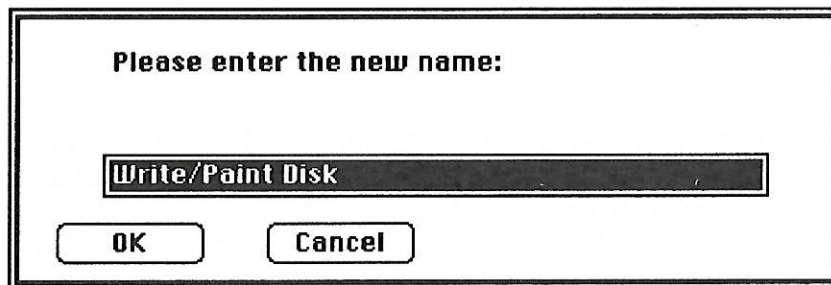
```
Please enter the new name:

Write/Paint Disk

    OK          Cancel
```

You can either type in a whole new name, or edit the current name using the Macintosh mouse features. (If you change your mind and don't want to rename the disk, you can click the Cancel button.) When you've finished entering the name, either press Return or click on the OK button. The disk will be renamed to the new name.

ViewEdit Disk and Undelete Files

The ViewEdit Disk and Undelete Files options are described in a later section in the manual.

Eject Disk

As described earlier, there are three ways to eject a disk: choose Eject from the Disk menu, click the close box for the disk window, or hold down the command (cloverleaf) key and type the letter "e".

Create New Folder

The Create New Folder option allows you to create a folder on an HFS disk. (This option is disabled for MFS diskettes, because MFS disks don't have real folders!) A dialog box appears asking what you want to name the new folder.
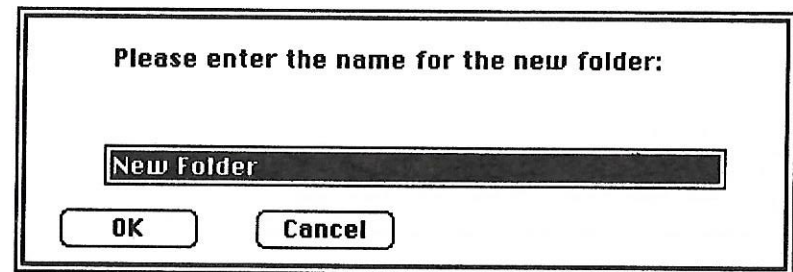
```
Please enter the name for the new folder:

New Folder

    OK          Cancel
```

You can either type in a whole new name, or edit the current name using the Macintosh mouse features. (If you change your mind and don't want to create the folder, you can click the Cancel button.) When you've finished entering the name, either press Return or click on the OK button. A folder with the specified name will be created on the disk.

Open Folder

There are three ways to open a folder on an HFS disk.
1) Click on the folder name and select Open Folder from the Disk menu.
2) Click on the folder name, press and hold command (cloverleaf) key and press the "O" key.
3) Double–click on the folder name.

The disk window will be updated to show that you have a folder open, and it will display information about all the files and folders contained in the folder just opened.

Remember that for HFS disks, a box appears around the title at the top of the window. If you are done looking at the information for the folder and you wish to see the information from the previous folder or from the main volume, move the mouse pointer inside this box and press and hold the mouse button. You will see a pull-down menu appear, showing the names of all the folders you opened to get to the one you are currently displaying. Here is an example:
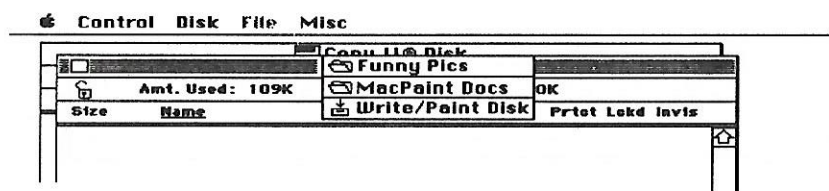
You may select what previous folder to display by using the standard Macintosh menu selection features. The information for the folder you select will now be in the window.

Tree Display

Tree Display is a new MacTools option that enables you to see the organizational structure of your HFS volume in a "tree" display. You can make changes to that structure by moving folders. The Tree Display example shows folders at five hierarchy levels. You may have more or less levels depending on your volumes.
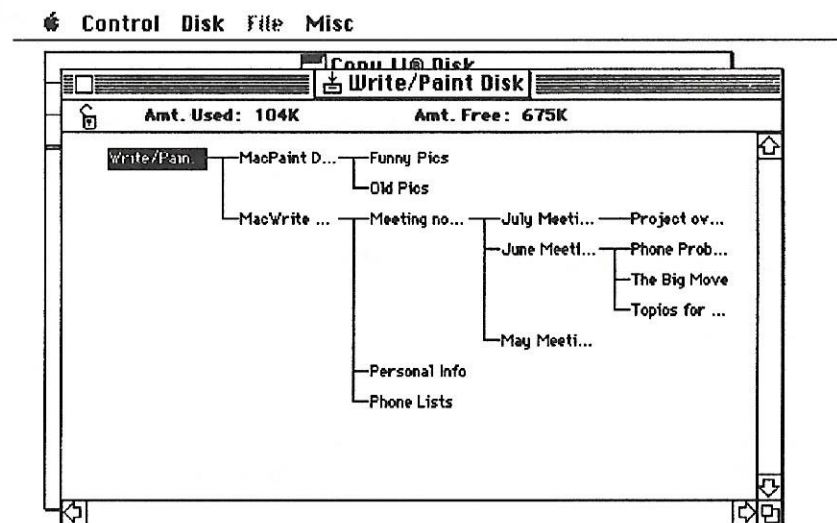
MacTools Tree Display

The Tree Display screen shows the following information:

- Lock icon: displays whether or not the volume is write-protected.

- Amt. Used: displays how much space on the volume is used.

- Amt. Free: displays how much space on the volume is available.

To start the Tree Display:

1. Select the **Tree Display** command from the Disk menu.

The first Tree Display screen highlights the top level of hierarchy (your hard drive's name) in the upper–left corner of the display.

2. Use the horizontal scroll bar to view more hierarchy levels, if any.

3. Use the vertical scroll bar to view other folders at the level currently being displayed.

To move a folder to another folder on your hard drive:

Note: You cannot drag the selected folder to a location that is not another folder. You must move the folder to another folder.

1. Click and hold the mouse button on the folder to select it. A dotted outline of the folder appears.

2. Drag the selected folder to the new folder. MacTools highlights the folder as you drag it over the top of the destination folder. This helps you determine the correct destination folder.

3. Release the mouse button to complete the move.

The selected folder and any folders attached to it at lower levels are moved into the new folder.

Note: If you select a folder and begin dragging it to a new location and then decide you don't want to move it, you can drag the folder into the white space or outside of the window. This stops the moving procedure and the folder remains where it was.

To list the contents of a folder:

1. Select the folder by clicking on it or use the arrow keys to move the selection point.

2. Select the **Catalog Display** option (Command +T) from the Disk menu.
   This option toggles between the Catalog display and the Tree display. Notice that the option name changes depending upon which display you are currently using.

Selecting any folder in Tree Display and returning to Catalog Display lists the contents of the selected folder. Selecting Tree Display from any folder in Catalog Display highlights that folder when the tree is displayed.

File Options

If you click on one of the files in the window, then choose the File menu, you can see what file options are available.

```
 🍎  Control  Disk  [File] Misc
┌─────────────────────────────────────────────────┐
│▣  ┌──────────────┐      Disk                      │
│   │ Verify Files │                                │
│ 🔼│ Copy Files   │   nt. Free: 57K                │
│   │ Rename Files │                                │
│ Size│ Delete Files │dified Date   Prtct Lckd Invis│
│ 23K ├──────────────┤ , Apr 1, 1986   ☐   ☐   ☐  🔼│
│ 37K │ ViewEdit Files│, Apr 1, 1986   ☐   ☐   ☐    │
│ 29K │ InfoEdit Files│, Apr 1, 1986   ☐   ☐   ☐    │
│ 2K  🗋 CPS TagFix    Tue, Oct 27, 1987  ☐   ☐   ☐  │
│ 2K  🗋 CPSSaveDeletes Mon, Nov 16, 1987 ☐   ☐   ☐  │
│ 6K  🗋 DeskTop      Tue, Jul 12, 1988  ☐   ☐   ■  │
│ 46K 🗋 Finder       Mon, Apr 8, 1985  ☐   ☐   ☐  │
│100K ▨ MacTools⊕    Tue, Jul 12, 1988  ☐   ☐   ☐  │
│ 10K ▨ Read Me      Tue, Apr 1, 1986  ☐   ☐   ☐  │
│ 79K 🗋 System       Tue, Jul 12, 1988  ☐   ☐   ☐ 🔽│
└─────────────────────────────────────────────────┘
```

Selecting Files

When working with the MacTools file options, you first select which file or folder you want to work with, then choose the appropriate option from the File menu. When you select a file, it is shown as white letters over a black bar. There are several ways to select files using the Macintosh mouse:

* To select just one file, click on the desired file with the hand pointer. (It can point anywhere in the line.)

* To select several adjacent files, press the mouse button and drag the hand pointer over those files.
* To select additional files, hold down the shift key on the keyboard while clicking on the new files. (This is called shift–clicking.)
* If you change your mind and want to deselect a selected file, then shift–click on that file. Just keep in mind that shift–clicking on a deselected file selects it, and shift–clicking on a selected file deselects it.
* If you decide you don't want to select any files, then click the mouse in either the free space in the window below the last file or in the file header bar where it shows "Size Name Prtct", etc.

Notice that the File menu is dimmed until you select one or more files to work with. This is because you need to select the files before you can choose what you want to do with them.

Verify Files

Verify Files works much like Verify Disk. (See the Verify Disk discussion on bad blocks.)

To use Verify Files, click on the file you wish to verify and choose Verify Files from the File menu. The pointer changes to a wristwatch and the disk whirs for a few seconds as MacTools verifies all blocks in that file.

If there are no errors in reading the file, a dialog box appears saying "The verify action was successful!". Click the "OK" button to continue. If any part of the file is unreadable, a dialog appears giving the relative block number of the file (the 3rd block of the file, for example) and an error ID number. (Possible error numbers appear at the end of the manual.) You can choose to either "Continue" verifying the file, or to "Cancel" the verify option.

If you select a folder to verify, then a dialog will appear asking if you really want to verify all files and folders inside the selected folder. Click on OK to continue, or Cancel to exit. If you click on OK, the Verify Files option will proceed to verify every file and folder it finds inside the selected folder.

Copy Files

You can back up individual files with the Copy Files option. MacTools can copy files more quickly than the Finder, and it can copy files that are marked as protected.

To use Copy Files insert the disk you want to copy files from, select the files or folders you want to copy, then choose Copy Files from the File menu. A dialog message will then appear asking you to select where you want to copy to. Use the options provided to get to the destination volume/folder. (If you insert a disk here and the Macintosh doesn't respond, try clicking in the scroll bar area of the dialog. This should get the Macintosh to "wake up!" and recognize the disk insertion. You may then proceed.) When everything looks good, click on the Continue button to continue with the copy (or click on Cancel to stop the copy process).
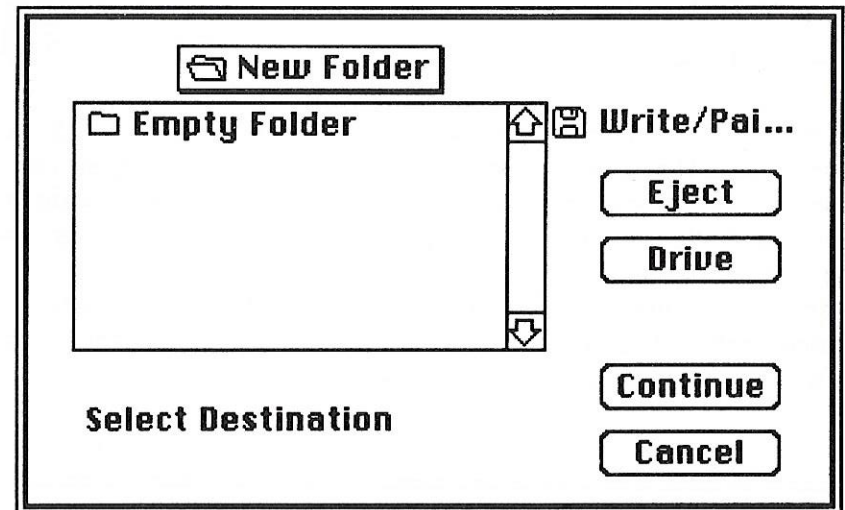
When you click on the Continue button, MacTools begins copying the selected files, prompting you for disk inserts when and if it needs any. If it finds that the file you are copying already exists on the destination disk/folder, MacTools will display a dialog asking if you want to replace the file on the destination disk. If you've asked MacTools to copy folders, it will display a dialog asking if you really want to copy all files and folders inside the folder. Folders can be copied only onto HFS disks. If you select an MFS volume as the destination disk, then MacTools will display a dialog telling you that it cannot copy folders to that volume, but it will copy any other files you may have selected.

To speed up copying, MacTools makes use of as much memory in the Macintosh as possible by "purging" everything it doesn't need. When the copy is finished, the Macintosh will ask you to insert the Copy II disk so that it can reload this information. If

you were copying from a disk other than the Copy II disk, you should then choose Eject from the Disk menu, and reinsert the disk you want to work with.

Rename Files

To rename one or more files, select the files you want to rename, then choose Rename from the File menu. For every file that you select, a dialog box will appear in turn, asking what you want to name each file. You can either type in a whole new name, or edit the current name using the Macintosh mouse features. If you change your mind and don't want to rename this file, click the Cancel button. If you decide you don't want to rename any more of the files you've selected, click the Exit button.

```
┌─────────────────────────────────────────────┐
│                                             │
│   Please enter the new name:                │
│                                             │
│                                             │
│  ┌────────────────────────────────────────┐ │
│  │ Sample Memo                            │ │
│  └────────────────────────────────────────┘ │
│  ┌────────┐   ┌──────────┐      ┌────────┐  │
│  │   OK   │   │  Cancel  │      │  Exit  │  │
│  └────────┘   └──────────┘      └────────┘  │
└─────────────────────────────────────────────┘
```
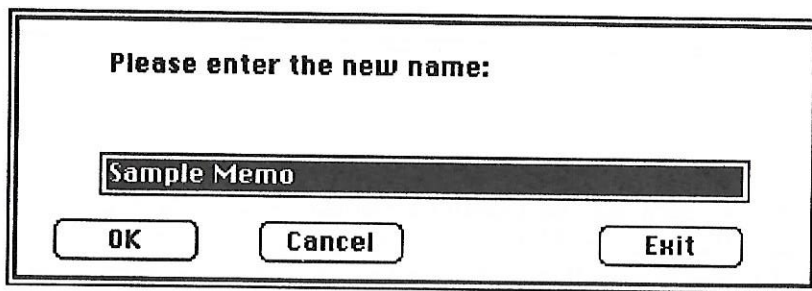
When you've finished entering the name, either press Return or click on the OK button. The file will be renamed to the new name. If there are more files to rename, another dialog box will appear for you to rename the next file.

Delete Files

You can delete one or more files with the Delete Files option. Deleting a file from MacTools is the same as throwing it in the trash from the Finder, then emptying the trash.

Select the file or folder you want to delete, then choose Delete from the File menu. A dialog box will appear, asking "Are you sure you want to delete the selected files?" If you click on the OK button, MacTools will delete the selected files and folders from the disk. Note: If you delete a folder, MacTools will delete any files or folders inside the folder before it will delete the selected folder.

ViewEdit and InfoEdit

The ViewEdit and InfoEdit options are described in a later section.

Control Options

By choosing the Control pull-down menu, you can see what Control options are available.
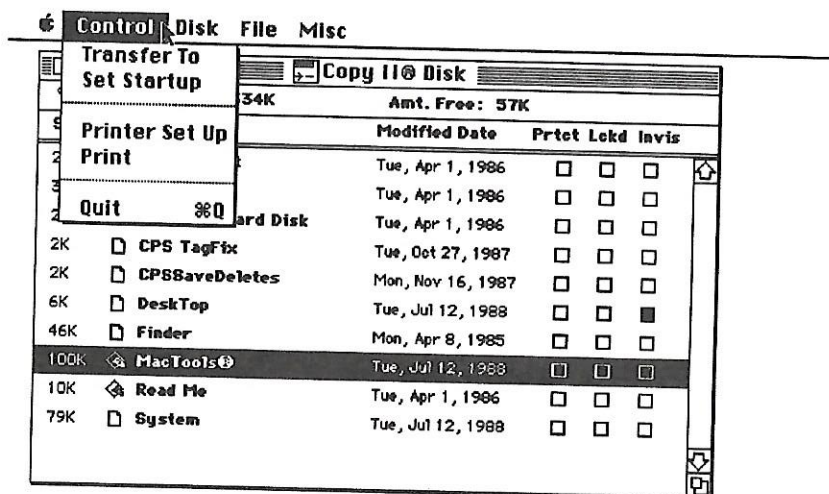
Quit

When you're finished using MacTools, use the Quit option from the Control menu to quit out of MacTools and return to the Finder.

Transfer To

If you want to go from MacTools directly to another application without returning to the Finder first, you can use the Transfer To option. Insert the disk you want to use. With the MacTools window for that disk on the screen, use the mouse to select the

application file to go to, then choose Transfer To from the Control menu or double-click on the application file. The application you selected will be opened and run.

Set Startup

Whenever you turn on your Macintosh and insert a disk, the disk will "start up" an application. With most disks, this application is simply the Finder. With the Set Startup option, you can change this so that a disk will start up with any application. Simply click to select the application file you want the disk to start up with, then choose Set Startup from the Control menu. MacTools will make a change to the startup information on this disk: The next time you turn on your computer to use this disk, the application you selected (rather than the Finder) will start up.

Printer Setup

This option lets you set up the page size and other options for printing in MacTools. The most common paper settings are already set. If you want to change them, choose Printer Setup and click on the appropriate buttons. To save your changes for printing, click on the OK button. If everything was already set up correctly, click on Cancel to leave everything as it was.
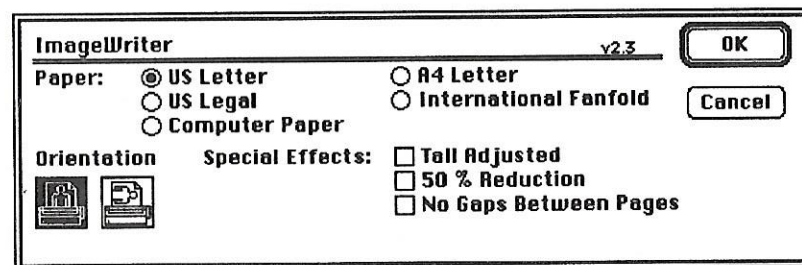
Print

The print option allows you to print out a copy of the catalog screen (the list of files) to your printer. Insert the disk that you want a printout of and select Print from the Control menu. A dialog will appear asking whether you want a high quality copy or a normal quality copy. Select the options you wish and click the OK button to continue with the printout. (Clicking on the Cancel button will abort the print process.)

```
┌────────────────────────────────────────────────────────┐
│ ImageWriter                              v2.3   ┌──────┐ │
│ Quality:      ○ Best    ◉ Faster   ○ Draft      │  OK  │ │
│                                                 └──────┘ │
│ Page Range:   ◉ All     ○ From: [   ]  To: [  ] ┌──────┐ │
│ Copies:       [1]                               │Cancel│ │
│ Paper Feed:   ◉ Automatic  ○ Hand Feed          └──────┘ │
└────────────────────────────────────────────────────────┘
```
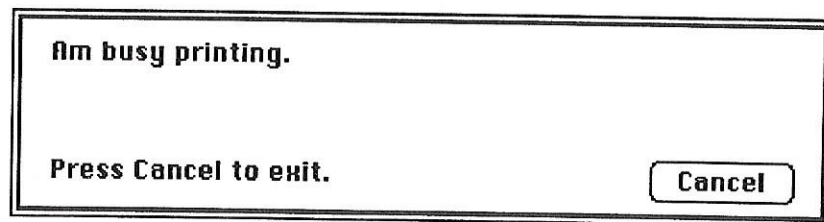
When you press the OK button, another dialog appears telling you that MacTools is busy printing out the information. There is a Cancel button available if you wish to stop the printer before it is finished with the printout.

```
┌────────────────────────────────────────────────┐
│ Am busy printing.                                │
│                                                  │
│                                                  │
│                                      ┌────────┐  │
│ Press Cancel to exit.                │ Cancel │  │
│                                      └────────┘  │
└────────────────────────────────────────────────┘
```

Miscellaneous

There are two options available in the Miscellaneous menu.

```
  Control  Disk  File  [Misc]
                        Select Files
                        ─────────────────────
                        Install Delete-Info File

┌──────────────────────────────────────────────────────────┐
│  Amt. Used: 334K                                           │
│ Size     Name                 Modified Date    Prot Lckd Invis │
│ 23K  ⬟ Backup List          Tue, Apr 1, 1986    ☐   ☐   ☐ │
│ 37K  ⬟ Copy II⑭             Tue, Apr 1, 1986    ☐   ☐   ☐ │
│ 29K  ⬟ Copy II⑭ Hard Disk   Tue, Apr 1, 1986    ☐   ☐   ☐ │
│ 2K   ▯ CPS TagFix           Tue, Oct 27, 1987   ☐   ☐   ☐ │
│ 2K   ▯ CPSSaveDeletes       Mon, Nov 16, 1987   ☐   ☐   ☐ │
│ 6K   ▯ DeskTop              Tue, Jul 12, 1988   ☐   ☐   ■ │
│ 46K  ▯ Finder               Mon, Apr 8, 1985    ☐   ☐   ☐ │
│ 100K ⬟ MacTools⑭            Tue, Jul 12, 1988   ☐   ☐   ☐ │
│ 10K  ⬟ Read Me              Tue, Apr 1, 1986    ☐   ☐   ☐ │
│ 79K  ▯ System               Tue, Jul 12, 1988   ☐   ☐   ☐ │
└──────────────────────────────────────────────────────────┘
```
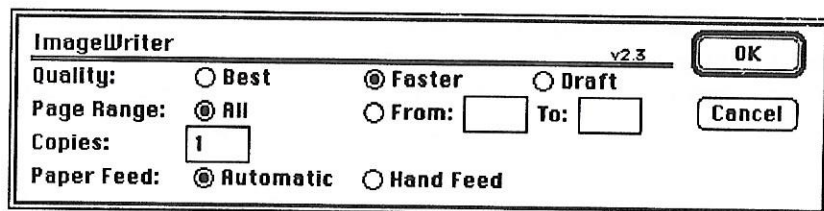
Select Files

The Select Files option provides a convenient way to select a number of related files with similar names before selecting one of the File menu options. For example, suppose you have a disk with the files "Screen 0", "Screen 1", "Screen 2", etc., and you want to delete these files. You can use the Select Files option to select all files that begin with the word "Screen". You could also select the files "PICTURE.BAS", "PAYROLL.BAS", and "INVENTORY.BAS" by using Select Files to select all files that end in ".BAS".

To select files by filename, choose Select from the Miscellaneous menu. A dialog box will appear:

```
┌──────────────────────────────────────────────────┐
│ ┌──────────────────────────────────────────────┐ │
│ │ ▦  Select the files that have the string      │ │
│ │ ▦      segment:                                │ │
│ │                                                │ │
│ │  ┌──────────────────────────────────────────┐ │ │
│ │  │                                          │ │ │
│ │  └──────────────────────────────────────────┘ │ │
│ │                                                │ │
│ │  in  ( First  )  part of its name.             │ │
│ │                                                │ │
│ │      ( Any   )                                 │ │
│ │                                                │ │
│ │      ( Last  )          ( All )  ( Cancel )    │ │
│ └──────────────────────────────────────────────┘ │
└──────────────────────────────────────────────────┘
```
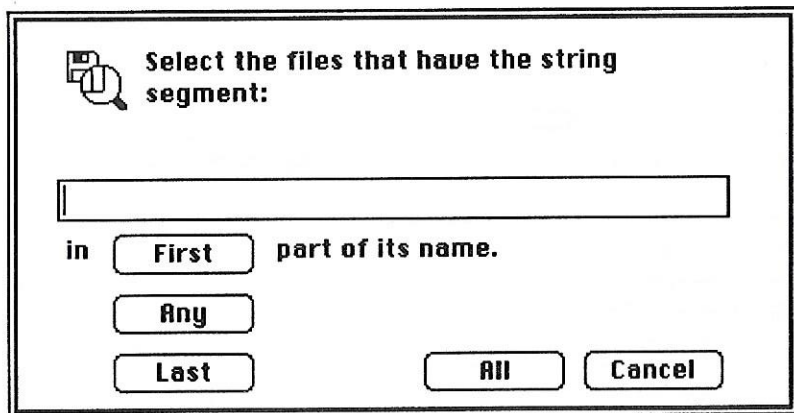
First type the letters or characters that you want to match with the files on the disk. Then click on the appropriate button. If you click "First", then every file that begins with the characters you typed will be selected. If you click "Any", then every file that contains the characters anywhere in the filename will be selected. If you click "Last", then every file that ends with the characters you typed will be selected.

You can click on the "All" button without typing anything to select every file on the disk. If you change your mind and don't want to select any files, you can click on the Cancel button.

After you've used the Select Files option to select a number of files, you can still shift-click to select additional files or deselect some of the selected files before choosing a File menu option.

Install Delete–Info File

This option is described in the "About the Save Deletes Method" section.

ViewEdit

The ViewEdit options in MacTools allow you to look at the contents of any file or any block on a disk, and make changes to the information if you want. This can sometimes be useful for double-checking what is in a file before copying it, deleting it, etc. Experienced Macintosh programmers will also find ViewEdit a powerful tool for debugging, repairing disks with damaged files, etc.

The ViewEdit option is easy to use, but much of the information it displays is technical in nature. If you want to change the contents of the disk (or to better understand what information you are looking at), you should be familiar with such things as disk blocks, bytes, hexadecimal, and ASCII.

The ViewEdit option appears in both the Disk menu and the File menu. If you want to view or edit any block on the disk, choose ViewEdit from the Disk menu. If you want to view or edit a particular file on the disk, first select that file by clicking on it with the mouse, then choose ViewEdit from the File menu.

When you choose either ViewEdit option, a new window and a new menu will appear. The new menu, titled ViewEdit, contains all the new options available to you while using ViewEdit. These options are Read Next Block, Read Previous Block, Read Specific Block, Write Block, Undo, Resource Fork, and Data Fork. The new window that appears displays information about the disk volume or the file that you want to look at. The display will be similar to the following:

```
 Control  Disk  File  Misc  ViewEdit
┌─────────────────────────────────────────────────┐
│ □ ▤▤▤▤▤▤▤▤▤▤ Write/Paint ▤▤▤▤▤▤▤▤▤          │
│                                                   │
│   Volume Name:          Write/Paint               │
│   Creation Date:        9795 7058   8/2/84 3:27 PM│
│   Last Backup Date:     9A6B 9C84   2/4/86 11:01 AM│
│   Attributes:           0040                      │
│   Number of Files:      0010        16            │
│   Directory Start:      0004        4             │
│   Directory Length:     000C        12            │
│   Allocation Blocks:    0187        391           │
│   Allocation Blocksize: 0000 0400   1024          │
│   Allocation Clipsize:  0000 2000   8192          │
│   Allocation Start:     0010        16            │
│   Next File Number:     0000 0022   34            │
│   Free Blocks:          001A        26            │
│                                                   │
└─────────────────────────────────────────────────┘
```
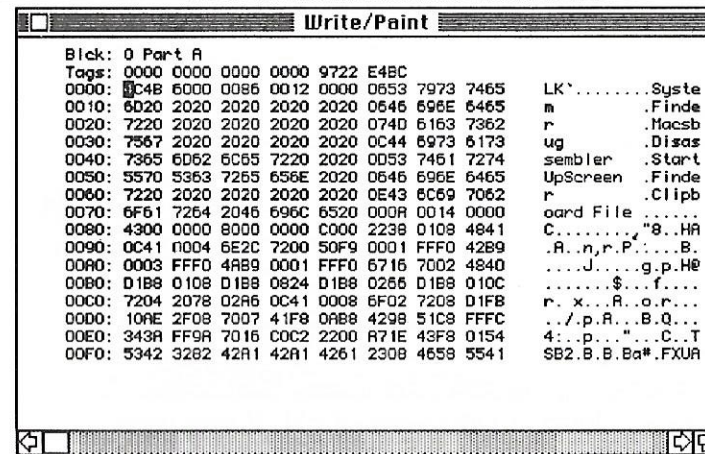
Two columns of numbers appear. The first column contains the actual values (in hexadecimal) that the Macintosh stores for each item. The second column shows the same numbers in (more readable) decimal form. This information will usually be of use only to programmers.

The usual MacTools file window will still be lurking behind the ViewEdit window. Anytime you want to exit the ViewEdit option, just click on the Close box in the upper–left corner, or click back in the file window.

At the bottom of the window is a horizontal scroll bar. If you click on the arrow on the right, then a new display will appear, showing the contents of the first block in the file or disk. (All information on the disk is stored in "blocks". Each block contains 512 bytes of data. Therefore it takes two blocks to make one "K" of information. A normal 400K disk contains 800 disk

```
 Control  Disk  File  Misc  ViewEdit
┌─────────────────────────────────────────────────┐
│ □ ▤▤▤▤▤▤▤▤▤▤ Write/Paint ▤▤▤▤▤▤▤▤▤          │
│  Blck: 0 Part A                                   │
│  Tags: 0000 0000 0000 0000 9722 E4BC              │
│  0000: 4C4B 6000 0086 0012 0000 0653 7973 7465  LK`........Syste │
│  0010: 6D20 2020 2020 2020 2020 0646 696E 6465  m        .Finde │
│  0020: 7220 2020 2020 2020 2020 0740 6163 7362  r        .Macsb │
│  0030: 7567 2020 2020 2020 2020 0C44 6973 6173  ug       .Disas │
│  0040: 7365 6D62 6C65 7220 2020 0053 7461 7274  sembler  .Start │
│  0050: 5570 5363 7265 656E 2020 0646 696E 6465  UpScreen .Finde │
│  0060: 7220 2020 2020 2020 2020 0E43 6C69 7062  r        .Clipb │
│  0070: 6F61 7264 2046 696C 6520 000A 0014 0000  oard File ...... │
│  0080: 4300 0000 8000 0000 C000 2238 0108 4841  C........."8..HA │
│  0090: 0C41 A004 6E2C 7200 50F9 0001 FFF0 4289  .A..n,r.P:....B. │
│  00A0: 0003 FFF0 4AB9 0001 FFF0 6716 7002 4840  ....J...g.p.H@ │
│  00B0: D1B8 0108 D1B8 0824 D1B8 0266 D1B8 010C  .......$...f.... │
│  00C0: 7204 2078 02A6 0C41 0008 6F02 7208 D1FB  r. x...A..o.r.. │
│  00D0: 10AE 2F08 7007 41F8 0AB8 4298 51C8 FFFC  ../.p.A...B.Q... │
│  00E0: 343A FF9A 7016 C0C2 2200 A71E 43F8 0154  4:..p..."...C..T │
│  00F0: 5342 3282 42A1 42A1 4261 2308 4658 5541  SB2.B.B.Ba#.FXUA │
│                                                   │
└─────────────────────────────────────────────────┘
```

Notice the "Blck: 0 Part A". The window shows the first half (256 bytes) of the 512–byte block. If you click on the right arrow again, you'll see the second half of the block, Part B. If you continue clicking on the right arrow, you'll see the first and second parts of block 1, then block 2, etc. Similarly, clicking the left arrow moves you backwards through the disk or file. You can also drag the "thumb" (the white rectangle) to move many blocks at a time either forwards or backwards.

(Note: If you selected ViewEdit from the Disk menu, the block number shown is the actual block number on the disk. If you selected ViewEdit from the File menu, the block number shown instead tells you how many blocks from the beginning of the file this block is, not its real disk block number.)

All of the values in the window (except for the block number) are hexadecimal. Each line includes an offset number followed by a colon, then 16 bytes from the block (2 digits per byte, shown as 8 groups of 4 digits each), then those same 16 bytes interpreted as ASCII characters. The offset number simply shows how many bytes into the block each line is. For example, byte number $10 is the first byte after the "0010:". Byte number $11 is the byte after that, etc.

If words or text appear on the right, then those bytes in the block are strings of valid ASCII characters. However, the characters on the right will often be meaningless. This means that the bytes are more likely part of a program or numeric data area. Any byte which is not a valid ASCII character is shown instead as a period.
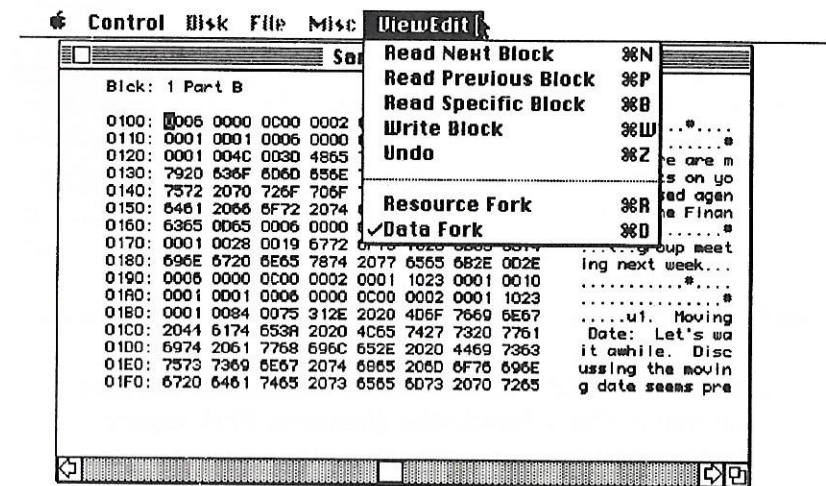
You can change any byte in the block by typing either new hexadecimal values or new text characters. Notice that the first digit of the block is inverse (white–on–black). If you type one or more hexadecimal digits (0–9 or A–F), those digits will change and the inverse cursor will move to the right. The corresponding text characters on the right will also change, depending on what you type. (Feel free to experiment. The changes you make are strictly temporary until you choose the Write Block option, which is described below.)

To change bytes somewhere else in the block, move the mouse pointer to the digit where you want to start the changes. The pointer will appear as a small box. Put the box around the digit, then click the mouse button. The inverse cursor will move here, and you can start typing new values.

Similarly, if you want to change bytes by typing new text characters, move the pointer over one of the characters in the text area and click the mouse. The inverse cursor will move here. Any characters you now type will replace those already in the

94

block. (As you type, the corresponding hexadecimal values on the left will also change.)

The ViewEdit Menu Options

```
  Control  Disk  File  Misc  [ViewEdit]
                            Read Next Block        ⌘N
                            Read Previous Block     ⌘P
     Blck: 1 Part B         Read Specific Block     ⌘B
     0100: 0006 0000 0C00 0002  Write Block         ⌘W
     0110: 0001 0D01 0006 0000  Undo                ⌘Z
     0120: 0001 004C 0030 4865
     0130: 7920 636F 606D 656E  Resource Fork       ⌘R
     0140: 7572 2070 726F 706F ✓Data Fork           ⌘D
     0150: 6461 2066 6F72 2074
     0160: 6365 0D65 0006 0000
     0170: 0001 0028 0019 6772  ....group meet
     0180: 696E 6720 6E65 7874 2077 6565 682E 0D2E  ing next week...
     0190: 0006 0000 0C00 0002 0001 1023 0001 0010  ...........#....
     01A0: 0001 0D01 0006 0000 0C00 0002 0001 1023  .............#
     01B0: 0001 0084 0075 312E 2020 4D6F 7669 6E67  .....u1. Moving
     01C0: 2044 6174 653A 2020 4C65 7427 7320 7761   Date:  Let's wa
     01D0: 6974 2061 7768 696C 652E 2020 4469 7363  it awhile.  Disc
     01E0: 7573 7369 6E67 2074 6865 206D 6F76 696E  ussing the movin
     01F0: 6720 6461 7465 2073 6565 6D73 2070 7265  g date seems pre
```

Read Next Block simply reads the next block from the disk or file. This is equivalent to clicking the right arrow of the scroll bar once or twice (since clicking the arrow will move by half a block). Read Previous Block of course reads the previous block. If you know exactly what block you want to read, then choose Read Specific Block. A small window will appear, with a field for entering a new block number. Type the number of the block you want to read, then click the OK box or press Return. That block will be read.

To make a change to the disk itself, first read the block, make the changes to the block in the ViewEdit window, then choose Write

95

Block. Write Block writes the displayed block back to the disk. Be careful in using Write Block; bad information written to the disk can make a file or the whole disk unusable.

The Undo option simply re–reads the current block from the disk, effectively removing any changes you might have made since you last read the block.

The last two options from the ViewEdit menu, Resource Fork and Data Fork, are available only if you've chosen ViewEdit from the File menu to look at a file on the disk. Some Macintosh files have two parts, called the resource fork and the data fork. Other files have a resource fork, but no data fork. If the file you're looking at does not have a data fork, then the Data Fork option in the Misc menu will be dimmed. If the file has both a data fork and a resource fork, then both options will be available.

When you first ViewEdit a file, MacTools shows you the resource fork. You can see a check beside the Resource Fork option. If the file contains both forks, you can view either fork by choosing Resource Fork or Data Fork from the ViewEdit menu. The check will show you which fork you are viewing at any time. As one example, the text of a MacWrite document is stored in the data fork of the file (as long as the document was stored as TEXT only). If you want to use ViewEdit to look at a MacWrite document, be sure to choose the Data Fork option. You can then see the text characters on the right as you read through blocks of the file.

Repairing Damaged Disks & Undeleting Files

MacTools includes an Undelete Files option to help you recover "lost" information from disks. Undelete Files can often recover files that you have accidently deleted with MacTools or thrown in the trash from the Finder. It can also recover files from some "damaged" disks. These are disks that the Macintosh cannot recognize as readable, giving you the "This diskette is unreadable. Do you wish to eject or initialize" alert.

MacTools actually provides <u>two</u> different undelete methods, the "Tag Method" and the "Save Deletes Method". The Tag Method works with 3.5 inch disks (both HFS and MFS), but is not supported by most hard disks (because most hard disks do not support tags). The Save Deletes Method works with any Macintosh HFS disk device, including hard disks. Whenever you choose Undelete Files, MacTools determines if either or both Undelete methods will work with this disk, and lets you choose which method you want to use.

The following sections describe how to use the Tag Method (with CPS TagFix and the InfoEdit option) and the Save Deletes Method to recover deleted files.

About CPS TagFix

A file on the Copy II disk, named "CPS TagFix", fixes two problems with 3.5 inch disks on Macintosh computers: (1) unreliable tags which interfered with file recovery, and (2) slow disk access in the upper drive of the Macintosh SE. The CPS TagFix file should be copied to the System Folder of a hard disk or any startup disks. Whenever the Macintosh is started up, the system will "see" the CPS TagFix file in the System Folder and install its features, fixing the problems.

Disk "tags" are a feature of the Macintosh which provide for more reliable recovery of accidentally deleted files and some damaged disks. Tags are a few bytes of information associated

block on a disk, describing which part of which file this block belongs to. The MacTools Undelete Files option reads this tag information from each block on the disk to help recover deleted files.

Unfortunately, tags written by a Macintosh 512e or Macintosh Plus (both with "128K ROMs") are unreliable. This has prevented the MacTools Undelete Files option (and other disk recovery programs that rely on tags) from working correctly.

CPS TagFix corrects this problem. When CPS TagFix is installed at system startup, it "patches" the Macintosh disk routines so that all files written to the disk have correct and reliable tags. If these files are later accidentally deleted, the MacTools Undelete Files option can recover them.

CPS TagFix also corrects a problem on a Macintosh SE with two internal drives. Without the fix, the upper drive on a Macintosh SE runs more slowly and more noisily than it should. This difference can be noticed easily by starting up the Macintosh first from a disk in the lower drive, then restarting again with the same disk now in the upper drive. The upper drive makes about twice as many "noises" as the lower drive and it takes a few seconds longer to start up. This same problem occurs during practically all disk accesses to the upper drive: when using applications, saving documents, copying files, etc.

CPS TagFix, when installed in a Macintosh SE, makes a patch to fix this problem, allowing the upper drive to work at a normal speed. (Apple might provide their own fix to the SE upper drive in a future release of system software. CPS TagFix is designed to "respect" other system patches. If it finds another patch already installed, it does not install its own patch, so there will be no conflict.)

Using CPS TagFix

To get the benefits of CPS TagFix (reliable disk tags on a Macintosh Plus or enhanced 512K Macintosh so you can later recover accidentally deleted files, and faster disk access on the upper drive of a Macintosh SE), you should copy the file "CPS TagFix" from the Copy II disk into the System Folder of any disk (or hard disk) you use for starting up your Macintosh. Then, anytime you start up with that disk, the CPS TagFix features will automatically be installed. On a Macintosh Plus or enhanced 512K Macintosh, below the "Welcome to Macintosh" message you'll see another message in its own box: "CPS TagFix installed." If you're using a Mac SE with two internal drives, you'll instead see "CPS SE upper drive fix installed."

(Note: If your startup disk is an MFS disk, CPS TagFix does not have to be in the System Folder. It just needs to be copied onto the MFS disk. If your startup disk is an HFS disk, CPS TagFix must be in the System Folder in order to be installed at system startup.)

(Another Note: On a Macintosh II, Macintosh SE, or unenhanced 512K Macintosh, you won't see the message "CPS TagFix installed", because the tag patches that CPS TagFix makes are not needed, and not made, on these computers. Disk tags are already correct.)

To fix the tags on your existing disks, make sure CPS TagFix has been installed, then copy all the files onto new initialized disks from the Finder desktop or using the Copy Files option in MacTools. The copies made will then have correct tags. (Don't use Copy II to copy the entire disk; both Sector Copy and Bit Copy would preserve the bad tags of the original disk.)

About the Tag Method

Whenever a file has been deleted, all record of the file in the disk's directory are lost. Fortunately, the Macintosh marks each

block with a tag, as described above. If CPS TagFix has been installed and the tags on a 3.5 inch disk are correct and reliable, the MacTools Undelete Files option can be used to recover files that have been deleted from the disk. (Undelete Files can also recover files from any hard disk that correctly supports tags. Unfortunately, tags are not supported on most hard disks.) For most kinds of files, the Macintosh also leaves behind a little additional "scavenging" information as part of the file itself. MacTools finds this scavenging information for every deleted file that has it, to provide the correct filename and other useful information about the file. A few kinds of data files do not have this scavenging information, and undeleting these files takes a little more work on your part.

When you choose Undelete Files from the Disk menu then choose the Tag Method, MacTools reads all of the tags on the disk and pieces together information about all the deleted files. The names of all or most of the deleted files are then listed for you to choose from. (For the few types of data files that do not have "scavenging" information, the name of the deleted file is not available.) You can then select which of the deleted files you would like to recover. (Note: If you try to Undelete Files from a volume that does not support tags, MacTools will inform you that the volume doesn't support tags and an Undelete cannot be done.)

MacTools will also ask you where you want to store the files it undeletes. MacTools does not undelete "in place"; it instead copies the files being recovered onto another volume. Nothing is written back to the original disk, which is especially helpful if you're having some problem with the disk and want to also try other methods for recovery.
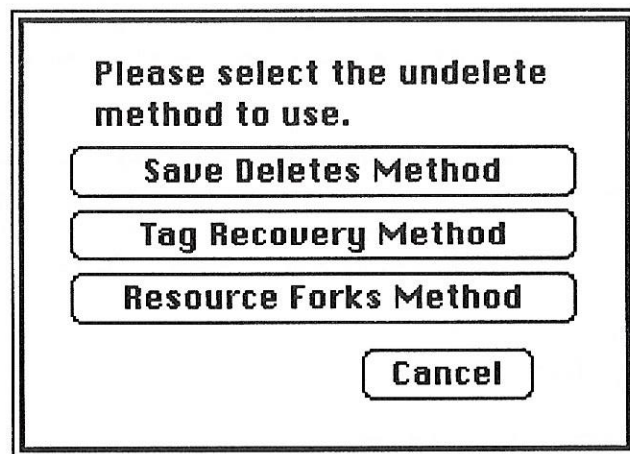
If the name of the deleted file was known, MacTools gives the new recovered file that same name. (If a file of the same name already exists on the destination disk, MacTools adds a number to the recovered file, such as SAMENAMEFILE001.) If the scavenging information was not available for this deleted file,

MacTools assigns a new filename to the recovered file, such as RECOVEREDFILE001, etc. This is done for each deleted file you've selected to recover. If the original disk has a large capacity or contains many deleted files, the entire process may take several minutes.

Most recovered files will be ready to use at this point. Recovered files for which there was no scavenging information need a little more help before they can be used. MacTools includes an InfoEdit option for you to determine and fill in this missing information.

Using the Tag Method

To use the Tag Method of Undelete Files, make sure the disk or volume you want to undelete files from is the frontmost (active) window, then choose Undelete Files from the Disk menu. You'll see a dialog similar to:

```
┌─────────────────────────────────────┐
│  ╔═══════════════════════════════╗   │
│  ║ Please select the undelete    ║   │
│  ║ method to use.                ║   │
│  ║                               ║   │
│  ║  ╭─────────────────────────╮  ║   │
│  ║  │  Save Deletes Method    │  ║   │
│  ║  ╰─────────────────────────╯  ║   │
│  ║  ╭─────────────────────────╮  ║   │
│  ║  │  Tag Recovery Method    │  ║   │
│  ║  ╰─────────────────────────╯  ║   │
│  ║  ╭─────────────────────────╮  ║   │
│  ║  │  Resource Forks Method  │  ║   │
│  ║  ╰─────────────────────────╯  ║   │
│  ║              ╭──────────╮     ║   │
│  ║              │  Cancel  │     ║   │
│  ║              ╰──────────╯     ║   │
│  ╚═══════════════════════════════╝   │
└─────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────┐
│ Tag Recovery Method                            │
│ Please select the files you wish to undelete.  │
│                                                │
│   File          Size   Recoverable   Date      │
│  ▫Simple letter  3.5K     3.5K      Wed, May 20, 1987 ▲│
│  ▫Birthday       29K      29K       Wed, May 20, 1987 │
│  ▫Letter to Mom  21.5K    21.5K     Wed, May 20, 1987 │
│   $00000014      4K       4K        Invalid Date      │
│   $00000013      5.5K     5K Invalid Invalid Date     │
│  ▫Simple and Quick ... 3K   3K      Wed, May 20, 1987 │
│   $00000011      5K       5K        Invalid Date      │
│  ▫DeskTop        1K       1K        Wed, May 20, 1987 ▼│
│                                                │
│  ╭────────╮   ╭──────────╮    ╭────────────╮  │
│  │ Cancel │   │ Continue │    │ Select All │  │
│  ╰────────╯   ╰──────────╯    ╰────────────╯  │
└──────────────────────────────────────────────┘
```

Choose the Tag Method. (If the "Tag Method" button is greyed out, which means it cannot be chosen, that means this disk device does not support tags, so the Tag Method will not work.)

MacTools will begin looking on the disk for deleted files. This part will take less than a minute for 3.5 inch diskettes, and several minutes for a hard disk. (You can click on Cancel if you need to stop.) MacTools will then display a dialog asking you to select which files you wish to undelete:
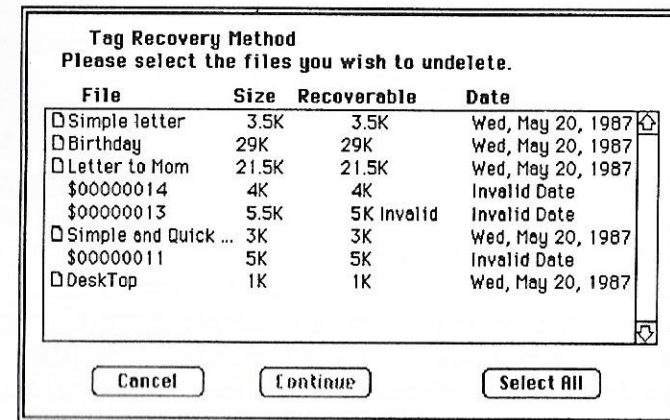
The information shown in the dialog helps you determine which file or files you want to undelete. For most files, the actual filename will be listed. (If you had ever renamed the file, be careful: The original name of the file, not the "renamed" name, will usually be listed here, simply because of the way the Macintosh recorded this scavenging information.)

If the name of the file could not be determined (scavenging information was not available for this type of data file), the file's hexadecimal file "number" is listed instead. This file number is helpful, for instance, if the file you want to undelete was created just recently. The Macintosh assigns a unique number to every file ever stored on the disk; the larger the number, the more recently the file was created. (The Undelete display shows all of the deleted files sorted by file number, by how recently they were

created, whether the filename or file number is listed. The most recently created files are at the beginning of the list.)

The Size column shows how big the file was, and the Recoverable column shows how much of the file is still actually recoverable. (If other files have since been saved on the disk, a portion of the deleted file may have been overwritten with a new file.) If the Recoverable value does not equal the Size of the file, then the word "Invalid" will appear as an indication that not all of this file can be successfully recovered.

The actual date shown in the Date column depends on a couple of things. On MFS disks, the date the file was last modified is provided in the tag information which MacTools reads from the disk. On HFS disks, this date is not available in the tags. So... if the tags contain a valid modified date for this file (if the disk is MFS), that date is listed in the Date column. Otherwise (the disk is HFS), if MacTools has listed the filename for this deleted file (which means the scavenging information is available), then the date this file was created is also known to MacTools, and that date is listed in the Date column. If neither date is available, then the phrase "Invalid Date" is shown instead, because no date is available for MacTools to list.

Select the files you wish to undelete, or click in the Select All button to select all the deleted files. Then click on Continue. MacTools will read and organize the deleted file information from the original disk. (This may also take several minutes for a hard disk.) Another dialog will then appear, this time for you to select which disk/volume/folder you want to save the recovered files to. Follow the usual Mac methods to select the destination, then click on Continue. MacTools will write the recovered files onto the disk you've selected.

For the recovered files that have the correct names (for which there was scavenging information), recovery is complete, and the files are ready to use.

About InfoEdit

For files named RECOVEREDFILEnnn (data files that didn't have the special "scavenging" information), MacTools needs a little help from you. The Macintosh system requires that two additional pieces of information be supplied about each file. These are called the file "TYPE" and the file "CREATOR". The Type and Creator are used by the Finder Desktop to help determine which icon to display, and to match a document file with the application that it belongs to. An application always has a Type of "APPL" and some other 4-letter Creator. The documents made with that application will have the same Creator as the application, and some other 4-letter Type. Whenever you open a document from the Finder desktop, the Finder actually looks for an application that has the same Creator value as the selected document and a Type of "APPL", and opens that! (For example, if you open a MacWrite document, which has a Creator of "MACA" and a Type of "WORD", the Finder actually opens the MacWrite application, which has a Creator of "MACA" and a Type of "APPL".)

The InfoEdit option in MacTools shows you the Type and Creator values for any file, and lets you change them if you want. You need to use InfoEdit to set the correct Type and Creator for the recovered file, so that the Macintosh will recognize what kind of file it is.

In order to set the correct Type and Creator for a RECOVEREDFILEnnn, you have to know, or guess, what kind of file it was. When you selected the file to be undeleted, the Undelete Files display gave you some helpful information about the file, such as file number (how recently the file was created), size, and date. Once you know what kind of file it was, then you can usually determine the file's Type and Creator simply by using InfoEdit to look at another file that is the same kind of file. (For example, if you know that RECOVEREDFILEnnn is a MacWrite document, its Type and Creator will be the same as any other MacWrite document you have.)

Find (or make) another file of the same kind, then select it in MacTools and choose InfoEdit. InfoEdit will show you the Type and Creator values for that file. Write down the 4–letter values for each. Now cancel the InfoEdit, select the RECOVEREDFILEnnn now and choose InfoEdit again. Type in the Type and Creator values that you just wrote down for the same kind of file. You can also rename the recovered file within InfoEdit to something more meaningful.

One helpful hint is to use InfoEdit to discover the Type and Creator for your various files before your data disks are damaged. By doing this, you'll be ready when disaster strikes. Here is a table of TYPE and CREATOR information for several popular applications:

DOCUMENT	TYPE	CREATOR
MacWrite	WORD	MACA
FactFinder	FACT	NARU
1st Base	1STD	M1ST
Filevision	PICB	TELO
MegaFiler	MFIL	MEGA
Multiplan	TEXT or MPBN	PLAN
ThinkTank	TEXT	TANK
MacPaint	PNTG	MPNT

Using InfoEdit

To use InfoEdit, select the appropriate file and choose InfoEdit from the Disk menu. You will see a display similar to the following:

The file name is displayed on the first line. You can give this recovered file a new name if you like. This isn't absolutely necessary, but file names such as "RECOVEREDFILE001" aren't very informative. Underneath this are two lines labeled "File Type" and "File Creator". To their right are the current values. If the file has just been recovered, you may see question marks as the current values. If the file has not been undeleted, the values shown are correct. If you are recovering a deleted file, type in the correct Type and Creator, using capital letters. When you are done, select the OK button, and you will be returned to the main MacTools display.

Recovering using resource forks

This is a new MacTools option for repairing damaged disks and undeleting files. This option helps you recover "lost" information from disks. It can also recover files from some damaged disks. These are the disks that the Macintosh cannot recognize as readable giving you the "This diskette is unreadable. Do you wish to eject or initialize" alert message.

This method for recovering data is different from the "Tag Method" in that the Tag method reads the tag for the block and using that information reconstructs a file. The resource forks method reads a block of information and determines if the block is a resource fork. If it is a resource fork, this method uses the information inside that block to reconstruct a file.
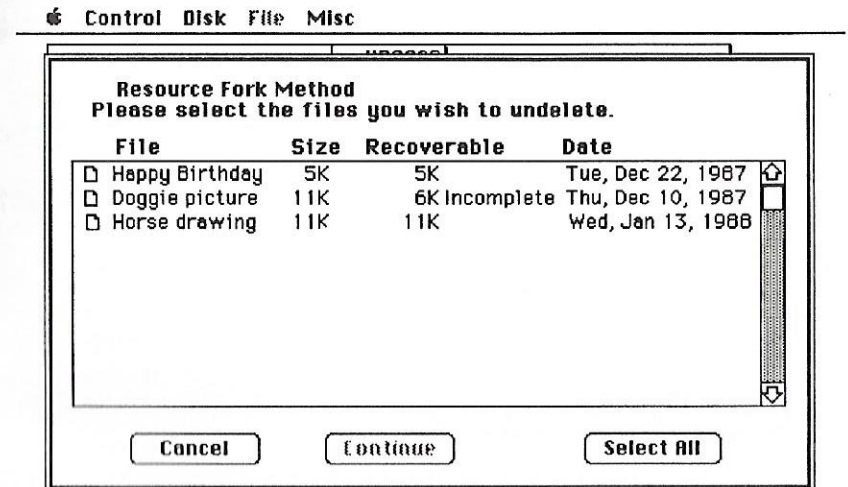
The recover using resource forks option can recover files from a disk whose directory and/or bit map has been destroyed. It identifies resource information and then recovers the file name and deduces where the data is stored. The word deduce is used here because it is possible that a file's data is not stored in one section on the diskette. This new option can get the start of the data, but since the bit map has been lost, it must guess where the rest of the data is. In the event of such conflicts, recovering using resource forks will recover as much of your file as possible.

To recover information using resource forks:

When using this option, make sure the disk or volume you want to undelete files from is in the active window.

1. Select the **Undelete** command from the Disk menu.

2. Choose the **Resource Forks Method** option..

MacTools begins looking on the disk for deleted files. This takes less than a minute for 3.5 inch diskettes and several minutes for a hard disk. When it's finished, MacTools displays a dialog box asking you to select which files to undelete.

<table>
<tr><td colspan="2">🍎 Control Disk File Misc</td></tr>
<tr><td colspan="2">Resource Fork Method
Please select the files you wish to undelete.</td></tr>
<tr><th>File</th><th>Size</th><th>Recoverable</th><th>Date</th></tr>
<tr><td>🗋 Happy Birthday</td><td>5K</td><td>5K</td><td>Tue, Dec 22, 1987</td></tr>
<tr><td>🗋 Doggie picture</td><td>11K</td><td>6K Incomplete</td><td>Thu, Dec 10, 1987</td></tr>
<tr><td>🗋 Horse drawing</td><td>11K</td><td>11K</td><td>Wed, Jan 13, 1988</td></tr>
<tr><td>Cancel</td><td>Continue</td><td></td><td>Select All</td></tr>
</table>

The information in the dialog box helps you determine which file or files to undelete.

Note: If you've changed the name of some of your files, the new name may not appear in this dialog box. This is because when you change a file name, the Macintosh doesn't always update the fork. Instead, the original file name may appear.

Size:
The size column shows how big the file was.

Recoverable:
The Recoverable column shows how much of the file is still recoverable. If other files have been saved on the disk, a portion of the deleted file may have been overwritten with a new file. If the recoverable value does not equal the size of the file value, the

word "Incomplete" appears telling you that all of the file cannot be successfully recovered.

Date:
The date the file was created. The date shown in the display depends on a couple of things.

- On MFS disks, the date the file was last modified is provided in the resource fork information which MacTools read from the disk.

- On HFS disks, the date is not available in the resource forks.

3. Select the files to undelete, or click the Select All button to select all the deleted files.

4. Click continue.

MacTools reads and organizes the deleted file information from the original disk. When it's finished, another dialog box appears asking you to select which disk, volume, or folder you want to save the files to.

Note: You must recover to a different diskette rather than to the original diskette. This protects your original diskette from further damage and gives you the option to try another undelete method.

5. Use the normal Macintosh methods to select which disk, volume, or folder you want to save the files to.

6. Click continue.

MacTools writes the recovered files onto the disk you've selected.

About the Save Deletes Method

Normally, when a file is deleted, the Macintosh destroys all record of what kind of file it was and where the file resides on the disk. Without this information, recovering an accidentally deleted file is usually impossible (if tags are not supported). The Save Deletes method is designed to save this information as the file is being deleted, so that the file can later be recovered.

The Save Deletes approach must be set up before you delete any files, for those files to be recoverable later. This method, if it's in effect, "watches over" all file deletes that take place. It saves the important information about the file being deleted into a special Delete–Info file on that disk. If the file was deleted accidentally and needs to be undeleted, MacTools can then use the information in the Delete–Info file to bring the deleted file back.

The Save Deletes method consists of three parts: The "CPSSaveDeletes" file, the MacTools "Install Delete–Info File" option, and the MacTools "Undelete Files" option.

The "CPSSaveDeletes" file is a special file (called an "INIT" file) found on the Copy II disk. This file provides the actual Save Delete capabilities. The CPSSaveDeletes file should be copied into the System Folder of your hard disk volume (or any disk you use to start up your Macintosh). Then, the next time you start up your Mac, the Macintosh system will "see" the CPSSaveDeletes file in the startup volume's System Folder and "run" this file, installing the Save Delete capabilities.

The MacTools "Install Delete–Info File" option, which can be found in the "Misc" menu, provides a place for the deleted–file information to be stored on a disk. Choosing this option actually places a new file (named "CPSDeleteInfo") on the disk. (This file is "invisible", which means it can be seen from MacTools, but not from the Finder desktop.) Whenever any file is later deleted from that disk, the necessary information from the file will be saved into the Delete–Info file. If you want to be able to recover

files from more than one disk, you need to choose "Install Delete–Info File" for each disk.

MacTools lets you decide how big the Delete–Info file will be, which determines how many deleted files it can keep track of. The Delete–Info file will always remember the most recently deleted files, if you delete more files than it can keep track of.

Once both the CPSSaveDeletes file and one or more Delete–Info files are set up, the disk or disks that have the Delete–Info files are protected against accidental file deleting. If you do accidentally delete one or more files and you want to recover them, you can start up MacTools, choose the Undelete Files option, see the names of the files that have been deleted, and select which of those files you want to recover. Using the information from the Delete–Info file, MacTools will undelete the selected files, placing them into a new folder on the disk called Recovered Files. You can then see the files from MacTools, or Quit to the Finder desktop and access them from there. Either way, you'll probably want to move the files out of the Recovered Files folder to a more appropriate place.
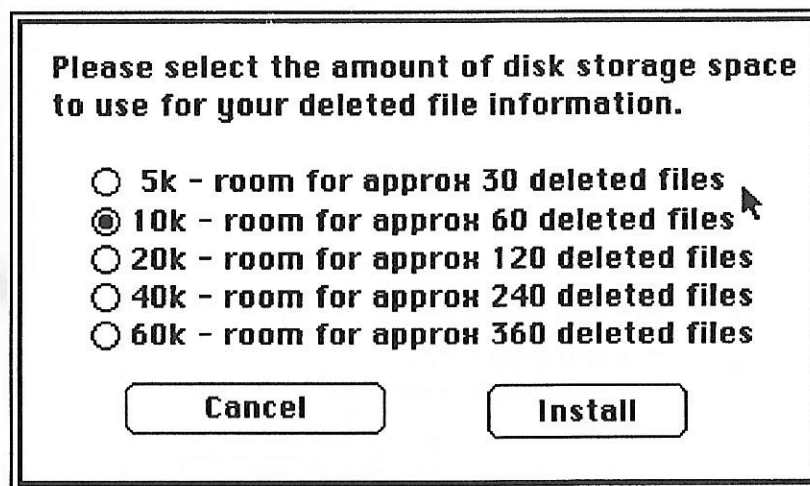
Using the Save Deletes Method

For the Save Deletes method to be in effect, your Macintosh must be started up from a disk volume that has the CPSSaveDeletes file in its System Folder:

1. Using either the Finder desktop or MacTools, copy the CPSSaveDeletes file from the Copy II disk into the System Folder of your hard disk. If there are any other disks you use to start up your Macintosh, and you want Save Deletes to be in effect when you've started up with them, copy CPSSaveDeletes into the System Folder of those disks, too.

For the files on any disk to be protected by the Save Deletes method (so they can later be recovered if they're accidentally deleted), a "CPSDeleteInfo" file must be placed on that disk:

2. Start up MacTools. For every disk which you want protected with the Save Deletes method, insert the disk if necessary, and click on the window for that disk to make it the frontmost (active) window. Choose the Install Delete–Info File option from the Misc menu. You'll see a dialog similar to the following:

> **Please select the amount of disk storage space to use for your deleted file information.**
>
> ○ **5k – room for approx 30 deleted files**
> ◉ **10k – room for approx 60 deleted files**
> ○ **20k – room for approx 120 deleted files**
> ○ **40k – room for approx 240 deleted files**
> ○ **60k – room for approx 360 deleted files**
>
> [**Cancel**]   [**Install**]

The bigger you make the Delete–Info file, the more deleted files it can keep track of. However, a bigger Delete–Info file also takes up more space on the disk, space which could have been used for other files. In most cases, you probably won't need a Delete–Info file bigger than 20K, unless you expect to be deleting large numbers of files at a time.

Select the size of Delete–Info file you want, then choose Install. A file named "CPSDeleteInfo", of the size you've chosen, will be added to the disk.

3. Whenever you want the Save Deletes method to be in effect, be sure to start up from a hard disk or disk that has the CPSSaveDeletes file in its System Folder. Below the "Welcome to

Macintosh" message, you'll see another message in its own box: "CPSSaveDeletes installed". The Save Deletes method will then be in effect for every disk that has a CPSDeleteInfo file.

4. To recover a file that has been accidentally deleted (if the disk is "protected" by the Save Deletes method), start up MacTools. Insert the disk if necessary, and click on the disk's window to make it the frontmost (active) window. Choose Undelete Files. You'll see a dialog similar to:

```
┌────────────────────────────────────┐
│  ┌──────────────────────────────┐  │
│  │                              │  │
│  │  Please select the undelete  │  │
│  │  method to use.              │  │
│  │                              │  │
│  │  ┌────────────────────────┐  │  │
│  │  │  Save Deletes Method   │  │  │
│  │  └────────────────────────┘  │  │
│  │  ┌────────────────────────┐  │  │
│  │  │  Tag Recovery Method   │  │  │
│  │  └────────────────────────┘  │  │
│  │  ┌────────────────────────┐  │  │
│  │  │ Resource Forks Method  │  │  │
│  │  └────────────────────────┘  │  │
│  │              ┌──────────┐    │  │
│  │              │  Cancel  │    │  │
│  │              └──────────┘    │  │
│  └──────────────────────────────┘  │
└────────────────────────────────────┘
```
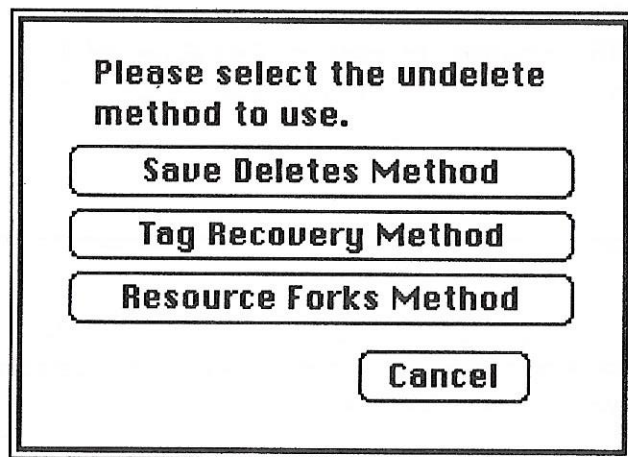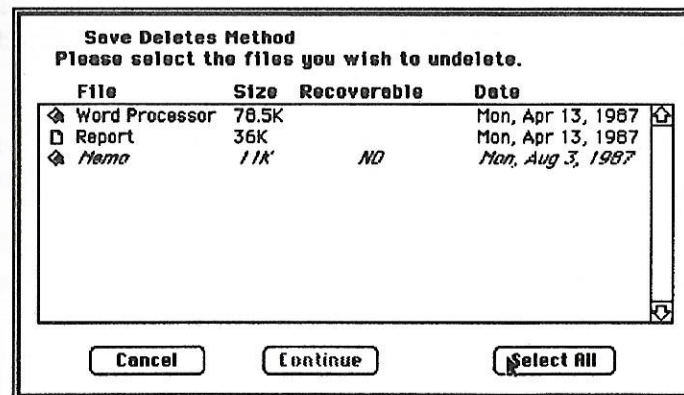
choose undelete method

(If the "Save Deletes Method" button is greyed out, which means it cannot be chosen, that means that there was not a CPSDeleteInfo file on this disk, and the deleted files cannot be recovered by this method.)

Click on the Save Deletes Method button. After a few seconds, another dialog will appear:

```
┌─────────────────────────────────────────────┐
│  Save Deletes Method                        │
│  Please select the files you wish to undelete. │
│                                             │
│   File          Size  Recoverable  Date     │
│  ▨ Word Processor 78.5K           Mon, Apr 13, 1987 ▲│
│  ▯ Report        36K             Mon, Apr 13, 1987 │
│  ▨ Memo          11K    NO       Mon, Aug 3, 1987  │
│                                             │
│                                             │
│                                          ▼  │
│  ┌────────┐   ┌──────────┐   ┌──────────┐   │
│  │ Cancel │   │ Continue │   │Select All│   │
│  └────────┘   └──────────┘   └──────────┘   │
└─────────────────────────────────────────────┘
```

This dialog shows all of the files that have been deleted while the Save Deletes method was in place. Each line shows:

(a) whether the file was a document or an application,
(b) the name of the file,
(c) the size of the file,
(d) the last modified date of the file before it was deleted, and
(e) whether or not the file is recoverable.

(If a deleted file is not recoverable, the entry is shown in italics and a NO appears in the Recoverable column. This means that other files have been saved on the disk (or have changed size) since this file was deleted, and the new files overwrote some or all of the contents of the deleted file. This deleted file cannot be recovered.)

(If many files are listed, but not the one you wanted, it may be that the Delete Info file was not big enough to hold all the files you've deleted. The Delete Info file always keeps track of the most recently deleted files, for as many files as it can keep track of at any one time. You've deleted too many files since.)

Using the mouse, select the files you want to recover, then click on the Recover button to proceed. MacTools will recover these files, placing them in a new folder called Recovered Files. (If the Recovered Files folder already contains a file with the same name as one of the files you've selected, it will append a 001, 002, etc. to the end of the name to make a unique name.)

5. The Undelete is now complete. You can use MacTools to see the contents of the Recovered Files folder, to show that the files have been recovered. Using either MacTools or the Finder desktop, you can move these files into other folders if you want. If you've undeleted a large number of files, it may take the Finder a few seconds the first time to rearrange the desktop to accommodate all these new files.

The next time you choose Undelete Files, you'll notice that the files you've already recovered are no longer listed in the Undelete Files display. MacTools always "cleans up" the Delete–Info file after every Undelete.

Repairing Damaged Disks

MacTools can often successfully recover files from disks which have become damaged and produce the message "This disk is unreadable. Do you wish to eject or initialize?" Note: If you also have other software tools that might help you recover this damaged disk, you may want to use the Copy II Sector Copy option to copy the damaged disk, then use the MacTools Mount option on the copy rather than the original. That way, the original damaged disk is not changed in any way.

The recovery process takes a few steps. To attempt recovery, first insert the damaged disk (or a copy) while in the MacTools application. MacTools will notice that there are problems with the disk, and provide a display similar to the following:

This disk has problems. Please select the option to perform.

Eject	Initialize
Mount	View
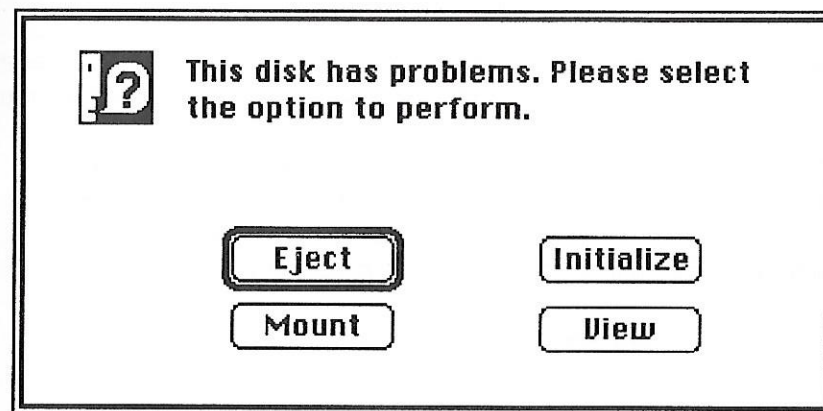
MacTools is now telling you what you already have discovered: this disk is dead. But rather than just giving you the option to eject or initialize it, two additional options are available, Mount and View.

The Mount option places a new, "clean" directory on the disk. This will make the disk useable but appear to be empty. You will see a window for this disk labeled "RECOVERED DISK" and no files. The files are still lurking out there on the disk, and can usually be recovered with Undelete Files.

The View option will take you directly to the MacTools sector editor. This is for adventurous souls who wish to manually look around and see what happened to the diskette.

You will normally want to choose the Mount option, then choose Undelete Files Tag Method as described above to recover the files from the disk, placing them onto another disk. (Note that the Undelete Files display will show you both the previously "active" files and the files that were already deleted on the disk.

information included in the display can help you determine which files you want to recover.)

(If you use the Mount option with the original damaged disk, take note: Even after the Mount option is used, the damaged disk may still have other problems. We suggest that after you've recovered the files from the disk, you choose Format Disk from the Disk menu to re-initialize the disk, completely overwriting any old damage. If Format Disk fails, then the disk itself is probably permanently damaged and should be discarded.)

Checklist for Handling Disk Problems

You threw the file in the Trash or deleted the file from MacTools: If nothing else has been done to the disk, the file can usually be successfully recovered. (If other files have been added or changed on the disk, part of the file may have been overwritten with new files.) Choose Undelete Files, then either the Save Deletes Method or the Tag Method. Select the file you threw away (using the information shown in the Undelete Files display to help you identify it); click on Continue to undelete it. If the original filename was not available (if it recovered as RECOVEREDFILEnnn), then use InfoEdit to set Type and Creator and rename the undeleted file.

Inserting the disk at the Finder desktop shows the message "This disk is unreadable" or "This is not a Macintosh disk": Start up MacTools and insert the problem disk. If a window for the disk correctly appears, then copy all files onto a new disk. MacTools may instead tell you that (1) you're using an 800K disk in a 400K drive, (2) you're using an HFS disk in an MFS Macintosh, or (3) simply that this disk has problems. If the disk has problems, choose Mount, then choose Undelete Files on the mounted disk. Use InfoEdit to set Type and Creator for any files named RECOVEREDFILEnnn.

You try to open a document from the Finder desktop and get the message "There is no application to open this document": First make sure the associated application is available. If it is, then the Type and Creator for the document are wrong. Use InfoEdit to check the Type and Creator for another document made by the same application, then set the same Type and Creator for the problem document.

From within an application, you get a message similar to "Cannot open the selected file": This is usually not recoverable. Either there is a disk error (bad block) in some part of this file, or the file itself is okay but some information stored in the file is not correct for this application. Use the MacTools Verify Files option to verify the problem file. If it detects errors, then one or more blocks of the file are bad. In either case, call the publisher of the application to see if they have any helpful hints for recovering the file.

If Verify Files showed any bad blocks for the file, here is a "last chance" rescue effort: Use the Copy II Sector Copy option to copy the entire disk. Try using the file from the copy. (This gives you a file that has no bad blocks, but may not contain the right information in the blocks that had been bad.) If that doesn't work, then go back to the problem disk. Check the size and date of the file and use InfoEdit to note its Type and Creator. Now delete the file, then immediately undelete it using the Tag Method. If necessary, use InfoEdit to set Type and Creator on the recovered file. Try this recovered file. (This gives you a file in which the bad blocks were "extracted". The application may not be able to tolerate a document with large sections of information "missing".)

Notes

The Macintosh is a powerful computer, and along with the power there are also a few interesting "quirks". It can be helpful to know what a few of these peculiarities are when working with MacTools.

When running an application such as MacTools, the Macintosh system may sometimes discover that it needs some information it doesn't currently have, and will eject the disk in the drive and ask you to insert a different disk so that it can load this information. After the information is loaded, the application will continue running as before. The disk swap is done by the Macintosh system, not the application. The only drawback is that the application doesn't "know" that a different disk is now in the drive, unless it can second-guess when the Macintosh is going to want to switch disks.

Because of this, MacTools may occasionally have one disk window on the screen (or no window at all) when a different disk is actually in the drive. If this happens, don't worry! If you choose one of the options, the Macintosh is smart enough to ask you to reinsert the disk that appears in the window. If the difference between the window and the disk in the drive ever bothers you, just eject the current disk then insert the disk you want to work with.

The invisible DeskTop file found on most Macintosh disks was discussed earlier. It contains information about the icons, folders, and windows that appear when you're in the Finder. If you're using the Copy Files option to copy files from one disk to another, don't copy the DeskTop file. If you do, you'll lose whatever folders you had on the copy disk (If you are using an MFS disk). Use the Copy Disk option when you want to copy all files and folders from one disk to another.

Using Hard Disks

MacTools can work with files on many hard disks as well as with floppy diskettes. To use MacTools with a hard disk, first start up your hard disk in its usual way (which with some earlier hard disks is often by starting up the Macintosh with a diskette that was supplied with your hard disk), then open the MacTools application. You can now copy files, rename files, etc., on the hard disk with MacTools.

(Note: If you "eject" a hard disk volume from MacTools, you can't mount that volume again without quitting out of MacTools first.)

In some cases, you can use MacTools to back up copy-protected applications onto your hard disk. Start up the hard disk and open MacTools (as described above). Then insert the application disk in the floppy drive and use the Copy Files option to copy the individual files of the application onto the hard disk. Don't change the protected, locked, or invisible status of any of the files.

Some protected applications will work just fine when running from a hard disk. Others "insist" that the original application disk remain in the floppy drive. This is an integral part of the protected program and cannot readily be changed. Other applications will simply not work correctly, as the methods they use exclude hard disks. The best test is to copy the application to the hard disk and give it a try. (The Copy II Hard Disk application is designed specifically for backing up many protected applications to hard disk. See the Copy II Hard Disk section for more information.)

Error ID Numbers

Listed here are the possible Macintosh disk error numbers that can appear when using MacTools (usually with the Verify Disk option). These disk error numbers are of use only to

programmers, and the errors usually can only be fixed by reformatting the disk. They're provided here for your information.

-67   couldn't find valid address mark
-69   address mark checksum didn't check
-70   bad address mark bit slip nibbles
-71   couldn't find a data mark header
-72   bad data mark checksum
-73   bad data bit slip nibbles
-74   write underrun occurred
-78   tried to read 2nd side on a 1-sided disk
-80   track number wrong on address mark
-81   sector number never found on a track

Locate

Locate

Locate is a desk accessory (DA) that enables you to find files or specific text strings inside files. Because Locate is a DA, you can start it from inside any application, but it must first be installed on your system.

To install Locate:

1. Select the Font/DA Mover icon on the desktop and choose Open from the File menu.

2. Click the Desk Accessory button.

3. Click Open to display a list of files to open.

4. Select the System File and click Open.

5. Select the Locate desk accessory and click Copy. This copies Locate to your system file.

For additional information about installing desk accessories, see your Macintosh documentation.

To display the Locate screen:

- Select the **Locate** command from the apple menu.
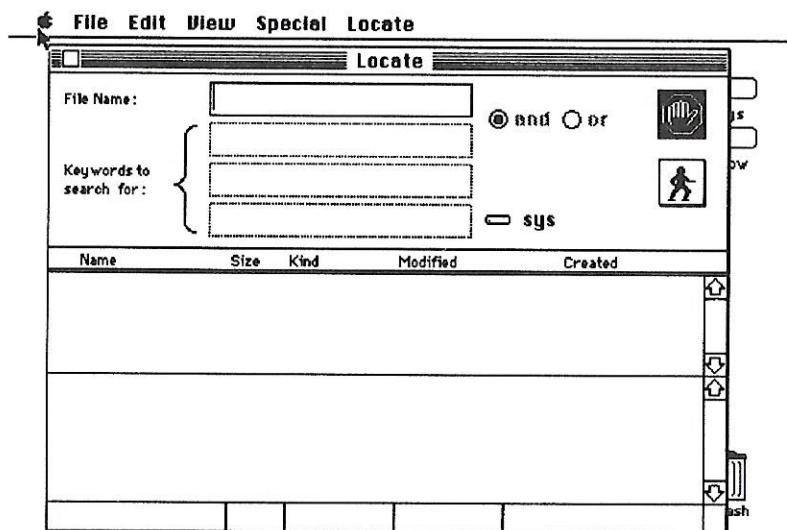
The Locate screen

You can use Locate to search for the following file information:

- A string in any part of a file name
- Up to three strings in a file
- A string in any part of a file name *and* up to three strings in a file
- A string in a file name *or* up to three strings in a file

As it searches, Locate displays the following information on the bottom line of the display:

- The name and size of the file being searched

- A running total of the files (by file icon) and folders (by folder icon) searched
- A search progress indicator

To begin a search:

- Click the start icon (the "walking man") or press Return.

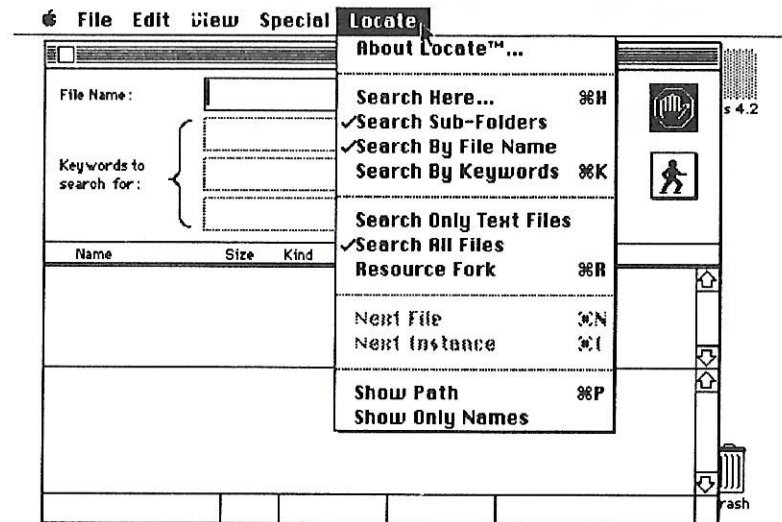**To stop a search:**

- Click the stop icon.

The Locate menu, shown below, provides a list of search and display options for file information. Locate searches a file name for as many as three strings or a sub-string inside a file.

The Locate menu

Search Here

Enables you to specify a volume or folder to search.

To search a volume or folder:

1. Select the **Search Here** command.
   Locate displays a dialog box where you choose the volume or folders to search.
2. Click OK to search the selected files.

Search Sub–Folders

Specifies whether or not to search sub–folders in the selected volume or folder. Unless you specify otherwise, Locate searches every sub–folder in the selected volume or folder.

Unselecting this command noticeably shortens the search time in large folders, or in folders containing many sub–folders.

Search By File Name

Specifies a search by the partial name of the file. Selecting this command activates the Filename box in the upper portion of the Locate screen, allowing you to type any part of a file name to search for. Unselecting this command automatically selects the Search By Keywords command and activates the remaining three edit boxes.

To search for a file name:

1. Select the **Search By File Name** command.

2. Type any string to search for in the filename box.

3. Click the start icon or press Return.

126

Locate searches for the string and displays running total information (described above.) As it searches, Locate displays information about each file whose name contains the string that matches the search parameters (see the screen below.) If the scroll bar is active, you can scroll the window containing the file names while the search continues, or after its completion.
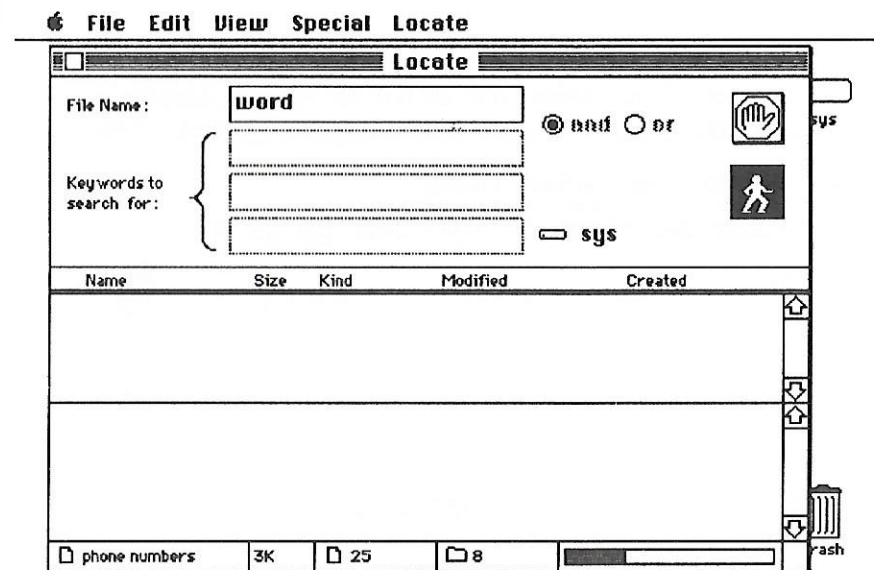
The Locate dialog box

Typing a character in the Filename and Key Word edit boxes activates the "and" or "or" buttons. Selecting the "and" button tells Locate to search for the file name string and the file

127

contents strings. Selecting the "or" button tells Locate to search for the file name string or the file contents strings.

Search By Keywords

Specifies a search for one to three strings in a file. This command is automatically selected when you unselect the Search By File Name command. You can use this command alone or with the Search By File Name command.

To search for occurrences of specific strings in a file, select the Search By Keywords command. Locate searches for and displays file names in the volume or folder that contains the strings.

If the scroll bar is active, you can scroll the window containing the file names. If you select one of the file names, Locate displays the the part of the file containing the search string.

```
  File  Edit  View  Special  Locate
┌──────────────────────────────────────────────────┐
│ ▓▓▓▓▓▓▓▓▓▓▓▓▓ Locate ▓▓▓▓▓▓▓▓▓▓▓▓▓                │
│                                                   │
│ File Name:  ┌──────────────┐                      │
│             └──────────────┘   ● and ○ or   [✋]  │sys
│             ┌──────────────┐                      │
│             │the           │                      │
│ Keywords to └──────────────┘              [🚶]    │
│ search for: ┌──────────────┐                      │
│             └──────────────┘                      │
│             ┌──────────────┐   ▭ sys              │
│             └──────────────┘                      │
├───────────────────────────────────────────────┬──┤
│ Name          Size  Kind    Modified     Created│⬆│
│ 🗋book outline  5K   WDBN  Mon,Jun 27,1988 Mon,Jun 27,1988│
│ 🗋book outline2 5K   WDBN  Wed,Jun 29,1988 Mon,Jun 27,1988│
│ 🗋Copy of floppy.a 13K TEXT Wed,Jun 29,1988 Wed,Jun 29,1988│
│ 🗋Office Management... 4K MORE Sun,May 1,1988 Wed,Jan 13,1988│⬇│
├───────────────────────────────────────────────┤  │
│ what  does  it  do..04  How  to  get  started. b│⬆│
│ rief  tutorial-style  chapter  about  starting  │ │
│ ,  choosing  applications,  moving  around  in  │ │
│ the menus,  how  to  select,  the  Esc  key,  int│ │
│ roduction  to  the  desk,  etc...  Are  things  a│ │
│ utomatically  saved  when  you  Esc  out  of  an│⬇│
├─────────┬──────┬───────┬──────────────────────┤  │
│ 704     4096   │  🗋24  │  🗀8                  │  │rash
└─────────┴──────┴───────┴──────────────────────┴──┘
```

Locate displays the search strings for the selected file

128

If the scroll bar in the text display window is active, you can scroll the window containing the text. Placing the cursor in the text display box and clicking on any character highlights the character. The number shown at the lower-left corner of the screen is the highlighted character's byte location in the file; the next number to the right is the file size in bytes.

Search Only Text Files

Specifies that only text files be included in the search. Selecting this command eliminates all non-text files such as applications, font files, and DA's from a search, shortening the search time. Locate normally searches all files.

Search All Files

Specifies that applications, text files, font files, and DAs be included in the search. This is the default search parameter.

Resource Fork

Specifies that only the file's resource forks be selected for the specified string. Selecting this command prevents Locate from searching file data forks.

Unselecting this command allows Locate to search only data forks. This is the default search parameter.

Next File

Used to specify which file to display next when more than one file is listed. Locate displays the file's matching string. If you don't select a file to display next, Locate automatically selects the first file in the list. If there are no more files, Locate notifies you with a beep.

129

Next Instance

Jumps to the next instance of the string in the file. If the file contains no more instances of the string, Locate jumps to the first instance of the string in the next file. If there are no more files, Locate notifies you with a beep.

Show Path

Displays the file's hierarchical location on the drive. Locate displays the contents of the selected file when this command is turned off.

Show Only Names

Shows only the names of files matching the search parameters. The file names are displayed in the file window.

Appendix A – Track Sector Lookup

To use this chart, find the block number in the chart. Look to the left for the track number and to the top for the sector number.

400K DISK

sector:	0	1	2	3	4	5	6	7	8	9	10	11
track:
0	0	1	2	3	4	5	6	7	8	9	10	11
1	12	13	14	15	16	17	18	19	20	21	22	23
2	24	25	26	27	28	29	30	31	32	33	34	35
3	36	37	38	39	40	41	42	43	44	45	46	47
4	48	49	50	51	52	53	54	55	56	57	58	59
5	60	61	62	63	64	65	66	67	68	69	70	71
6	72	73	74	75	76	77	78	79	80	81	82	83
7	84	85	86	87	88	89	90	91	92	93	94	95
8	96	97	98	99	100	101	102	103	104	105	106	107
9	108	109	110	111	112	113	114	115	116	117	118	119
10	120	121	122	123	124	125	126	127	128	129	130	131
11	132	133	134	135	136	137	138	139	140	141	142	143
12	144	145	146	147	148	149	150	151	152	153	154	155
13	156	157	158	159	160	161	162	163	164	165	166	167
14	168	169	170	171	172	173	174	175	176	177	178	179
15	180	181	182	183	184	185	186	187	188	189	190	191
16	192	193	194	195	196	197	198	199	200	201	202	
17	203	204	205	206	207	208	209	210	211	212	213	
18	214	215	216	217	218	219	220	221	222	223	224	
19	225	226	227	228	229	230	231	232	233	234	235	
20	236	237	238	239	240	241	242	243	244	245	246	
21	247	248	249	250	251	252	253	254	255	256	257	
22	258	259	260	261	262	263	264	265	266	267	268	
23	269	270	271	272	273	274	275	276	277	278	279	
24	280	281	282	283	284	285	286	287	288	289	290	
25	291	292	293	294	295	296	297	298	299	300	301	
26	302	303	304	305	306	307	308	309	310	311	312	
27	313	314	315	316	317	318	319	320	321	322	323	
28	324	325	326	327	328	329	330	331	332	333	334	
29	335	336	337	338	339	340	341	342	343	344	345	
30	346	347	348	349	350	351	352	353	354	355	356	
31	357	358	359	360	361	362	363	364	365	366	367	
32	368	369	370	371	372	373	374	375	376	377		
33	378	379	380	381	382	383	384	385	386	387		
34	388	389	390	391	392	393	394	395	396	397		
35	398	399	400	401	402	403	404	405	406	407		
36	408	409	410	411	412	413	414	415	416	417		

37	418	419	420	421	422	423	424	425	426	427
38	428	429	430	431	432	433	434	435	436	437
39	438	439	440	441	442	443	444	445	446	447
40	448	449	450	451	452	453	454	455	456	457
41	458	459	460	461	462	463	464	465	466	467
42	468	469	470	471	472	473	474	475	476	477
43	478	479	480	481	482	483	484	485	486	487
44	488	489	490	491	492	493	494	495	496	497
45	498	499	500	501	502	503	504	505	506	507
46	508	509	510	511	512	513	514	515	516	517
47	518	519	520	521	522	523	524	525	526	527
48	528	529	530	531	532	533	534	535	536	
49	537	538	539	540	541	542	543	544	545	
50	546	547	548	549	550	551	552	553	554	
51	555	556	557	558	559	560	561	562	563	
52	564	565	566	567	568	569	570	571	572	
53	573	574	575	576	577	578	579	580	581	
54	582	583	584	585	586	587	588	589	590	
55	591	592	593	594	595	596	597	598	599	
56	600	601	602	603	604	605	606	607	608	
57	609	610	611	612	613	614	615	616	617	
58	618	619	620	621	622	623	624	625	626	
59	627	628	629	630	631	632	633	634	635	
60	636	637	638	639	640	641	642	643	644	
61	645	646	647	648	649	650	651	652	653	
62	654	655	656	657	658	659	660	661	662	
63	663	664	665	666	667	668	669	670	671	
64	672	673	674	675	676	677	678	679		
65	680	681	682	683	684	685	686	687		
66	688	689	690	691	692	693	694	695		
67	696	697	698	699	700	701	702	703		
68	704	705	706	707	708	709	710	711		
69	712	713	714	715	716	717	718	719		
70	720	721	722	723	724	725	726	727		
71	728	729	730	731	732	733	734	735		
72	736	737	738	739	740	741	742	743		
73	744	745	746	747	748	749	750	751		
74	752	753	754	755	756	757	758	759		
75	760	761	762	763	764	765	766	767		
76	768	769	770	771	772	773	774	775		
77	776	777	778	779	780	781	782	783		
78	784	785	786	787	788	789	790	791		
79	792	793	794	795	796	797	798	799		

To use this chart, find the block number in the chart. Look to the left for the track number and to the top for the sector number.

Note: On 800K disks, every track has two sides. The first line of the track is side A and the second line of a track is side B (see example on track 0).

800K DISK

sector:	0	1	2	3	4	5	6	7	8	9	10	11
track:												
0	0	1	2	3	4	5	6	7	8	9	10	11
	12	13	14	15	16	17	18	19	20	21	22	23
1	24	25	26	27	28	29	30	31	32	33	34	35
	36	37	38	39	40	41	42	43	44	45	46	47
2	48	49	50	51	52	53	54	55	56	57	58	59
	60	61	62	63	64	65	66	67	68	69	70	71
3	72	73	74	75	76	77	78	79	80	81	82	83
	84	85	86	87	88	89	90	91	92	93	94	95
4	96	97	98	99	100	101	102	103	104	105	106	107
	108	109	110	111	112	113	114	115	116	117	118	119
5	120	121	122	123	124	125	126	127	128	129	130	131
	132	133	134	135	136	137	138	139	140	141	142	143
6	144	145	146	147	148	149	150	151	152	153	154	155
	156	157	158	159	160	161	162	163	164	165	166	167
7	168	169	170	171	172	173	174	175	176	177	178	179
	180	181	182	183	184	185	186	187	188	189	190	191
8	192	193	194	195	196	197	198	199	200	201	202	203
	204	205	206	207	208	209	210	211	212	213	214	215
9	216	217	218	219	220	221	222	223	224	225	226	227
	228	229	230	231	232	233	234	235	236	237	238	239
10	240	241	242	243	244	245	246	247	248	249	250	251
	252	253	254	255	256	257	258	259	260	261	262	263
11	264	265	266	267	268	269	270	271	272	273	274	275
	276	277	278	279	280	281	282	283	284	285	286	287
12	288	289	290	291	292	293	294	295	296	297	298	299
	300	301	302	303	304	305	306	307	308	309	310	311
13	312	313	314	315	316	317	318	319	320	321	322	323
	324	325	326	327	328	329	330	331	332	333	334	335
14	336	337	338	339	340	341	342	343	344	345	346	347
	348	349	350	351	352	353	354	355	356	357	358	359
15	360	361	362	363	364	365	366	367	368	369	370	371
	372	373	374	375	376	377	378	379	380	381	382	383
16	384	385	386	387	388	389	390	391	392	393	394	
	395	396	397	398	399	400	401	402	403	404	405	
17	406	407	408	409	410	411	412	413	414	415	416	

Page 134:

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        417  418  419  420  421  422  423  424  425  426  427
18      428  429  430  431  432  433  434  435  436  437  438
        439  440  441  442  443  444  445  446  447  448  449
19      450  451  452  453  454  455  456  457  458  459  460
        461  462  463  464  465  466  467  468  469  470  471
20      472  473  474  475  476  477  478  479  480  481  482
        483  484  485  486  487  488  489  490  491  492  493
21      494  495  496  497  498  499  500  501  502  503  504
        505  506  507  508  509  510  511  512  513  514  515
22      516  517  518  519  520  521  522  523  524  525  526
        527  528  529  530  531  532  533  534  535  536  537
23      538  539  540  541  542  543  544  545  546  547  548
        549  550  551  552  553  554  555  556  557  558  559
24      560  561  562  563  564  565  566  567  568  569  570
        571  572  573  574  575  576  577  578  579  580  581
25      582  583  584  585  586  587  588  589  590  591  592
        593  594  595  596  597  598  599  600  601  602  603
26      604  605  606  607  608  609  610  611  612  613  614
        615  616  617  618  619  620  621  622  623  624  625
27      626  627  628  629  630  631  632  633  634  635  636
        637  638  639  640  641  642  643  644  645  646  647
28      648  649  650  651  652  653  654  655  656  657  658
        659  660  661  662  663  664  665  666  667  668  669
29      670  671  672  673  674  675  676  677  678  679  680
        681  682  683  684  685  686  687  688  689  690  691
30      692  693  694  695  696  697  698  699  700  701  702
        703  704  705  706  707  708  709  710  711  712  713
31      714  715  716  717  718  719  720  721  722  723  724
        725  726  727  728  729  730  731  732  733  734  735

32      736  737  738  739  740  741  742  743  744  745
        746  747  748  749  750  751  752  753  754  755
33      756  757  758  759  760  761  762  763  764  765
        766  767  768  769  770  771  772  773  774  775
34      776  777  778  779  780  781  782  783  784  785
        786  787  788  789  790  791  792  793  794  795
35      796  797  798  799  800  801  802  803  804  805
        806  807  808  809  810  811  812  813  814  815
36      816  817  818  819  820  821  822  823  824  825
        826  827  828  829  830  831  832  833  834  835
37      836  837  838  839  840  841  842  843  844  845
        846  847  848  849  850  851  852  853  854  855
38      856  857  858  859  860  861  862  863  864  865
        866  867  868  869  870  871  872  873  874  875
39      876  877  878  879  880  881  882  883  884  885
        886  887  888  889  890  891  892  893  894  895
40      896  897  898  899  900  901  902  903  904  905
        906  907  908  909  910  911  912  913  914  915
41      916  917  918  919  920  921  922  923  924  925
        926  927  928  929  930  931  932  933  934  935
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Page 135:

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42      936   937   938   939   940   941   942   943   944   945
        946   947   948   949   950   951   952   953   954   955
43      956   957   958   959   960   961   962   963   964   965
        966   967   968   969   970   971   972   973   974   975
44      976   977   978   979   980   981   982   983   984   985
        986   987   988   989   990   991   992   993   994   995
45      996   997   998   999  1000  1001  1002  1003  1004  1005
       1006  1007  1008  1009  1010  1011  1012  1013  1014  1015
46     1016  1017  1018  1019  1020  1021  1022  1023  1024  1025
       1026  1027  1028  1029  1030  1031  1032  1033  1034  1035
47     1036  1037  1038  1039  1040  1041  1042  1043  1044  1045
       1046  1047  1048  1049  1050  1051  1052  1053  1054  1055

48     1056  1057  1058  1059  1060  1061  1062  1063  1064
       1065  1066  1067  1068  1069  1070  1071  1072  1073
49     1074  1075  1076  1077  1078  1079  1080  1081  1082
       1083  1084  1085  1086  1087  1088  1089  1090  1091
50     1092  1093  1094  1095  1096  1097  1098  1099  1100
       1101  1102  1103  1104  1105  1106  1107  1108  1109
51     1110  1111  1112  1113  1114  1115  1116  1117  1118
       1119  1120  1121  1122  1123  1124  1125  1126  1127
52     1128  1129  1130  1131  1132  1133  1134  1135  1136
       1137  1138  1139  1140  1141  1142  1143  1144  1145
53     1146  1147  1148  1149  1150  1151  1152  1153  1154
       1155  1156  1157  1158  1159  1160  1161  1162  1163
54     1164  1165  1166  1167  1168  1169  1170  1171  1172
       1173  1174  1175  1176  1177  1178  1179  1180  1181
55     1182  1183  1184  1185  1186  1187  1188  1189  1190
       1191  1192  1193  1194  1195  1196  1197  1198  1199
56     1200  1201  1202  1203  1204  1205  1206  1207  1208
       1209  1210  1211  1212  1213  1214  1215  1216  1217
57     1218  1219  1220  1221  1222  1223  1224  1225  1226
       1227  1228  1229  1230  1231  1232  1233  1234  1235
58     1236  1237  1238  1239  1240  1241  1242  1243  1244
       1245  1246  1247  1248  1249  1250  1251  1252  1253
59     1254  1255  1256  1257  1258  1259  1260  1261  1262
       1263  1264  1265  1266  1267  1268  1269  1270  1271
60     1272  1273  1274  1275  1276  1277  1278  1279  1280
       1281  1282  1283  1284  1285  1286  1287  1288  1289
61     1290  1291  1292  1293  1294  1295  1296  1297  1298
       1299  1300  1301  1302  1303  1304  1305  1306  1307
62     1308  1309  1310  1311  1312  1313  1314  1315  1316
       1317  1318  1319  1320  1321  1322  1323  1324  1325
63     1326  1327  1328  1329  1330  1331  1332  1333  1334
       1335  1336  1337  1338  1339  1340  1341  1342  1343

64     1344  1345  1346  1347  1348  1349  1350  1351
       1352  1353  1354  1355  1356  1357  1358  1359
65     1360  1361  1362  1363  1364  1365  1366  1367
       1368  1369  1370  1371  1372  1373  1374  1375
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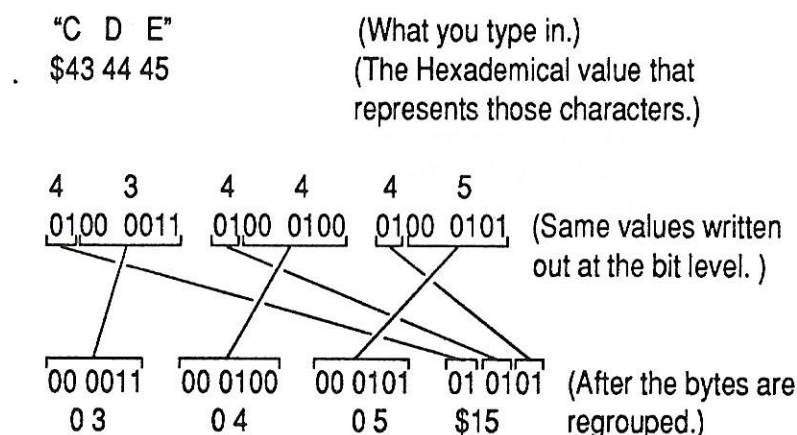
```
66 | 1376 1377 1378 1379 1380 1381 1382 1383
   | 1384 1385 1386 1387 1388 1389 1390 1391
67 | 1392 1393 1394 1395 1396 1397 1398 1399
   | 1400 1401 1402 1403 1404 1405 1406 1407
68 | 1408 1409 1410 1411 1412 1413 1414 1415
   | 1416 1417 1418 1419 1420 1421 1422 1423
69 | 1424 1425 1426 1427 1428 1429 1430 1431
   | 1432 1433 1434 1435 1436 1437 1438 1439
70 | 1440 1441 1442 1443 1444 1445 1446 1447
   | 1448 1449 1450 1451 1452 1453 1454 1455
71 | 1456 1457 1458 1459 1460 1461 1462 1463
   | 1464 1465 1466 1467 1468 1469 1470 1471
72 | 1472 1473 1474 1475 1476 1477 1478 1479
   | 1480 1481 1482 1483 1484 1485 1486 1487
73 | 1488 1489 1490 1491 1492 1493 1494 1495
   | 1496 1497 1498 1499 1500 1501 1502 1503
74 | 1504 1505 1506 1507 1508 1509 1510 1511
   | 1512 1513 1514 1515 1516 1517 1518 1519
75 | 1520 1521 1522 1523 1524 1525 1526 1527
   | 1528 1529 1530 1531 1532 1533 1534 1535
76 | 1536 1537 1538 1539 1540 1541 1542 1543
   | 1544 1545 1546 1547 1548 1549 1550 1551
77 | 1552 1553 1554 1555 1556 1557 1558 1559
   | 1560 1561 1562 1563 1564 1565 1566 1567
78 | 1568 1569 1570 1571 1572 1573 1574 1575
   | 1576 1577 1578 1579 1580 1581 1582 1583
79 | 1584 1585 1586 1587 1588 1589 1590 1591
   | 1592 1593 1594 1595 1596 1597 1598 1599
```

Appendix B – Byte Encoding Methods

6&2 encoded bytes

In this encoding scheme, three normal bytes become four encoded bytes. The encoder takes the low six bits of every number and performs a lookup in the write translate table to get the byte value to write to the diskette.

The top two bits of every number are rotated into the fourth byte and then that fourth 6-bit byte is used to do a lookup in the write translate table.

"C D E"   (What you type in.)

$43 44 45   (The Hexademical value that
                       represents those characters.)

```
 4     3       4     4       4     5
01 00 0011   01 00 0100   01 00 0101   (Same values written
                                        out at the bit level.)


00 0011   00 0100   00 0101   01 0101   (After the bytes are
  0 3       0 4       0 5      $15       regrouped.)
```

These new numbers (all in the range of 0–$3F) are put through the write translate table to get the number to store on the diskette. So, in our example:

```
$03   —>   $9B
$04        $9D
$05        $9E
$15        $BA
```

Write Translate Table
6 and 2

00 = 96	10 = B4	20 = D6	30 = ED
01 = 97	11 = B5	21 = D7	31 = EE
02 = 9A	12 = B6	22 = D9	32 = EF
03 = 9B	13 = B7	23 = DA	33 = F2
04 = 9D	14 = B9	24 = DB	34 = F3
05 = 9E	15 = BA	25 = DC	35 = F4
06 = 9F	16 = BB	26 = DD	36 = F5
07 = A6	17 = BC	27 = DE	37 = F6
08 = A7	18 = BD	28 = DF	38 = F7
09 = AB	19 = BE	29 = E5	39 = F9
0A = AC	1A = BF	2A = E6	3A = FA
0B = AD	1B = CB	2B = E7	3B = FB
0C = AE	1C = CD	2C = E9	3C = FC
0D = AF	1D = CE	2D = EA	3D = FD
0E = B2	1E = CF	2E = EB	3E = FE
0F = B3	1F = D3	2F = EC	3F = FF

The bytes AA and D5 are reserved bytes and should never appear inside of the sector data. (They are used in address and data prologs and epilogs.)

138

Appendix C – Number Conversion Tables

The table below lets you convert between decimal and hexadecimal numbers.

Dec	Hex	Dec	Hex	Dec	Hex
0	$00	37	$25	74	$4A
1	$01	38	$26	75	$4B
2	$02	39	$27	76	$4C
3	$03	40	$28	77	$4D
4	$04	41	$29	78	$4E
5	$05	42	$2A	79	$4F
6	$06	43	$2B	80	$50
7	$07	44	$2C	81	$51
8	$08	45	$2D	82	$52
9	$09	46	$2E	83	$53
10	$0A	47	$2F	84	$54
11	$0B	48	$30	85	$55
12	$0C	49	$31	86	$56
13	$0D	50	$32	87	$57
14	$0E	51	$33	88	$58
15	$0F	52	$34	89	$59
16	$10	53	$35	90	$5A
17	$11	54	$36	91	$5B
18	$12	55	$37	92	$5C
19	$13	56	$38	93	$5D
20	$14	57	$39	94	$5E
21	$15	58	$3A	95	$5F
22	$16	59	$3B	96	$60
23	$17	60	$3C	97	$61
24	$18	61	$3D	98	$62
25	$19	62	$3E	99	$63
26	$1A	63	$3F	100	$64
27	$1B	64	$40	101	$65
28	$1C	65	$41	102	$66
29	$1D	66	$42	103	$67
30	$1E	67	$43	104	$68
31	$1F	68	$44	105	$69
32	$20	69	$45	106	$6A
33	$21	70	$46	107	$6B
34	$22	71	$47	108	$6C
35	$23	72	$48	109	$6D
36	$24	73	$49	110	$6E

139

Dec	Hex	Dec	Hex	Dec	Hex	Dec	Hex
111	$6F	154	$9A	197	$C5	240	$F0
112	$70	155	$9B	198	$C6	241	$F1
113	$71	156	$9C	199	$C7	242	$F2
114	$72	157	$9D	200	$C8	243	$F3
115	$73	158	$9E	201	$C9	244	$F4
116	$74	159	$9F	202	$CA	245	$F5
117	$75	160	$A0	203	$CB	246	$F6
118	$76	161	$A1	204	$CC	247	$F7
119	$77	162	$A2	205	$CD	248	$F8
120	$78	163	$A3	206	$CE	249	$F9
121	$79	164	$A4	207	$CF	250	$FA
122	$7A	165	$A5	208	$D0	251	$FB
123	$7B	166	$A6	209	$D1	252	$FC
124	$7C	167	$A7	210	$D2	253	$FD
125	$7D	168	$A8	211	$D3	254	$FE
126	$7E	169	$A9	212	$D4	255	$FF
127	$7F	170	$AA	213	$D5		
128	$80	171	$AB	214	$D6		
129	$81	172	$AC	215	$D7		
130	$82	173	$AD	216	$D8		
131	$83	174	$AE	217	$D9		
132	$84	175	$AF	218	$DA		
133	$85	176	$B0	219	$DB		
134	$86	177	$B1	220	$DC		
135	$87	178	$B2	221	$DD		
136	$88	179	$B3	222	$DE		
137	$89	180	$B4	223	$DF		
138	$8A	181	$B5	224	$E0		
139	$8B	182	$B6	225	$E1		
140	$8C	183	$B7	226	$E2		
141	$8D	184	$B8	227	$E3		
142	$8E	185	$B9	228	$E4		
143	$8F	186	$BA	229	$E5		
144	$90	187	$BB	230	$E6		
145	$91	188	$BC	231	$E7		
146	$92	189	$BD	232	$E8		
147	$93	190	$BE	233	$E9		
148	$94	191	$BF	234	$EA		
149	$95	192	$C0	235	$EB		
150	$96	193	$C1	236	$EC		
151	$97	194	$C2	237	$ED		
152	$98	195	$C3	238	$EE		
153	$99	196	$C4	239	$EF		

Notes

Notes

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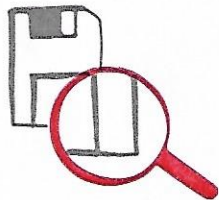
INDEX

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