COPY II PLUS

VERSION 9

PRODOS/DOS UTILITIES

DATA RECOVERY FILE MANAGEMENT
PROTECTED SOFTWARE BACKUP

Central Point Software INC
(503) 690-8090

Copy II Plus

Version 9.0

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Introduction

This manual describes Copy II Plus version 9, which contains these programs:

- a powerful DOS/ProDOS disk utility package.
- a sophisticated Bit Copy program for 5.25" floppy disk drives utilizing better memory management for less disk swapping.
- a separate Bit Copy program designed for 3.5" disk drives.

This manual is organized in four major sections:

- The Utilities
- The Bit Copy programs
- The technical tools needed to create and edit your own parameter entries
- The appendices which contain technical information, conversion tables, and other helpful information.

The DOS/ProDOS Utilities (which we'll call the Utilities) allow you to manipulate DOS 3.3 and ProDOS files and disks quickly and easily. The two Bit Copy programs can make backups of software that has been copy–protected.

There are two disks in the Copy II Plus package: one double-sided 5.25" disk and one 3.5" disk. The 5.25" disks contain the Utilities and the 5.25" Bit Copy program. The 3.5" disk contains all three programs.

The Copy II Plus disks are standard ProDOS disks and are not copy-protected in any way. We recommend you make and use a backup of Copy II Plus using the Copy Disk function on the Utilities menu and store the originals in a safe place.

Fill out and send in your registration card now. Being a registered owner entitles you to technical support, should you need it, and it lets us tell you about product updates. When we enhance or update Copy II Plus, all registered owners will be able to purchase the update at a reduced price.

> ***Note:*** *If you purchased your Copy II Plus directly from Central Point Software, you have been automatically registered and you do not need to send in a registration card.*

If you have questions about Copy II Plus, dial (503) 690-8080. Dial 1 then extension 5708 anytime after the automated attendant has answered; you do not need to listen for the message to be completed. Our business hours are 8-5 PST, Monday-Friday. Please see Appendix H for further information on our technical support services.

Copyright Law

A few words need to be said about the Bit Copy programs and copy-protected software. Under the Federal Copyright Law, you are entitled to make backups of software for your own use, so that if a disk is damaged or accidentally erased, the information is not lost. Some software companies, in efforts to prevent illegal duplication, copy-protect their disks so they cannot be copied using normal copy methods. The Bit Copy programs are designed for copying these protected disks. They are provided only to help you make backups of protected disks for your own use, not for illegal copying.

> *Note: Schools and institutions wishing to copy a program for educational use on a number of computers should check with the software publisher for their educational copying policy.*

Hardware Requirements

The following list shows the computers supported by this version of Copy II Plus. The minimum memory requirement is 128K and an 80 column card is required.

- Enhanced Apple IIe
- Apple IIc
- Apple IIc+ (only works with the Utilities and 5.25″ Bit Copy)
- Apple IIGS
- Laser 128
- Laser 128EX
- Laser 128 EX/2
- Other Apple–compatible computer with at least 128K of memory, and designed to work with ProDOS.

For the Utilities, you need only one disk drive. However, a second disk drive can be helpful when copying disks or files.

The **Copy Disk**, **Copy Files**, and **Compare Files** options of the Utilities can take advantage of additional memory to perform their functions in a more efficient manner. (See Appendix F for information about what kinds of memory Copy II Plus can use.)

Copy II Plus is unable to access extended files (those with resource and data forks) that are created under GS/OS.

For the 5.25" Bit Copy program, two 5.25" drives are highly recommended. However, the bit copy routine has been re-written to more fully utilize available memory, thus resulting in less disk swapping when used on a single drive machine.

If you wish to install the Utilities and Bit Copy programs on a hard disk, you must copy these files:

Util.System
Util.More
Bitcopy.System
BC3.System
Parm.Data
Parm.Key
Parm35.Data
Parm35.Data

The files Util.Apps and Util.Config are created when necessary from the Utilities main menu. The files Quit.Save and Util.Quit are programs that allow you to use a program selector rather than the standard ProDOS quit code. Further details are found in the Utilities section "Quit."

3.5 inch Bit Copy Requirements

The 3.5" Bit Copy program does not work with Apple II, Apple II Plus, or the older unenhanced Apple IIe computers. It also does not work with the Apple IIc+.

You need at least one 3.5" disk drive. The Bit Copy program can work with *any 3.5" drive except for the UniDisk 3.5.* (An inherent limitation of UniDisk 3.5 drives makes them unsuitable for Bit Copy type programs.) The 3.5" Bit Copy program does work with:

- ✔ Apple 3.5" or Laser daisy chain 3.5" drive connected to the drive port of an Apple IIGS, or
- ✔ Apple 3.5" drive or CPS 3.5" drive connected to a CPS Universal Disk Controller (UDC) card, or
- ✔ CPS 3.5" drive connected to the drive port of a Laser 128EX computer.

Depending on the amount of memory in your computer, a second 3.5" drive can be very helpful. Additional memory can reduce the number of passes needed to copy a disk. (See Appendix F for more information on memory.)

What You Need to Know

To use the Utilities, you should be generally familiar with DOS 3.3 and ProDOS, and the standard DOS operations such as CATALOG, DELETE, RENAME, etc. If you need to know more about these things, you should refer to your DOS or ProDOS User's Manual. A few of the Utilities options are a little more complicated and this manual includes explanations for those options.

Using the Bit Copy programs to copy most protected disks doesn't require any technical knowledge, if the program you want to copy is included in our list of parameter entries. If it is not, we provide a few suggestions on how to copy new programs.

If these suggestions don't work, or if you want to learn more about disk protection methods, then you'll need to understand a number of fairly technical concepts. Protection methods are an inexact and obscure art rather than a science. We do provide some reference material on disks and disk protection in the appendices.

Hexadecimal number notation is used throughout both Bit Copy programs and occasionally in the Utilities. (The hexadecimal numbers are preceded with a dollar sign, as in "$D5".) Understanding hex numbers is helpful, but not necessary. Appendix E contains a table that lets you convert between decimal and hex.

For users interested in learning more, we recommend:

DOS Programmer's Manual and/or *ProDOS Programmer's Manual,* by Apple Computer, for information on DOS commands, with an appendix on disk file storage.

Beneath Apple DOS and/or *Beneath Apple ProDOS* by Quality Software, for information on file storage and track and sector formatting,

Understanding the Apple II or *Understanding the Apple IIe,* also by Quality Software, with a chapter of in–depth information on 5.25" disk hardware.

Copy II Plus Utilities

With the Utilities, you can:

- Create a list of applications that can be launched from Copy II Plus
- Copy any 16 sector unprotected 5.25" disk
- Copy unprotected 3.5" disks
- Copy files
- Copy files between DOS and ProDOS formats
- Copy DOS (from 5.25" to 5.25" disks)
- Catalog a disk in four different views
- Delete files
- Delete all information from a disk
- Delete DOS
- Lock or unlock files
- Rename files or ProDOS volumes
- Sort the catalog
- Format a disk in DOS or ProDOS
- Verify a disk, file, or drive speed
- Compare files
- View the contents of files
- See a map of where files are stored on the disk
- Change the boot program on a disk (DOS 3.3 only)
- Undelete files
- Create a new subdirectory
- Set the printer slot
- Set the date
- Set the mouse movement scale
- Save your settings for future use

Because of the inherent differences between DOS and ProDOS, some options will work only with DOS disks, and some only with ProDOS disks. The options for DOS disks include:

- Copy DOS onto a disk
- Catalog any hidden control characters
- Delete DOS to free up more space for files
- Change the boot program on the disk

The options for ProDOS disks include:

- View any or all subdirectories without having to type pathnames
- Rename a volume
- Create new subdirectories

Most of the options listed above are for standard DOS 3.3 or ProDOS disks only. However, the **Copy Disk** and **Verify Disk** options can be used with any 16 sector unprotected disks, including DOS 3.3, ProDOS, SOS, CP/M, and Pascal formatted disks.

> ***Note for Apple /// users:*** *Copy II Plus is designed to work only on Apple II series (or compatible) computers. However, Apple /// SOS stores files exactly like ProDOS. You can use the Copy II Plus Utilities on an Apple II to work with Apple /// SOS disks.*

The Utilities can access ProDOS files stored on floppy disks, hard disks, RAM disks, 3.5" disks, and any other ProDOS–compatible "intelligent" disk device. (This is because ProDOS itself has the ability to work with all of these devices.)

When accessing DOS 3.3 files, however, the Utilities will work only with 35–track 5.25" disks. DOS 3.3, from Apple Computer, Inc., originally was designed and intended only for 5.25" disks. Various other companies have since devised elaborate patches or modified versions of DOS 3.3 to allow it to work with another type of disk device. Patches for different devices sometimes conflict with one another. Since Copy II Plus works from ProDOS and directly handles the 5.25" disks itself, there is no DOS 3.3 in memory to patch for these other devices.

Copy II Plus is unable to access extended files (those with resource and data forks) that are created under GS/OS.

Using the Utilities

When you first boot the Copy II Plus disk (either the 5.25" or 3.5" disk), the Utilities program automatically starts up. The Utilities main menu appears.

```
                    Copy ][ Plus 9.0
          (C) 1982-89 Central Point Software, Inc.
 ------------------------------------------------------

A  -   Applications
C  -   Copy                          Use mouse,arrow
T  -   Catalog Disk                  keys and RETURN,
D  -   Delete                        or single letter
E  -   Edit Applications             to select
L  -   Lock/Unlock Files             function
R  -   Rename
S  -   Sort Catalog
F  -   Format Disk
Y  -   Verify
K  -   Compare Files
V  -   View Files
M  -   Disk Mapping
P  -   Change Boot Program
U  -   Undelete Files
B  -   Create Subdirectory
O  -   Set Options
Q  -   Quit

                                      PRINTER
31-Oct-89                               Off
```

Along the left side of the screen are 18 main options. The right side of the screen displays any submenus that may be associated with certain options. For example, the **Copy** option has a submenu that allows you further options:

```
5  -  Bit Copy 5.25
3  -  Bit Copy 3.5
F  -  Files
D  -  Disk
W  -  Disk w/Format
O  -  DOS
```

Throughout Copy II Plus, you can press ESC to back out of the submenu or current option.

Choosing Menu Options

One of the menu items is always highlighted using inverse (black–on–white) letters.

Note the prompt in the upper–right area of your screen:

```
Use mouse, arrow
keys and RETURN,
or single letter to
select function
```

There are three ways you can choose an item from the menu:

- Press the up or left arrow key to move the highlight bar up the menu or the down or right arrow key to move the highlight bar down the menu until your choice is highlighted. Press RETURN to run it.

  or

- Press the single letter listed to the left of each option to activate that option, or

- Click the mouse on the option you wish to use and it activates immediately.

At the bottom left of the screen, you see either today's date, or the phrase "<NO DATE>." (You may set the date from the main menu. This is explained in the section "Set Options.") To the right you see the phrase `PRINTER OFF`. By using the `Set Options` described shortly, you can opt to use the printer with the Utilities.

Any time you make a selection and then change your mind, pressing ESC takes you back to the Utilities main menu.

Selecting the Drive(s)

Most of the options on the Utilities main menu must know what drive(s) you are using during their execution. The method of selecting the drive(s) you wish to use is standard for all the options and is described in the following section.

1. Select the command you wish to use from the main menu using one of the methods described in the previous section "Choosing Menu Options." (All of the menu commands are explained in detail following this section.)

2. Select further options from any submenu that may appear.
   A screen similar to the following appears:

```
Select source device:

Slot 3      Drive 2:     /RAM disconnected
Slot 5      Drive 1
Slot 2      Drive 1
Slot 6      Drive 1
Slot 6      Drive 2

Press [?] to display volume names
```

   Important: *The list of slots and drives you see includes all floppy drives and compatible ProDOS disk devices that are plugged into your computer. Computers such as the Apple IIc, Apple IIGS, and Laser 128 have disk "ports" in addition to, or instead of, real slots. For a chart showing the different slot and drive combinations, please see Appendix G.*

The "/RAM disconnected" designation in the display refers to the special RAM disk that ProDOS installs in any Apple II series (or compatible) computer that has 128K of memory. "/RAM" is an area of memory that ProDOS sets aside to act like a very fast disk drive, pretending to be slot 3 drive 2. Copy II Plus disconnects it so that it can use the extra memory for program storage.

> ***Note:*** *Copy II Plus will disconnect only the small built–in RAM disk. If you have an auxiliary–memory based memory board plugged into your computer and you've run the RAM disk driver program supplied with your memory board, Copy II Plus won't disturb the large RAM disk it creates. Also, if you have set a RAM disk from the Control Panel of a GS, then Copy II Plus will not disconnect it. See Appendix G for details on slots and drives and Appendix F for information on RAM disks.*

3. Use the arrow keys or the mouse to move the highlight bar among the choices. Press RETURN or click the mouse when the one you want to use is highlighted.

   In addition, from this menu you can press the ? key (you do not need to hold down the shift key) to see what disks are in each drive. ProDOS disks will show their volume name, but DOS disks will simply say DOS 3.3 for its name:

```
SLOT 3      DRIVE 2:    /RAM DISCONNECTED
SLOT 5      DRIVE 1:    /COPYIIPLUS
SLOT 6      DRIVE 1:    DOS 3.3
SLOT 6      DRIVE 2:    DOS 3.3
```

If the disk you wanted is not in any drive, you can change disks, then press ? again to make sure the correct disk is now in the drive. You can also press ESC to back out if you decide you do not want this option.

Note: *If you press a number from 1 to 7, the highlight bar moves to the first drive it finds in that slot number. If there are no drive devices in slot 2 or slot 1, then pressing 2 highlights the second drive in that slot number and pressing 1 highlights the first drive again.*

After selecting the source drive, the screen to select the target drive appears (if you are using an option that only accesses one drive-such as **Catalog**-then this screen will not appear):

```
Select target device:

Slot 3      Drive 2:    /RAM disconnected
Slot 5      Drive 1
Slot 2      Drive 1
Slot 6      Drive 1
Slot 6      Drive 2

Press [?] to display volume names
```

Note: *If you select the same drive for both source and target, Copy II Plus will prompt you when to switch disks.*

4. Use the arrow keys or the mouse to move the highlight bar among the choices. Press RETURN or click the mouse when the one you want to use is highlighted.

Selecting Files from the File Display

The File Display is used in various ways throughout Copy II Plus for selecting files to be worked with. Notice that the first file in the File Display is highlighted (displayed in inverse). By using the arrow keys or the mouse, you can highlight any file in the display. The word "MORE" appears if there are more files than can fit on one screen.

If you repeatedly press the arrow keys, the display scrolls. If you press the Apple key simultaneously with the arrow key, you scroll a screenful of filenames at a time.

```
Copy Files                Source: Slot 6    Drive 1
DISK VOLUME 254
------------------------------------------------------------
      *A    003   HELLO
      *A    003   MASTER
      *B    020   FID
      *A    014   RENUMBER
      *B    009   MASTER CREATE
----------------------MORE----------------------------------

[RETURN]-Mark File,      [D]elete,    [E]nter
filename,    Number-insert, [G]o,
[ESC]-Exit
```

The prompt at the bottom of the screen shows the options available for the particular command you chose. These options vary slightly in some of the Utilities commands, but the principle of operation remains the same.

Selecting a File

1. Press E for **Enter Filename**.
2. Type the name of the file you want.
3. Press RETURN.
   Copy II Plus looks for that name in the File Display and marks it with the next available number.
   If you decide you do not want to type in a filename or pattern, pressing ESC returns all the options at the bottom of the screen.

   or

✔ Use the arrow keys to highlight the file you want.
Press RETURN to select it. Copy II Plus marks it with the next available number.

   or

✔ Use the mouse to scroll through the list of filenames. Click on the file you wish to select. Copy II Plus marks it with the next available number.

   or

✔ Press E for **Enter Filename**. You may then enter a filename pattern.

Press RETURN.
This process is described in the following section.

Filename Patterns

A pattern is a filename with one or more equals signs (=) in it. The equals sign is a special wildcard character that will match any number of characters in the catalog, as long as the rest of the filename matches. For example, the pattern **AB=** will match the files **AB**, **ABCDE**, and **ABRAHAM**. The pattern **=N=** will match the files **N**, **OHNO**, or any filename containing the letter N. The pattern "**=**" will match anything, and can be used when you want to copy every file on the disk.

In addition, patterns can specify what filetypes to match. If you want a pattern to match only certain filetypes, finish the pattern by typing a comma, followed by the filetypes used in the catalog. For DOS 3.3 disks, these are the letters:

A Applesoft
I Integer
B Binary
T Text

For example, the pattern **=XYZ,BT** will match any file whose name ends in **XYZ** and is a binary or text file. The pattern **=,A** will match any Applesoft Basic file.

For ProDOS disks, the filetypes would be the ProDOS three–letter abbreviations. For example, the pattern **=XYZ,BIN,TXT** will match any file whose name ends in **XYZ** and is a binary (BIN) or text (TXT) file. The pattern **=,BAS** will match any Applesoft Basic file.

After you enter the pattern and press RETURN, the program will scan through the display, marking all matching files. If no files match, the inverse field will return to the file that was in inverse before you pressed E.

Selecting Subdirectories

If you're working with a ProDOS disk that contains subdirectories, the File Display also provides you with another way of selecting which subdirectory you want to work with. The following illustration shows a ProDOS disk with subdirectories.

```
Copy Files                Source: Slot 5    Drive 1
/SAMPLE

SAMPLE-------------->SUB1-----SUB2--------->SUB3
                             !             !
                             !             !>SUBSUB2
                             !>SUBSUB1------>SUBSUBSUB1

Use mouse or arrows and [RETURN] to select
```

1. Use the arrow keys or the mouse to highlight the subdirectory name.

   Note: Copy II Plus defaults to highlight the root directory.

2. Press RETURN or click the mouse.
   The File Display appears showing all the files contained within that subdirectory. If there are no files contained in that subdirectory, a message appears informing you.

```
Copy Files                      Source: Slot 5    Drive 1
/Sample
-----------------------------------------------------------

PRODOS              SYS         39          14-JUL-88
SYSTEM              DIR         2           03-OCT-88
SUB1                DIR         1           22-APR-89
SUB2                DIR         3           14-AUG-89
SUB3                DIR         1           12-JUN-88
-----------------------------------------------------------
```

- If you wish to view the files contained in another subdirectory that is contained within your current subdirectory, highlight the name of the subdirectory you wish to view from the File Display. For example, in the illustration above, you could highlight SUB1.

  ✔ Press the > (greater than) key (you do not have to hold down the shift key).
  The selected subdirectory replaces the directory you were looking at.

- If you wish to "back out" of your current subdirectory to the next higher level, then:

- ✔ Press the < (less than) key (you do not have to hold down the shift key) to back out of the subdirectory. You are returned to the next higher directory level.

You can use the > and < keys to look into any subdirectory on the disk before you decide which subdirectory you want to work with. ***You can select files in only one subdirectory at a time.***

You can use the mouse to move around the directory tree also. Click the mouse when the subdirectory you wish to view is highlighted.

Copying Subdirectories

If you're copying files from a ProDOS disk that contains subdirectories, you can also copy entire subdirectories.

- ✔ Select the root directory using the arrow keys and RETURN or the mouse.
- ✔ Use the arrow keys and RETURN to number the subdirectory you wish to copy from the File Display.
  The Utilities automatically copies the subdirectory first and then every file inside the subdirectory.

  or

- ✔ Use the mouse to select the subdirectory you wish to copy. Click once to select it.

The Menu Options

This section describes each of the options of the Utilities menu in the order in which they appear.

Applications

This option allows you to select from a list of twelve ProDOS applications that you can launch from Copy II Plus. These applications must be of the filetype "SYS." This option automatically closes Copy II Plus and launches the application you select from the list. You can create and edit the **Applications** list by using the **Edit Applications** option described later.

Copy II Plus acts as a "program selector" with the **Applications** list. When you launch an application from Copy II Plus using the **Applications** list, you will be returned to Copy II Plus when you quit from the application.

Launching an Application

1. Choose **Applications** from the main menu using the arrow keys and RETURN or by pressing A or by using the mouse.
   Be sure the disk containing the application you wish to run is in the appropriate drive.

   Important: *If for any reason Copy II Plus cannot access the file Util.Apps, Copy II Plus returns this message in the place where the submenu appears:*

   ```
   E - Empty list
   ```

   Pressing ESC returns you to the main menu where you can select the **Edit Applications** option and add to the **Applications** list.

   Note: *The file Util.Apps contains one "application" as shipped to you. That is the pathname to exit to the standard Applesoft Basic prompt. See your Basic manual for instructions on how to use Basic. Type* `Bye` *at the basic prompt if you wish to return to Copy II Plus.*

2. Select the application you wish to run from the submenu using the arrow keys and RETURN or by pressing the first letter that appears to the left of the application name or by using the mouse.

```
                    Copy ][ Plus 9.0
          (C) 1982-89 Central Point Software, Inc.

A  -  Applications
C  -  Copy                          Select option:
T  -  Catalog Disk
D  -  Delete                        A-Program A
E  -  Edit Applications             B-Program B
L  -  Lock/Unlock Files             C-Program C
R  -  Rename                        D-Program D
O  -  Sort Catalog                  E-Program E
F  -  Format Disk                   F-Program F
Y  -  Verify                        G-Program G
K  -  Compare Files                 H-Program H
V  -  View Files                    I-Program I
M  -  Disk Mapping                  J-Program J
P  -  Change Boot Program           K-Program K
U  -  Undelete Files                L-Program L
B  -  Create Subdirectory
S  -  Set Options
Q  -  Quit

                                    PRINTER
31-Oct-89                             Off
```

- Be sure the disk containing the application you wish to run is in the appropriate drive. If Copy II Plus cannot find your application, the following message appears:

  ```
  Please insert /Prefix/Pathname and then press a key
  ```

  If you still do not insert the disk it asks for after pressing any key, Copy II Plus displays this message:

  ```
        Unable to load /Prefix/Pathname
  [Return] - Retry        [Esc] - Abort?
  ```

  Pressing ESC returns to the Utilities main menu.

Copy

When you select the **Copy** option from the Utilities main menu, this submenu appears with the following choices:

```
5 - Bit Copy 5.25
3 - Bit Copy 3.5
F - Files
D - Disk
W - Disk w/Format
O - DOS
```

If you want to go to one of the Bit Copy programs, choose the Bit Copy option you wish to use. Insert the Copy II Plus disk in the appropriate drive and press RETURN. The Bit Copy program is loaded from the disk. For further details on using the Bit Copy programs, please see the chapters "Automatic Bit Copy" and "Manual Bit Copy."

Copying Files

The **Copy Files** option allows you to copy standard, unprotected DOS and ProDOS files from one disk to another quickly and easily. You can use this option to copy files from a 5.25" disk to a 3.5" disk, or from a hard disk to a RAM disk, etc. You can also use it to automatically convert files between DOS and ProDOS formats. However, some files do not convert easily between the two operating systems because of inherent differences between DOS 3.3 and ProDOS. See the section "Converting Files Between DOS 3.3 and ProDOS" for further information.

Copy II Plus is unable to access extended files (those with resource and data forks) that are created under GS/OS.

> *Note: For programming reasons, Copy II Plus can keep track of no more than 255 files in one directory at a time. If you have a ProDOS disk that contains more than 255 files in one subdirectory, the Utilities shows you the first 255. Any files after the first 255 will be unaffected by any of the operations of Copy II Plus. This limitation allows an entire directory to be stored in memory, giving Copy II Plus much of its speed.*

1. Place the disk you wish to copy from (source) into the drive. If you have a second drive, place your target (destination) disk into it.
2. Select the **Copy** option from the main menu by using the arrow keys and RETURN, or by pressing C, or by using the mouse.
3. Select the **Files** option from the submenu by using the arrow keys and RETURN, or by pressing F, or by using the mouse.

```
5 - Bit Copy 5.25
3 - Bit Copy 3.5
F - Files
D - Disk
W - Disk w/Format
O - DOS
```

4. Select the drive(s) you wish to use for the source and target disks. Please refer to the preceding section, "Selecting the Drives" for details on how to do this.

   Copy II Plus reads the files from the source disk and displays them on the screen. If it is a DOS disk, the files appear as a normal catalog listing on your screen:

```
Copy Files                Source: Slot 6    Drive 1
DISK VOLUME 254
------------------------------------------------
   *A 003   HELLO
   *A 003   MASTER
   *B 020   FID
   *A 014   RENUMBER
   *B 009   MASTER CREATE
----------------------MORE----------------------

[Return]-Mark file,     [D]elete,   [E]nter
filename,   Number-insert, [G]o,
[ESC]-Exit
```

   If it is a ProDOS disk with subdirectories, then the subdirectory tree displays the following:

```
Copy Files                Source: Slot 5    Drive 1
/SAMPLE

SAMPLE-------------->SUB1-----SUB2--------->SUB3
                             !             !
                             !             !>SUBSUB2
                             !>SUBSUB1------>SUBSUBSUB1

Use mouse or arrows and [RETURN] to select
```

   - Select which subdirectory contains the file(s) you wish to copy. Use the arrow keys or the mouse to move around the tree until the subdirectory you

wish to use is highlighted. Press RETURN or click the mouse. The files contained in the subdirectory are now displayed:

```
Copy Files                Source: Slot 5    Drive 1
/SAMPLE/SUB1/SUBSUB1
-------------------------------------------------

      FINDER.DATA FND    1      16-OCT-88
      FINDER.ROOT FND    1      16-OCT-88
      AW.INSTALL  S16    25     04-OCT-88
      SCRIPTS     DIR    2      19-OCT-88
      INSTALLER   S16    54     18-AUG-88
----------------------MORE---------------------------
[Return]-Mark File,      [D]elete,    [E]nter
filename,    Number-Insert, [G]o,
[ESC]-Exit
```

Selecting Files to Copy

Pressing RETURN (or clicking with the mouse on a filename) places a number to the left of the current (inverse) file. The first RETURN (or mouse click) places the number 1, the second a 2, etc. These numbers represent the order the files are copied.

If you accidentally press RETURN (or click the mouse) to number a file you don't want to copy, you can remove the number by moving the inverse field to that file and pressing D for `Delete Number`. (You will not delete the file, just the number next to it.)

> ***Note:*** *The marked files are automatically renumbered after a deletion.*

You can also make insertions or changes in the list of numbers by typing a number directly, then pressing RETURN.

- Be sure your target disk is formatted.
- Press G for **Go** to begin the copy after you have selected the file(s). If only one drive is being used, you are prompted to insert the proper disk.

> ***Note:*** *On a single 5.25" drive system with a memory expansion card of at least 64K (this memory must be in addition to the 128K that Copy II Plus requires) the Memory Manager will utilize the extra memory to reduce disk swapping. However, each file is read separately and thus will require at least 2 disk swaps.*

As the files are copied the program will check to see if any of the files already reside on the target disk. If there are duplicate filenames, you are prompted, as in this example:

```
File HELLO
Already exists.  Now what?

[C]opy anyway, [N]ew name, [D]on't copy,
[ESC]- exit copy, Copy [A]ll
```

Note: If the duplicate file is locked, Copy II Plus says `IS LOCKED` *instead of* `ALREADY EXISTS`.

If you select to **Copy anyway**, the original is deleted, then the new file is copied.

If you select **New name**, you are asked to type in a new name for the file.

Selecting **Don't copy** will simply not copy this file, and pressing ESC exits out of the entire copy option.

If you select **Copy All**, Copy II Plus copies all files with duplicate names to the target disk, without notifying you each time it runs across the same filenames. Use this option only if you are absolutely sure you wish to copy over all the duplicate files on the target disk.

As the files are copied, they are shown in the File Display, with the file currently being copied highlighted. At the bottom of the screen, you'll also see the word "TARGET:" with the name of the file being copied. This is especially useful if you're copying files from a DOS 3.3 disk onto a ProDOS disk. Since ProDOS has more restrictions concerning filenames, Copy II Plus might have to slightly change the name of the DOS file to fit ProDOS rules. This changed filename is shown after the word "TARGET:" for your information.

Created and Modified Dates (ProDOS only)

Copy II Plus follows a certain convention for the created and modified dates of any ProDOS files it copies. These are the dates that can be seen with the **Catalog** option. Copy II Plus uses the *current* date as the created date when making a copy of a file, rather than using the created date of the original file. The modified date of the copied file is kept the same as the original file.

This approach is intentional, as it provides useful information. If the created date of a file is more recent than the modified date, this tells you that this file is a copy of another file. The created date indicates when the copy was made, and the modified date indicates when the last changes were made to the original file. If the created

date is older than the modified date, this means the file has been modified on this disk since it was placed there.

Converting Files Between DOS 3.3 and ProDOS

Converting files between DOS 3.3 and ProDOS can be very straightforward with **Copy Files**. Files that convert easily are TEXT, BASIC, and some BINARY. Exceptionally complex files can be a challenge and are not always successfully converted. Since many programs use routines that are an integral part of the operating system in which they were written, converting them to the other operating system is no guarantee they will still run. The best way to determine a successful conversion is to convert a COPY of the file and run it.

1. Choose the **Copy Files** option.
2. Select the DOS disk as the source disk.
3. Select the ProDOS disk as the target disk.
4. Select the files you want to convert using the methods described earlier in the section "Selecting Files from the File Display."
5. Press G for **Go**.
   Copy II Plus automatically recognizes the disks are of different types and converts the files as it copies.

To convert ProDOS to DOS, instead select the ProDOS disk as the source and the DOS disk as the target disk.

Copy Disk

The **Copy Disk** option makes fast, reliable copies of any standard unprotected 16 sector disk. (DOS 3.3, ProDOS, SOS, CP/M, and Pascal disks all use a 16 sector format.) **Copy Disk** can also copy unprotected 3.5 inch Apple–format disks, or copy between any two ProDOS disk devices that have the same size.

> *Note: The **Copy Disk** option is not intended for copying information between disks of different sizes. An error message "Device size mismatch" appears if you attempt this. If, for example, you copied all the blocks from a 140K floppy disk (including the disk "bookkeeping" blocks) onto a 1 Meg RAM disk, the RAM disk would now "think" that it was only a 140K disk, too. That would leave the rest of the RAM disk unusable. If you want to copy information between disks of different sizes, choose the **Copy Files** option.*

1. Select the **Copy** option from the main menu by using the arrow keys and RETURN or by pressing C, or by using the mouse.
2. Select the **Disk** option from the submenu by using the arrow keys and RETURN or by pressing D, or by using the mouse.

```
5 - Bit Copy 5.25
3 - Bit Copy 3.5
F - Files
D - Disk
W - Disk w/Format
O - DOS
```

3. Select the drive(s) you wish to use. Please refer to the section "Selecting the Drives" presented earlier for a detailed explanation of how to do this.
4. Insert the disk you wish to copy (source) into the drive.
5. Insert the target disk (destination) into your second drive. If you are using a single drive, Copy II Plus prompts you when to change disks.
6. Press RETURN to start the copy process.

Copy Disk can take advantage of most kinds of extra memory in your computer to reduce the number of passes needed to copy a disk. As the **Copy Disk** option makes the copy, it first reads a number of tracks (or a number of blocks for a ProDOS disk) from the source disk into memory, then writes those tracks (or blocks) to the target disk. It repeats this process (each called a pass) until all the tracks or blocks are copied. If you're copying from one drive to another, the number of passes back and forth between the two drives doesn't really matter much. However, if you're copying with only one drive, the extra-memory handling can reduce the number of times you have to swap disks. (See Appendix F for information about what kinds of memory Copy II Plus can use.)

When the copy is completed, if the entire disk's contents were read into memory in one pass, you're offered the option to make additional copies of the same disk. These copies are made more quickly, since the original source disk doesn't have to be read again. This is ideal for duplication of disks (such as for a user group's public domain software library).

Copying 5.25 inch Disks

When copying normal 5.25" disks, Copy II Plus uses its own optimized floppy disk capabilities for greater speed. It copies the disk track by track, and automatically formats as it copies, so disks do not have to be formatted ahead of time. It doesn't matter whether you choose **Copy Disk** or **Copy Disk w/format** when copying 5.25" disks; Copy II Plus's built-in floppy routines always format and write simultaneously.

There are 35 tracks on a 5.25" disk, numbered in hexadecimal from $00 to $22. As it reads or writes each track, Copy II Plus displays the track number at the bottom of the screen:

```
Reading track $01
```

Copy Disk also checks for errors as it copies. If an error occurs, a message is displayed showing what kind of error it is (Read error or Write error) and what track on the disk it occurred on. The program will continue copying the rest of the disk. A Read error means that one or more sectors on the source disk was unreadable. (The disk media itself may or may not be damaged.) If a Write error occurs, then the media on the destination disk is most likely damaged. Double–check everything, using the **Verify Disk** command explained later, then try again.

Even if the **Copy Disk** routine reads a bad sector, it still writes a good sector to the destination disk. That is, some of the data in that sector may be inaccurate, but an I/O error usually does not occur if that sector on the destination disk is read. If a disk is getting old and begins to create I/O errors, the data should be copied to a new disk using **Copy Disk**.

When the copy is complete, and if the copy took just one pass, you'll then see:

```
Copy same onto another disk (Y/N) ?
```

If you want to make a second copy of the same disk, press Y (for Yes). You'll be prompted to insert a new target disk. Insert a second disk and press RETURN. A second copy will be made onto this disk. The "Copy Same" question will then be repeated so you can make more copies if you want.

Double-sided 5.25" Disks

Some 5.25" disks have data on both sides of the disk. To copy both sides, you can use a separate disk for each side. Or you can use a disk with a write-protect notch on both sides to copy the disk. Although there are devices available that allow you to punch out a write-protect notch on the opposite side of a single-sided disk, the reliability of the back side of the disk may be questionable.

If a 5.25" double-sided target disk is used for copying a double-sided source disk, you must still copy one side at a time with the **Copy Disk** option. Flip the target disk over to the other side when you want to copy the second side of the source disk.

Copying 3.5 inch Disks

When copying 3.5" disks, Copy II Plus handles the information block–by–block through ProDOS, rather than track–by–track, because of the inherent differences

between 3.5" drives and 5.25" drives. Choose **Copy Disk** if you know the target disk is already formatted; otherwise choose **Copy Disk w/format** to format the target disk as part of the copy process (which takes a little longer).

When the copy is complete, and if the copy took just one pass, you'll then see:

```
Copy same onto another disk (Y/N) ?
```

If you want to make a second copy of the same disk, press Y (for Yes). You'll be prompted to insert a new target disk. Insert a second disk and press RETURN. A second copy will be made onto this disk. The "Copy Same" question will then be repeated so you can make more copies if you want.

Note: This message appears for all disk types, including RAM disks.

Copy Disk with Format

This option is for the 3.5" copy disk option. If you are copying a 3.5" disk to an unformatted 3.5" disk , then you must choose **Copy Disk with format.**

Copy DOS (DOS 3.3 disks only)

Copy DOS is similar to **Copy Disk**, but it copies only the first three tracks of a disk. This is where the Disk Operating System is stored on DOS 3.3 disks. You can use **Copy DOS** to add DOS to a disk that was formatted with the Copy II Plus **Format** option. (See **Format Disk** below for more information.) You can copy DOS onto a disk that has somehow had its DOS tracks damaged or erased. You can also convert an initialized, or "slave" disk into a "master" disk. (The difference between initialized and master disks is not important in most applications. See the Apple DOS 3.3 manual for more information.)

1. Select the **Copy** option from the main menu by using the arrow keys and RETURN or by pressing C, or by using the mouse.

2. Select the **DOS** option from the submenu by using the arrow keys and RETURN or by pressing O, or by using the mouse.

```
5 - Bit Copy 5.25
3 - Bit Copy 3.5
F - Files
D - Disk
W - Disk w/Format
O - DOS
```

3. Select the drive(s) you wish to use. See the section "Selecting the Drives" presented earlier.
4. Insert the disk containing DOS into the drive.
   We recommend using your DOS System Master disk or a disk you know has an unaltered, clean copy of DOS on it.
5. Insert the target disk (destination) into your second drive. If you are using a single drive, Copy II Plus prompts you when to change disks.

Catalog Disk

Copy II Plus allows you to view the catalog of a disk in four different ways.

Normal

The **Normal** catalog is similar to the standard DOS Catalog or ProDOS Cat command. Copy II Plus checks the disk in the drive to determine if it is a DOS or ProDOS disk. If it is a DOS disk, the disk volume number is shown. Each file is displayed, along with a letter indicating its filetype, its file length (in sectors), an asterisk to indicate if the file is locked, and finally, the file name itself. If it is a ProDOS disk, the volume name is displayed, along with an asterisk to indicate if the file is locked, the filename, the 3 letter filetype abbreviation, the file length in blocks, and the date the file was last modified.

If the printer is on (selected with the option **Set Options**, described later) you are asked if you wish a printout of the catalog.

The catalog pauses every 20 files. You can continue to view files by pressing any key except ESC (which would abort the catalog and return you to the main menu.) If the catalog is being sent to the printer, it will not pause.

> *Note: For programming reasons, Copy II Plus can keep track of no more than 255 files in one directory at a time. If you have a ProDOS disk that contains more than 255 files in one subdirectory, the Utilities shows you the first 255. Any files after the first 255 will be unaffected by any of the*

operations of Copy II Plus. This limitation allows an entire directory to be stored in memory, giving Copy II Plus much of its speed.

File Lengths

The catalog command **File Lengths** shows all the same information as the normal catalog. For all Basic files, it also shows the actual length of the program in bytes. For binary files, it shows both the starting memory address of the file and its length. A DOS 3.3 catalog listing appears like this:

```
*A    006   HELLO L1137 (L$0471)
*B    003   CHAIN A2056, L456 (A$0808, L$01C8)
```

This shows that the Basic file HELLO is 1137 bytes long ($471 in hex), and the binary file CHAIN has a starting address of 2056 and a length of 456 (with corresponding hex numbers in parentheses.)

For ProDOS disks, the **Catalog with file lengths** option is similar to the ProDOS 80-column CATALOG command, adding the created date, the length of the file in bytes, and any subtype when appropriate:

```
Name          Type  Blks  Modified     Created      Endfile  Subtype

FINDER        FND   1     16-OCT-88    12-SEP-88    106
PRODOS        SYS   30    10-NOV-84    15-NOV-83    10240
ANIMALS       BAS   10    15-OCT-83    15-OCT-83    4578
```

Deleted Files

The **Catalog with deleted files** includes the files on the disk which have been marked as deleted, but have not yet been overwritten by a new file entry. Any deleted files are marked in this display with the letter "D" to the left of the entry. (Notice that in some cases, deleted files can safely be recovered and made active again using the **Undelete Files** option, explained later.)

Hidden Characters

DOS 3.3 allows users to include hidden "control" characters in a filename. The **Catalog with hidden characters** option allows you to see any imbedded control characters, which are normally not printed by Copy II Plus. The control characters show up as inverse characters. If the printer is on, control characters are translated to lowercase.

Since ProDOS does not normally allow hidden control characters in filenames, this option displays a normal catalog with ProDOS disks.

To Catalog a Disk:

1. Select the **Catalog** disk option by using the arrow keys and RETURN, or by pressing T or by using the mouse.
   A submenu appears on the right of the screen. The options are:

   ```
   N - Normal
   F - File Lengths
   D - Deleted Files
   H - Hidden Chars
   ```

2. Select the option you wish by using the arrow keys and RETURN or by pressing the single letter of the option or by using the mouse.
3. Select the drive that contains the disk you wish to catalog.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   If this is a ProDOS disk that contains one or more subdirectories, an additional display appears at this point. This is the subdirectory tree display:

   ```
   Catalog                    Source: Slot 5    Drive 1
   /SAMPLE

   SAMPLE--------------->SUB1-----SUB2--------->SUB3
                                !              !
                                !              !>SUBSUB2
                                !>SUBSUB1------>SUBSUBSUB1

   Use mouse or arrows and [RETURN] to select
   ```

   This diagram shows that the main or root directory (which goes by the volume name /SAMPLE) has three subdirectories, named SUB1, SUB2, and SUB3. In addition, the subdirectory SUB1 contains two subdirectories of its own called SUBSUB1 and SUBSUBSUB1. The subdirectory named SUB2 has one subdirectory named SUBSUB2. By using the arrow keys or the mouse you can select any subdirectory. If the tree is too large to fit on the screen, it will scroll automatically as you move around the tree. When the subdirectory you want is highlighted, press RETURN or click the mouse on it to view the files contained in it.

4. Press Y or N to the printout question.

Delete

The main **Delete** option has three suboptions:

```
F - Files
D - Disk
O - DOS
```

Delete Files

This option is equivalent to the standard DOS or ProDOS Delete command, except that multiple files can be deleted at one time. If the disk contains ProDOS subdirectories, the subdirectory tree display appears so that you can select the subdirectory in which you want to delete files.

1. Select **Delete** from the menu by using the arrow keys and RETURN or by pressing D, or by using the mouse.
2. Select **Files** from the submenu by using the arrow keys and RETURN or by pressing F, or by using the mouse.

```
F - Files
D - Disk
O - DOS
```

3. Select the drive that contains the disk of file(s) you wish to delete using the method described in the "Selecting the Drives" section.

   The contents of the disk are displayed. If the disk contains ProDOS subdirectories, the tree appears so that you can select the subdirectory in which you want to delete files. The File Display appears next:

```
Delete Files              Source: Slot 6    Drive 1
DISK VOLUME 254
-------------------------------------------------
      *A    003   HELLO
      *A    003   MASTER
      *B    020   FID
      *A    014   RENUMBER
      *B    009   MASTER CREATE
-------------------------------------------------
[Return]-Toggle marker, [E]nter
filename, [G]o, [ESC]-Exit
```

Pressing RETURN or clicking the mouse places an arrow (-->) to the left of the filename. The arrow marks the file to be deleted. Repeatedly pressing RETURN (or clicking the mouse) toggles the arrow on and off. A number of files can be marked by using the arrow keys and RETURN or clicking the mouse on the filename. A filename or pattern can also be entered by pressing E. The rules for the pattern are the same as in **Copy Disk** (please see the "Selecting Files from the File Display" section for full details.) Any file that matches the pattern will be marked to be deleted.

If this is a ProDOS disk, you may press the > and < keys to browse through other subdirectories. (See the previous section "Selecting Subdirectories" for details on how to do this.)

4. Press G to start the deletion process.
   All files marked are deleted. The display shows the filenames as the files are deleted.

   Note: If you want to delete a subdirectory on a ProDOS disk, first find that subdirectory in the tree display. Back up one level in the tree display and highlight that subdirectory. Press RETURN *to show the files contained within that subdirectory. The name of the subdirectory you wish to delete appears as an entry within this file display. Use the arrow keys and* RETURN *(or the mouse) to mark it. When you mark a subdirectory to be deleted, Copy II Plus deletes the subdirectory itself and every file within that subdirectory.*

Delete Disk

The **Delete disk** option cleanly erases all the "record-keeping" information on the disk, including the names and locations of the files, and the presence or absence of DOS or ProDOS. Deleting a disk is similar to reformatting it to start over, but takes less time. (An unformatted disk, however, must be formatted before it can be used.)

Important: Once you delete a disk, the information that it contained is erased. Undelete cannot recover any data from a deleted disk.

1. Select **Delete** from the menu by using the arrow keys and RETURN or by pressing D, or by using the mouse.
2. Select **Disk** from the submenu by using the arrow keys and RETURN or by pressing D, or by using the mouse.

```
F - Files
D - Disk
O - DOS
```

3. Select the drive that contains the disk you wish to delete.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.
   The following message appears:

```
Warning: deleting the disk will
destroy all data PERMANENTLY. All
files will be unrecoverable.
Ready to delete (y/n) ?
```

4. Press Y to delete the disk.

Delete DOS (DOS 3.3 only)

As mentioned earlier, on DOS 3.3 disks, DOS uses the first three tracks on a disk. The **Delete DOS** option frees two of those tracks so that files can use them. The first track (track 0) is not accessible to files, and is not freed. Deleting the DOS increases the storage capacity of a disk by 8 kilobytes, but the disk cannot be booted, since there is no longer any DOS to boot. If you try to boot a disk that has had its DOS deleted with Copy II Plus, it prints this message on the screen:

```
THIS DISK HAS NO DOS TO BOOT.

INSERT ANOTHER DISK AND
PRESS A KEY TO REBOOT.
```

The **Delete DOS** option does not apply to ProDOS disks. You can accomplish the same thing with a ProDOS disk by deleting the file named ProDOS.

Edit Applications

This option allows you to create and edit the applications list that appears under the **Applications** command discussed earlier. You may add up to twelve ProDOS applications to this list. The applications must be of filetype "SYS." You may specify whatever letter you wish to launch the application with a single keystroke from the list.

Editing the Application List

1. Select the **Edit Applications** option from the main menu by using the arrow keys and RETURN or by pressing E or by using the mouse.
   The following screen appears:

```
                Copy II Plus 9.0
      (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------
Edit  Previous  Next   New  Delete  Exit  Save
-------------------------------------------------

Application number:     1
Application name: Basic
Command letter: B

Application prefix:/Basic

Application pathname: Basic.System

Number of Applications: 1
Status: Unchanged
```

Adding a New Entry

The commands between the dotted lines are selected by using the left and right arrow keys and pressing RETURN when the command you wish to use is highlighted or by using the mouse to select the command you wish to use by clicking on it.

The **New** and **Edit** commands use the up and down arrow keys to move up and down the fields during entry. The right and left arrow keys move the cursor right and left within the entry line. The cursor always goes to the beginning of an entry in each field. To keep the current entry, you may press TAB (which moves the cursor to the end of the entry line) and then RETURN to move on to the next field, or use the up and down arrow keys to move between fields without changing the entries.

1. Select **New** to add an application to the list using the arrow keys and RETURN or clicking with the mouse.
   The cursor jumps to the `Application name` field. The `Application number` field increments by one.

   *Note: If you wish to add each new application to the bottom of the list, first use the **Next** command to display the last application in your list. Then select **Edit**. The newest addition then gets the next consecutive number. Otherwise, Copy II Plus inserts the new application with the next consecutive number of the application that was on the screen when you selected **New**. All subsequent applications in the list are then renumbered. If you inadvertently select the **New** command, and wish to back out without changing anything, press ESC. The ESC key cancels whatever actions have been taken.*

2. Type in the application name as you want it to appear on the **Applications** list. A maximum of 13 characters is allowed for the name.
3. Press RETURN.
   The cursor jumps to the `Command letter` field.
4. Type the single letter you wish to use for the command letter.
5. Press RETURN.
   The cursor then moves to the `Application prefix` field.
6. Type in a slash (/), then the prefix (volume name and directory) of the application. A maximum of 49 characters is allowed for this entry.
   The prefix should look similar to this:

   ```
   /Hard.Disk/Directory
   ```

7. Press RETURN.
   The cursor moves to the `Application pathname` field.
8. Type in the pathname of the application. Do not type the preceding slash in this field. A maximum of 15 characters is allowed for this entry.
   The pathname should look similar to this:

   ```
   Application.Name
   ```

9. Press RETURN.
   The cursor then automatically jumps to the **Save** command at the top of the screen.
10. Press RETURN to save the new information to disk.
    Copy II Plus saves your addition to the **Applications** list.

    *Note: The **Edit Applications** option creates a file called Util.Apps that consists of the list of applications you have added.*

Editing Entries

After you have added entries to the application list, you may wish to change the information contained in some of your entries. For example, you must change the `Application prefix` at any time you rename the volume that contains an application from your list.

1. Select **Edit** using the arrow keys and RETURN or clicking with the mouse, to make changes to the current entry showing on screen. The cursor moves to the beginning of the `Application name` field.

   By pressing the TAB key, the cursor moves to the end of the entry. Pressing RETURN at this point goes to the next field to edit, leaving the information intact on the previous line. This is helpful if you wish to modify only one or two entries. You do not have to re-type each entry before moving on to the next. Otherwise, pressing RETURN erases what is shown on the line and puts the cursor at the beginning of the next line. Or you may use the up and down arrow keys to move up and down the fields without changing the information.

   Pressing ESC at any point returns you to the command line without changing any of the information on screen.

2. To save the changes you have made, the cursor must be at the end of the `Application pathname` field.
   Press RETURN.
   The cursor moves to **Save** in the command line.
3. Press RETURN to save your changes.
   The status line at the bottom of the screen changes to:

```
Number of applications: x
Status: Saved
```

4. To edit a different entry, use the **Previous** or **Next** commands to find the entry you wish to edit.

✔ The commands **Previous** and **Next** allow you to move through your Applications list in a sequential manner, either forward or backward. Press RETURN or click the mouse when the command you want is highlighted.

Deleting an Application From the List

Use this command to delete applications you no longer wish to have on the list.

1. Select **Delete** from the command line using the mouse or the arrow keys.

   Important: Be sure the application you wish to delete is showing on screen. As soon as you press RETURN or click the mouse with ***Delete*** *highlighted, Copy II Plus deletes whatever application is on screen. However, if you inadvertently delete an application, you may press ESC. This returns you to the Utilities main menu and restores the list to what it contained before the delete.*

2. After the deletion has been done, select **Save** from the command line. This writes the changes to the disk.

✔ The **Exit** command returns you to the Utilities main menu without saving any changes. After you use the **Save** command, the cursor jumps to the **Exit** command.

✔ The **Save** command must be used whenever you wish to write the changes, additions, or deletions to disk. The cursor jumps to the **Save** command every time you press RETURN at the end of the last field.

Lock/Unlock Files

If you wish to lock or unlock one or more files, choose this option and select the appropriate drive. If you've selected a ProDOS disk that contains subdirectories, the subdirectory tree display appears for you to select which subdirectory contains the files you want to lock or unlock.

Locking or Unlocking a File

1. Select **Lock/Unlock** from the main menu by using the arrow keys and RETURN or by pressing L, or by using the mouse.
2. Select the drive that contains the file(s) you wish to lock or unlock. For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The contents of the disk are displayed. If the disk contains ProDOS subdirectories, the tree appears so that you can select the subdirectory in which you want to lock or unlock files. The file display appears next:

```
Lock/Unlock Files        Slot 6      Drive 1
DISK VOLUME 254
-----------------------------------------------------
      *A    003   HELLO
      *A    003   MASTER
      *B    020   FID
      *A    014   RENUMBER
      *B    009   MASTER CREATE
-----------------------------------------------------
[Return]-Toggle asterisk,     [E]nter
filename, [G]o, [ESC]-Exit
```

3. Use the arrow keys or the mouse to select a file, then press RETURN (or click) to toggle the asterisk on or off. (The asterisk to the left of a filename indicates a file is locked.)

   To lock or unlock a number of files automatically, press E. You are prompted for a filename, with the same pattern capabilities as described in the "Selecting Files from the File Display" section.

   After entering a filename, you see:

   ```
   [L]ock or [U]nlock?
   ```

   Press L to lock all the files that match the pattern or press U to unlock them.

4. Press G to activate the locking or unlocking process.
   The catalog is written back to the disk with the proper files locked and/or unlocked.

Rename

This option allows you to change the names of your files or the volume names of your ProDOS disks.

Renaming Files

1. Select **Rename** from the main menu by using the arrow keys and RETURN or by pressing R or by using the mouse.
2. Select **Files** from the submenu by using the arrow keys and RETURN or by pressing F, or by using the mouse.

```
F - Files
V - Volume
```

3. Select the drive that contains the disk of file(s) you wish to rename. For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The contents of the disk are displayed. If the disk contains ProDOS subdirectories, the tree appears so that you can select the subdirectory in which you want to rename files.

   See the section "Selecting Files from the File Display" for details on subdirectories.

   The File Display appears next:

```
RENAME FILES              SOURCE: SLOT 6    DRIVE 1
DISK VOLUME 254
-----------------------------------------------------
      *A    003   HELLO
      *A    003   MASTER
      *B    020   FID
      *A    014   RENUMBER
      *B    009   MASTER CREATE
-----------------------------------------------------
[RETURN]-Select to rename,    [E]nter
filename, [G]o, [ESC]-Exit
(Renamed files are marked)
```

   Use the arrow keys and RETURN or the mouse to select a file to rename. You are prompted for the new name:

```
Rename <filename>
AS?
```

4. Enter a new filename and press RETURN.
   The new name must be a legal DOS or ProDOS filename.
   - ✔ DOS filenames must begin with a letter and cannot contain a comma. The maximum number of characters allowed is 31.
   - ✔ ProDOS filenames must begin with a letter and can contain only letters, numbers, and periods. The maximum number of characters allowed is 15.

For every file that is renamed, an arrow (->) appears to the left of the file. This simply serves as a reminder as to which files have been renamed.

The **Enter filename** option is available, but since files must be renamed manually, the E option stops at the first file that matches the pattern, leaving that file highlighted. From here you can press RETURN to rename the file.

5. Press G to make the changes permanent.
   The new filenames are written to the disk.
   If you do not wish to save the name changes, press ESC.

Renaming A Volume (ProDOS only)

1. Select **Rename** from the main menu using the arrow keys and RETURN or by pressing R, or by using the mouse.
2. Select **Volumes** from the submenu by using the arrow keys and RETURN or by pressing V, or by using the mouse.

```
F - Files
V - Volume
```

3. Select the drive that contains the ProDOS disk you wish to rename. The following screen appears:

```
Rename                              Slot 5 Drive 1
/USERS.DISK

New Volume name:  /
```

Notice the volume's current name is displayed in the upper left corner of the screen.

4. Type in the new name. The volume name cannot be longer than 15 characters, must begin with a letter and contain only letters, numbers, and periods.
5. Press RETURN to complete the renaming.

Sort Catalog

This option sorts the filenames stored on the disk so when a Catalog is done, the files appear in alphabetical order or in any order that you wish it to appear.

Note: For programming reasons, Copy II Plus can keep track of no more than 255 files in one directory at a time. If you have a ProDOS disk that contains more than 255 files in one subdirectory, the Utilities shows you the first 255. Any files after the first 255 will be unaffected by any of the operations of Copy II Plus. For example, Copy II Plus would only sort the first 255 files of a directory containing 300 files. This limitation allows an entire directory to be stored in memory, giving Copy II Plus much of its speed.

1. Select **Sort Catalog** from the main menu using the arrow keys and RETURN or by pressing O, or by using the mouse.
2. Select the drive that contains the disk you wish to sort.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The following screen appears:

```
Sort catalog          Slot 5 Drive 1
/Users.disk
-------------------------------------------
 STARTUP        BAS   24    15-OCT-83
*ANIMALS        BAS   10    15-OCT-88
*CONVERT        SYS   42    12-DEC-87
 PRINTER        BAS   23    4-APR-79
-------------------------------------------
[A]lphabetize, [D]elete, [E]nter
filename, [G]o, [Esc] - exit, [Return]-
mark, [S]how, Number insert
```

- Select A to number the files in alphabetical order. Copy II Plus automatically displays on screen what the alphabetized catalog looks like.
- Select D to delete the number of the highlighted file.
- Select E to enter a filename. The highlight bar moves to that file if it is found.
- Select G to write the sorted catalog back to the disk.
- Select ESC to go back to the Utilities menu.
- Select RETURN to mark the highlighted file with the next consecutive number.
- Select S to view the sorted catalog on screen. This option is provided in the event you have sorted the catalog in ways other than alphabetical.
- Type a number which allows you to change the copy sequence number of any of the numbered files. Manually inserting a

number causes the other numbered files to be automatically renumbered.

Important: *When sorting bootable ProDOS disks: If a disk contains two or more files whose filenames end with ".SYSTEM", the first .SYSTEM file in the catalog is the one that starts up whenever the disk is booted. Alphabetizing the disk can rearrange the .SYSTEM files, causing a different program to start up the next time you boot the disk. We recommend that you don't alphabetize any original program disk. You should make a backup and alphabetize the backup. Also, just rearranging the files on a ProDOS disk can change the startup program.*

Format Disk

This option formats any floppy, hard, and/or RAM disks so that files can be stored onto them. A blank disk must be formatted before it can be used. If a formatted disk already contains information, then formatting it again will completely wipe out the old information.

Copy II Plus gives you the two formatting options: DOS 3.3 or ProDOS. Normally under DOS 3.3, you can use the DOS INIT command to initialize a disk. Formatting a disk is not quite the same as initializing one. If you're unfamiliar with the differences between formatting and initializing, the following shows the differences:

DOS 3.3 INIT Command	Copy II Plus Format Command
Lays down sector boundaries, dividing the disk into individual sectors	Lays down sector boundaries, dividing the disk into individual sectors
Writes the catalog track	Writes the catalog track
Puts a copy of DOS onto the disk	Writes a "boot sector" so that if you try to boot the disk, an error message appears
Saves whatever Basic program is in memory onto the disk	
Sets up DOS so that the Basic program runs as the greeting program when the disk is booted	

Formatting a DOS 3.3 Disk

Copy II Plus can only format 5.25" floppy disks with DOS 3.3. It cannot recognize hard disks, 3.5" disks, or RAM disks.

1. Select **Format** from the main menu by using the arrow keys and RETURN or by pressing F or by using the mouse.
2. Select the type of formatting you wish to do:

```
P  -  ProDOS
D  -  DOS 3.3
```

3. Select the drive you wish to use.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The following screen appears:

```
Format Disk DOS 3.3              Slot 6 Drive 1

Insert disk to format
Ready to format (y/n)  ?
```

4. Insert the disk you wish to format into the designated drive.
   If the disk contains data, Copy II Plus asks if you wish to destroy the disk.
5. Press Y to format the disk. Press N to cancel.

Creating a Bootable DOS 3.3 Disk using Copy II Plus

1. Format the disk using the **Format disk**, DOS 3.3 option.
2. Use the **Copy DOS** option to copy the DOS from another DOS 3.3 disk onto the new one.
3. Copy a BASIC greeting program onto the disk using the **Copy Files** option.
4. If necessary, use the **Change Boot Program** (described later) to change the name of the program DOS runs to the name of the file you saved.

ProDOS Formatting

For ProDOS disks, the Copy II Plus **Format Disk** option:

✔ Lays down sector boundaries, dividing the disk into individual sectors, so the disk can be written to and read from (this is the actual formatting),

✔ Writes the volume and directory area, which is a place to record the volume name and the names of the files that will go on the disk,

✔ Writes "boot blocks" so that if you later copy the appropriate files onto the disk, it will become a bootable disk.

Whenever you boot a normal ProDOS disk, it first finds the file named ProDOS on the disk, and loads it into the computer's memory. Then it looks for the first file that ends with .SYSTEM (for example, "BASIC.SYSTEM"), and loads that too. The system program might look for yet a third file. For example, BASIC.SYSTEM looks for a Basic program called STARTUP on the disk.

2:1 Interleave

On an Apple IIGS with an Apple Disk 3.5" (not the UniDisk 3.5") drive in the SmartPort, you have an additional option of selecting the interleave of the formatting of a 3.5" disk. The option Copy II Plus gives you is a 2:1 interleave. This results in much faster disk access. After selecting the 3.5" drive you wish to use for the copy, the following message appears:

```
Use hi speed interleave ?
```

The default is No, which you may accept by pressing RETURN. Otherwise, type Y for yes.

For more details about the interleave, please see Appendix A.

Formatting a ProDOS Disk

1. Select **Format** from the main menu by using the arrow keys and RETURN or by pressing F or by using the mouse.
2. Select the type of formatting you wish to do:

```
P  -  ProDOS
D  -  DOS 3.3
```

3. Select the drive you wish to use.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The following screen appears:

```
Format disk                Slot 6 Drive 1

Insert disk to format
Ready to format (y/n)  ?
```

4. Insert the disk you wish to format into the designated drive.
   If the disk contains data, Copy II Plus asks if you wish to destroy that disk.
5. Press Y to format the disk. Press N to cancel.

You are prompted for a volume name if the disk is blank. Type a name using the standard ProDOS rules for volume names.

Creating a Bootable ProDOS Disk

1. Format the disk with the **Format disk**, ProDOS option.
2. Use the **Copy Files** option to copy the ProDOS file and an appropriate .SYSTEM file from another ProDOS disk onto the new disk.
3. Copy any other necessary files onto the new disk.

Formatting /RAM

As mentioned earlier, with 128K Apple II series (or compatible) computers, ProDOS installs a small RAM disk into part of the computer's memory. This memory then acts like a very fast disk drive with a volume name of /RAM. However, it stores information into Apple memory rather than onto a floppy disk. Once you turn the computer off, any files you've saved in the RAM disk are lost.

Copy II Plus uses this same area of memory for program storage, so it disconnects the RAM disk. That's why you see the phrase "/RAM disconnected" in the Drive Select Display. You are not able to format or access this particular RAM disk because Copy II Plus uses the memory there for itself. However, if you have a RAM disk set up in any slot other than S3 D2 then you may format or delete it as you wish. Copy II Plus treats it like any other ProDOS device. Also, if you have set up a RAM disk on a GS using the Control Panel, then Copy II Plus will not disconnect it. It views it as a disk device in slot 5. See Appendix G for further information.

Note: If you have a large (greater than 64K) "auxiliary–memory" based memory board, you need to use the RAM disk install program supplied with your memory board before ProDOS — and Copy II Plus — can make use of the extra memory. See the section on "Large Memory Boards" in Appendix F for more information about how Copy II Plus deals with extra memory and /RAM.

Verify

The Verify option is used to select one of three suboptions:

```
D - Disk
F - Files
S - Drive Speed
```

Verify Disk

This option is used to check if any sectors or blocks on the disk are bad. If the disk being verified is a 5.25" disk, Copy II Plus verifies it track–by–track. Any other disk device is verified block–by–block.

Verify Disk will work with standard 16 sector (DOS 3.3, ProDOS, SOS, CP/M, and Pascal) 5.25" disks and with other ProDOS compatible disk devices. Blank (unformatted) disks will produce errors, since there are no sectors written on the disk to verify. Most copy–protected disks also produce errors, since the formatting on these disks is often different than the standard Apple 16 sector format.

If a normal DOS or ProDOS disk you're using is giving DOS I/O errors, it can be one of three things: bad data, bad sectors, or a physically damaged disk. Bad data means the catalog or file information is wrong, for example, telling the DOS to look for a file on track 200. A bad sector is one that simply can't be read (possibly caused by a "power glitch" or by opening the drive door or pressing Reset while the drive was writing) even though the disk is still capable of storing good data. A disk can also be permanently damaged from improper handling, fingerprints, heat, spilled coffee, etc.

It's a good idea to verify suspect disks to see where the errors are. If **Verify Files** shows errors, but **Verify Disk** does not, then bad data stored in the catalog is the most likely culprit. If **Verify Disk** shows errors, then you have either bad sectors or a damaged disk (or a blank or copy–protected disk). You should use **Copy Files** or **Copy Disk** to save as much of the information as you can, then try to reformat the disk. If the formatting fails, then the disk is most likely permanently damaged.

Verifying a Disk

1. Select the **Verify** option from the main menu by using the arrow keys and RETURN, or by pressing Y or by using the mouse.
2. Select the **Disk** option from the submenu by using the arrow keys and RETURN or pressing D or by using the mouse.

```
D  - Disk
F  - Files
S  - Drive Speed
```

3. Select the drive you wish to use.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.
   Be sure the disk you wish to verify is in the drive before pressing RETURN.

Copy II Plus reads each of the tracks (or blocks) in turn. As it reads, the current track or block number is displayed near the bottom of the screen:

```
Verifying Track (or Block) $03
```

If bad sectors are found on any track, their track and sector numbers are displayed in hexadecimal in the middle of the screen, as in this example:

```
ERROR TRACK $03
SECTOR $5 7 B
```

This message means there were errors on track $03, sectors $5, $7, and $B.

When finished, the program shows the total number of errors. If you want to exit out of the verify before it's finished, you can press ESC at any time.

Verify Files

Verify Files checks the data and sectors used by individual files.

Verifying File(s)

1. Select the **Verify** option from the main menu by using the arrow keys and RETURN, or by pressing Y or by using the mouse.
2. Select the **Files** option from the submenu by using the arrow keys and RETURN or pressing F or by using the mouse.

```
D  - Disk
F  - Files
S  - Drive Speed
```

3. Select the drive you wish to use.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.
4. Select the file(s) you wish to verify using the methods described earlier in the section "Selecting Files from the File Display."
5. Press G to begin the verification process.
   The file display highlights each file as it is verified. If an error occurs, the track and sector number (or the block number) for the error appears at the bottom of the screen. You may press RETURN to continue verifying the file, SPACE to move to the next file, or ESC to return to the main menu.

Verify Drive Speed (5.25" drives only)

To properly read the data on disks, a 5.25" disk drive must spin at the right speed. This speed is 5 revolutions per second, or 1 revolution every 200 milliseconds. This speed is set at the factory, but with time, the drive speed can drift. If the speed is too far from 200 milliseconds, I/O errors can occur, or data can be written that is unreadable on a normal speed drive.

The **Verify Drive Speed** option allows you to periodically check the speed of your disk drives. In normal use, the drive speed can vary from 198 to 202 milliseconds (ms.). Small fluctuations in the speed are also normal. (Smaller numbers mean faster speeds.)

Verify Drive Speed is not used for 3.5" drives, because these drives continually change speeds depending on which track is being accessed. Circuitry built into 3.5" drives monitors and corrects their own speeds as they operate.

> *Note: When using the Copy II Plus Bit Copy program, you may need to adjust the speed more accurately. This is explained later in "More Helpful Hints" in the chapter "Automatic Bit Copy."*

Determining Drive Speed

1. Select the **Verify** option from the main menu using the arrow keys and RETURN or by pressing Y or by using the mouse.
2. Select the **Drive Speed** option from the submenu by using the arrow keys and RETURN or pressing S or by using the mouse.

```
D  - Disk
F  - Files
S  - Drive Speed
```

3. Select the drive you wish to test.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The following screen appears:

```
Verify Drive Speed              Slot 6 Drive 1

Insert a blank disk in Slot 6 Drive 1
[RETURN]-Continue [ESC]-Exit
```

Important: *Be sure you use a disk that is blank or is otherwise expendable as far as any data it might contain is concerned.*

4. Place a blank disk into the selected drive.
5. Press RETURN.
   The following screen appears:

```
Verify Drive Speed              Slot 6 Drive 1

Drive speed should be between 198.0 ms.
and 202.0 ms.

Drive speed is 201.5 ms.

([ESC] - Exit)
```

   You may see the drive speed fluctuate on the screen. This is normal.

6. Press ESC to exit the drive speed test.

Adjusting Your Drive Speed

If the speed is out of bounds, in most cases you can adjust the drive speed yourself. Here are procedures for adjusting the speed of Apple Disk II or Micro–Sci A–2 drives, Duodisks, or Apple //c built–in and external drives.

Important: *Adjusting the drive speed may void the warranty. During the first 90 days of ownership, you might prefer to take the drive to your Apple dealer for adjustment.*

Adjusting the Speed on Apple Disk II Drives or Micro–Sci A–2 Drives

1. Turn off your computer.
2. Remove the drive cover. There are four screws on the bottom of Apple drives or on the sides of Micro–Sci A–2 drives. After removing them, slide the cover off towards the back of the drive. You might want to unplug the drive from the controller card for more room before sliding the cover off.
3. Now reconnect the drive to the controller card, and reboot your Copy II Plus disk, choosing the **Verify Disk Speed** option.
4. The drive speed can be adjusted by turning the speed control potentiometer. This is a small ceramic box with a tiny adjustment screw at one end. It can be found on the smaller circuit board at the back of the drive (right side of the drive, far lower corner). Turn the screw with a screwdriver or your fingernail until the drive speed is correct.
5. Exit the Copy II Plus program and turn off your computer.
6. Re-install the cover on your disk drive.

Adjusting the Duodisk

1. Tip the Duodisk up on its side so the underside of its case is exposed. There are two small holes underneath each drive, near the drive door. The speed adjustment screws are in the holes.
2. Boot Copy II Plus and choose the **Verify Disk Speed** option. (The drive will run fine on its side. It doesn't have to be upright.)
3. With a small-blade screwdriver, turn the screw in the appropriate hole until the drive speed is correct.
4. Place the Duodisk back in its normal operating position.

Adjusting the Apple IIc Built-in Drive

1. Tip the IIc computer itself on its side so the underside of its case is exposed. There is a small hole in the bottom of the case, near the drive door. The drive speed adjustment screw is in the hole.
2. Boot Copy II Plus and choose the **Verify Disk Speed** option. (The computer will run fine tipped on its side.)
3. With a small-blade screwdriver, turn the screw until the drive speed is correct.
4. Place the computer back in its normal operating position.

Adjusting the Apple IIc External Drive:

1. Tip the drive on its side so the underside of its case is exposed. There is probably a silver label on the bottom of the case near the drive door. Underneath this label is a small hole, and the drive speed adjustment screw is in the hole. You'll probably want to remove the label to access the hole.
2. Boot Copy II Plus and choose the **Verify Disk Speed** option.
3. With a small-blade screwdriver, turn the screw until the drive speed is correct.
4. Place the drive back in its normal operating position.

Note: In older Franklin computers, the processor itself runs at a slightly different speed. This affects both the optimal speed for the drives and the timing of the ***Verify Disk Speed*** *option itself. Most Franklin drives are preset so that the drive speed reads at about 198 ms. per revolution. If you have problems accessing or backing up commercial disks on a Franklin computer, adjusting the speed closer to 200 ms. may help.*

A more technical discussion of drive speed is included in Appendix A for interested readers.

Compare Files

This option allows you to compare files in 80 column mode. You may compare ProDOS to ProDOS and DOS to DOS files, but not compare a ProDOS to a DOS file.

> ***Note:*** *If you copy a ProDOS disk and then wish to compare a file from the original disk to a file on the copy, be sure to rename the copy to a different volume name before starting the compare.*

1. Select **Compare Files** from the menu by using the arrow keys and RETURN or by pressing K or by using the mouse.
2. Select the drive that contains the disk with the source file you wish to compare. For detailed instructions on selecting a drive, see the section "Selecting the Drives."
3. Select the drive that contains the disk with the file you wish to compare with the first.
4. Select the first file you wish to compare from the File Display using the arrow keys or the mouse:

```
Compare Files                  Slot 6      Drive 1
/COPYIIPLUS
-------------------------------------------------
PRODOS              SYS         32    14-JUN-88
UTIL.SYSTEM         SYS         35    25-SEP-89
UTIL.MORE           BIN         45    17-JUN-89
-------------------------------------------------
Use arrow keys or mouse to highlight file to use
for source comparison file, then press Return
```

5. Select the second file for comparison from the File Display using the arrow keys or the mouse:

```
Compare Files                  Slot 6      Drive 2
/EXAMPLE
-------------------------------------------------
PRODOS              SYS         32    14-JUN-88
UTIL.SYSTEM         SYS         35    25-SEP-89
UTIL.APPS           BIN         26    17-JUN-89
-------------------------------------------------
Use arrow keys or mouse to highlight file to use
for target comparison file, then press Return
```

The following question appears:

```
Show differences? N
```

The default is No.

Copy II Plus then reads the files. If the files are identical, this message appears:

```
The files are identical.
Press any key to continue.
```

You are returned to the Utilities main menu after pressing a key.

If you answered Y for Yes to the `Show differences?` question, then Copy II Plus displays the differences:

```
Compare Files                    Slot 6      Drive 2
/CPII/PRODOS
Source file:
000000: 4C 06 20 EE DF 21 A5 43 8D 6A 22 20 BC 25 AE 76
000010: 22 AC 77 22 20 F7 28 B0 23 A0 00 A9 FF 8D FF BF
000020: 4D FF BF 38 D0 28 8D FF BF AD FF BF D0 20 AD 82
000030: C0 20 2A 25 B0 06 A5 0C 29 20 D0 03 4C 35 22 AE
000040: 78 22 AC 79 22 20 F7 28 AD FF BF 8D F4 FD B0 6A
000050: AD 82 C0 AE B3 FB E0 06 D0 42 A9 E0 2C C0 FB 08
000060: A5 0C 29 37 28 50 02 30 0F 08 09 08 28 10 04 09
000070: 40 10 07 EE 58 09 70 02 09 80 85 0C AD 82 C0 38

Target file:
000000: 4C 06 20 EE D4 21 A5 43 8D 5F 22 20 B1 25 AE 6B
000010: 22 AC 6C 22 20 EC 28 B0 23 A0 00 A9 FF 8D FF BF
000020: 4D FF BF 38 D0 28 8D FF BF AD FF BF D0 20 AD 82
000030: C0 20 1F 25 B0 06 A5 0C 29 20 D0 03 4C 2A 22 AE
000040: 60 22 AC 6E 22 20 EC 28 AD FF BF 8D FA FD B0 6A
000050: AD 82 C0 AE B3 FB E0 06 D0 37 A9 E0 2C C0 FB 08
000060: A5 0C 29 37 28 50 02 30 0F 08 09 08 28 10 04 09
000070: 40 10 07 EE 58 09 70 02 09 80 85 0C AD 82 C0 38

Press any key to continue
```

The top block of hex numbers is from the source file. The second block is from the target file. The numbers on the left represent the offset address into the file of the differences Copy II Plus found when it compared the files. The bytes that are different are shown in inverse on the screen (bold in the example illustration.) By pressing any key, you may continue to view each difference between the files. When Copy II Plus cannot find any

more differences or the end of the file is reached, you are returned to the Utilities main menu.

Possible Error Messages

- After selecting the source and target files of significantly different sizes, the following message may appear:

```
Premature EOF in source (target) file      Continue? Y
```

The default is Yes, which you may accept by pressing RETURN or clicking the mouse. This message usually appears when one of the files is shorter than the other.

- After selecting the source and target files of different filetypes, the following message appears:

```
Filetypes are different.       Compare anyway?   Y
```

The default is Yes, which you may accept by pressing RETURN or clicking the mouse. This message appears if you are comparing a binary file to a Basic file, or a text file to a binary file, etc.

View Files

The **View Files** option allows you to quickly and easily look at the data in any file. This is useful for double–checking exactly what is in a file before copying it, deleting it, etc. **View Files** has two suboptions, for viewing the data as values or as text. The values option shows both the hexadecimal numbers and the ASCII characters in the file. The text option prints just the characters in a more readable form. In addition, if the printer is selected, the data can be sent to the printer.

Viewing File(s)

1. Select the **View Files** option from the main menu by using the arrow keys and RETURN or by pressing V or by using the mouse.
2. Select one of the two options presented to you in the submenu:

```
V  -  Values
T  -  Text
```

When using the **View Values** option, the file is displayed as hexadecimal bytes, 8 bytes per line, with the equivalent ASCII characters to the right. Control characters are replaced with periods. In the **View Text** mode, the characters are printed out in standard

40–character lines. Control characters are not printed, except for carriage returns.

3. Select the drive that contains the disk with files you wish to view. For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.
4. Select the file you wish to view by using the arrow keys or the mouse.
5. Press G to view the file.
   If the printer is on, you are asked if you want a printout.
   In text mode, the screen appears filled with text that may or may not make sense, depending on the type of file you are viewing. In values mode, the screen appears similar to this:

```
View Files  Values                    Slot 6 Drive 1
/USERS.DISK/HYPNOSIS
[RETURN]-Continue        [ESC]-Exit              136
-------------------------------------------------
A2 FF 9A 20 3E 20 20 49        " > I b 3 HpW s i....
21 20 26 20 20 62 08 90        n @ @ .....J - ! ! ..
01 00 20 9A 20 2C FC 90        @ @ @ ~~~~~.......I !
```

In the upper right portion of the screen is a running byte count, showing how many bytes in the file have been printed. This can be used to find the approximate locations of text strings or bytes in the file.

At the end of a DOS 3.3 file, there may be a few funny characters, including inverse "@" signs. These are extra characters beyond the end of the real end–of–file. They were not suppressed because random access text files can have end–of–file markers interspersed throughout the file, before the file has actually ended. These files can still be viewed. The **View Files** option stops reading when there are no more data sectors to read.

When you've finished viewing one file, the program returns to the File Display. From here, you can select another file to view, or press ESC to go back to the main menu.

Disk Mapping

The **Disk Mapping** option gives you an informative display showing what sectors on the disk are used by which files, and which sectors are free for use. It is designed for use on any size drive.

Note: If you wish to map a hard disk that has partitions for CP/M and/or Pascal, Copy II Plus may view these partitions as one huge file on the map. Also, ProDOS 8 has a limitation of only recognizing the first two partitions of a hard disk.

Mapping a Disk

1. Select the **Disk Map** option from the main menu by using the arrow keys and RETURN or by pressing M or by using the mouse.
   The following submenu appears:

```
D - Disk
F - Files
```

2. Select **Disk**.
   The drive selection list appears next. Select the drive that contains the disk you wish to map.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   A screen similar to the following appears for a ProDOS disk:

```
Disk Mapping Disk                    Slot 5 Drive 1
/CopyIIPlus                          Scale = 1:1
Blocks Free: 1462 Used: 138   Total: 1600
************.....................................
************.....................................
********.......................................
****************.................................
******.........................................
******.........................................
            Press any key to continue
```

   In the grid, every block on the disk that is marked as in use is shown as an asterisk. Unused blocks are marked with a dot (a period.) If the disk is mostly full, large areas of the grid are filled in with asterisks.

A screen similar to the following appears for a DOS 3.3 disk:

```
Disk Mapping Disk                          Slot 6 Drive 1
Disk Volume 254
Track                          1                          2
0 1 2 3 4 5 6 7 8 9 A B C D E F 0 1 2 3 4 5 6 7 8 9 A B C D E F 0 1 2
S 0 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
e 1 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
c 2 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
t 3 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
o 4 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
r 5 * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
                Press any key to continue
```

This grid-like map shows all the sectors of the disk with the track numbers ($0 to $22) across the top row and the sector numbers (0) to $F) along the left edge. In the grid, every sector on the disk that is marked as in use is shown as an asterisk. Unused sectors are marked with a dot (a period). If the disk is mostly full, large areas of the grid are filled in with asterisks. You can see whether or not any given sector is in use by following the track number down and the sector number across and noting whether or not an asterisk is there.

3. Press any key after looking at this display to return to the main menu.

Mapping File(s)

1. Select the **Disk Map** option from the main menu by using the arrow keys and RETURN or by pressing M or by using the mouse.
   The following submenu appears:

   ```
   D - Disk
   F - Files
   ```

2. Select **Files**.
   The drive selection list appears next. Select the drive that contains the file you wish to map.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

A screen similar to the following appears in 80 columns for a ProDOS disk:

```
Disk Mapping Files                          Slot 5 Drive 1
/CopyIIPlus                                 Scale = 1:1
*.............................................
*.............................................
*.............................................
**............................................
**............................................
**............................................
Filename: PRODOS       Use mouse or arrow keys to map different files
```

The sectors that the file occupies are shown with asterisks. By moving the mouse right or left or by pressing the arrow keys, you may view each file on the disk sequentially. The right arrow key (or right mouse movement) moves forward through the files and the left arrow key (or left mouse movement) goes back. The asterisks move to the right across the screen when in forward mode showing where each file is written on the disk.

3. Press ESC to return to the main menu.

A screen similar to the following appears for a DOS 3.3 disk:

```
Disk Mapping File                           Slot 6 Drive 1
Disk Volume 254
   Track                    1                         2
   0 1 2 3 4 5 6 7 8 9 A B C D E F 0 1 2 3 4 5 6 7 8 9 A B C D E F 0 1 2
S 0 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
e 1 . . . . . . . . . . . * . . . . . . . . . . . . . . . . . . . . .
c 2 . . . . . . . . . . . * . . . . . . . . . . . . . . . . . . . . .
t 3 . . . . . . . . . . . * . . . . . . . . . . . . . . . . . . . . .
o 4 . . . . . . . . . . . * . . . . . . . . . . . . . . . . . . . . .
r 5 . . . . . . . . . . . * . . . . . . . . . . . . . . . . . . . . .
         Use mouse or arrow keys to map files
Filename: SAMPLE
```

The grid–like map shows all the sectors on the disk, with the track numbers ($0 to $22) across the top row and the sector numbers ($0 to $F) along the left edge. The sectors that the file occupies are shown with asterisks. By moving the mouse right or left or by pressing the arrow keys, you may view each file on the disk sequentially. The right arrow key (or right mouse movement) moves forward through the files and the left arrow key (or left mouse movement) goes back. The asterisks move up the screen when in forward mode showing where each file is written on the disk.

4. Press ESC to return to the main menu.

Change Boot Program (DOS 3.3 only)

When a standard initialized DOS 3.3 disk is booted, it automatically runs whatever Basic program the disk was initialized with. For example, a disk that was initialized with the command "INIT HELLO" will run the program "HELLO" whenever it is booted. Using the **Change Boot Program** option, you change the DOS to boot a different Basic program, or even BRUN a binary file or EXEC a text file on boot–up.

Changing the Boot Program

1. Select the **Change Boot Program** option from the main menu by using the arrow keys and RETURN, or by pressing P or by using the mouse.
2. Select the drive that contains the disk you wish to alter.
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The following screen appears:

```
Change Boot Program                    Slot 6 Drive 1
Disk Volume 254
------------------------------------------------
*I 003      APPLESOFT
*B 006      LOADER.OBJ
*B 042      FPBASIC
*A 003      MASTER
*A 001      HELLO
------------------------------------------------
File: HELLO
is the current booting program.
[G]o, [E]nter filename, [ESC] to exit
```

3. Select a new booting program by using the arrow keys or the mouse to highlight the desired file. You can also enter a filename or a pattern. The highlight will stop at the first filename that matches the pattern. (For details on using pattern matching to select files, please see the section "Selecting Files from the File Display.")
4. Press G to save this file as the booting program.
   Copy II Plus automatically checks the filetype of the file, and sets either the RUN, BRUN, or EXEC command for boot–up.

   Note: *For ProDOS disks, the first system–type file that ends in ".SYSTEM" is always loaded when you boot the disk, so* ***Change Boot***

Program *doesn't apply. See* ***Format Disk*** *described earlier, or your ProDOS User's Manual for more information.*

Undelete Files

When a DOS 3.3 file is deleted, it is not immediately erased. It is instead marked internally as a deleted file, and its sectors are marked as free to be re-used. If other data does not later overwrite part of the file, it can still be recovered and made an active file. If a file has just been accidentally deleted, and no other disk writing has occurred, the file can always be recovered, or undeleted. That is what the **Undelete Files** option is for.

When ProDOS deletes a file, the file is marked internally as a deleted file, but with older versions of ProDOS, often times some of the file "bookkeeping" information itself is lost too. There is not enough information left to guarantee that the file can be correctly recovered. In these cases, the **Undelete Files** option will make a best guess effort to recover the file.

But when Copy II Plus deletes a file from a ProDOS disk, it marks the file internally as deleted, but also keeps all of the file information intact. If you accidentally delete a ProDOS file using Copy II Plus, and no other disk writing has occurred, the file can always be recovered with the **Undelete Files** option.

Undeleting File(s)

1. Select the **Undelete Files** option from the main menu by using the arrow keys and RETURN, or by pressing U or by using the mouse.
2. Select the drive that contains the disk with the deleted file(s).
   For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.
   The File Display appears on the screen containing a list of all the deleted files still stored invisibly in the catalog. If there are no deleted files in the catalog, the message "NO FILES" appears.
3. Select the file(s) you wish to undelete using the methods described in the section "Selecting Files from the File Display."
4. Press G to begin the undeletion process.
   The file display shows the files as the program attempts to undelete them. If a deleted file has already been partly or completely overwritten with other data, Copy II Plus cannot undelete it, since the data is not recoverable. If any of the files cannot be undeleted, they are listed with the label "LOST FILES".

After the undelete is completed, use the Copy II Plus **Catalog** option to look at the undeleted files on the disk. If Copy II Plus had difficulty undeleting a file (which may sometimes occur, but only for files deleted by older versions of ProDOS, not by

Copy II Plus), then the undeleted file will be marked with a question mark. Copy II Plus has no way of knowing if it recovered all of the information correctly. You should always test or try using the suspect file to see if it was recovered successfully. (If the file is good, you can later lock or unlock the file to remove the question mark.)

Create Subdirectory (ProDOS only)

If you want to add a new subdirectory to a ProDOS disk, then choose the **Create Subdirectory** option.

Creating a Subdirectory

1. Select the **Create Subdirectory** option from the main menu using the arrow keys and RETURN or by pressing B or by using the mouse.
2. Select the drive that contains the ProDOS disk you wish to add the subdirectory to. For detailed instructions on selecting a drive, see the section "Selecting the Drives" presented earlier.

   The following screen appears:

```
Create Subdirectory              Slot 6 Drive 1
/USERS.DISK

Subdirectory name:
```

3. Type in the name of the subdirectory you wish to create.
   Be sure and follow ProDOS rules in that the name must begin with a letter and contain only letters, numbers, and periods.
4. Press RETURN to add the new subdirectory to your disk.
   The following screen appears:

```
Create Subdirectory              Slot 6 Drive 1
/USERS.DISK

Subdirectory name:Sample
Subdirectory created
Press [Return]
```

5. Press RETURN to go back to the main menu.

Set Options

The four items you set from this option are the date, printer slot, the mouse movement scale and an option to save your selections. If your computer has a built in clock, then Copy II Plus automatically reads it at boot up. However, if you do not have a clock, you may set the date manually so all ProDOS date stamping reflects the correct date.

Copy II Plus prints the displays from the **Catalog**, **View Files**, and **Disk Mapping** options if desired. If you want to use your printer with the Utilities, you need to let Copy II Plus know where your printer is.

The mouse movement scale allows you to control how rapidly or slowly your mouse moves on the screen.

The save setup option allows you to save your selections from session to session without having to reset them each time.

Setting the Date

1. Select **Set Options** from the main menu by using the arrow keys and RETURN or by pressing S or by using the mouse.
   The following submenu appears:

```
D - Date
P - Printer Slot
M - Mouse Scale
S - Save Setup
```

2. Select the date option by using the arrow keys and RETURN or by pressing D or by using the mouse.
   The following message appears in the lower left corner of the screen in place of the <NO DATE> message:

```
Enter the date:  DD-MMM-YY
```

3. Type the date in the format day-month-year and press RETURN.

   If your computer has a built in clock or a clock card, and you attempt to change the date, Copy II Plus displays this message:

```
ProDOS will not allow date/time changes
when a clock driver is installed.
Press any key to continue.
```

Setting the Printer Slot

1. Select **Set Options** from the main menu by using the arrow keys and RETURN or by pressing S or by using the mouse.

   The following submenu appears:

   ```
   D - Date
   P - Printer Slot
   M - Mouse Scale
   S - Save Setup
   ```

2. Select the printer slot option by using the arrow keys and RETURN or by pressing P or by using the mouse.
   The word "OFF" underneath the PRINTER label at the bottom right of your screen changes to "SLOT 0" and the "0" flashes.
3. Type the slot number of your printer interface card.
   If you decide you don't want to use your printer after all, press RETURN or type "0." The zero is used to designate no printer.

   Note: Apple IIc, IIc+, GS and Laser 128 users should select Slot 1 to use the printer from the Utilities.
   *The **Printer Slot** option affects printing only within the Utilities program. You don't need to set this option to print within the Bit Copy programs.*

Setting the Mouse Movement

If you have a mouse and are finding it moves too rapidly or slowly while using Copy II Plus, you can adjust its speed with this option.

1. Select **Set Options** from the main menu by using the arrow keys and RETURN or by pressing S or by using the mouse.

   The following submenu appears:

   ```
   D - Date
   P - Printer Slot
   M - Mouse Scale
   S - Save Setup
   ```

2. Select the mouse scale option by using the arrow keys and RETURN, pressing M, or by clicking the option with the mouse.
   The following screen appears:

```
Horizontal mouse scale: 3
Vertical mouse scale:   8


Use arrow keys to change horizontal
scale. Press [Return] when horizontal
scale is correct
```

3. Use the arrow keys to select a number between 0 and 255 (maximum.)
   The higher the number, the slower the movement. If you select 0, this turns off the horizontal movement of the mouse.

4. Press RETURN.
   The following screen appears:

```
Horizontal mouse scale: 3
Vertical mouse scale:   8


Use arrow keys to change vertical
scale. Press [Return] when vertical
scale is correct
```

5. Use the arrow keys to select a number between 0 and 255 (maximum.)
   The higher the number, the slower the movement. If you select 0, this turns off the vertical movement of the mouse.

6. Press RETURN.
   You are returned to the main menu.

Save Setup

1. Select **Set Options** from the main menu by using the arrow keys and RETURN or by pressing S or by using the mouse.

The following submenu appears:

```
D - Date
P - Printer Slot
M - Mouse Scale
S - Save Setup
```

2. Select Save Setup AFTER you have configured Copy II Plus the way you like. You do not have to press RETURN or click the mouse; Copy II Plus automatically saves your options to disk.

Quit

When you want to exit Copy II Plus and run another ProDOS program or boot another disk, choose the **Quit** option.

To boot a new disk after selecting **Quit**, insert the new disk and press CONTROL-RESET.

If you booted Copy II Plus with the ProDOS it was shipped with, you are asked to type the prefix and the pathname of the application you wish to run next. when you select the **Quit** command.

Remember, if you wish to run another application, Copy II Plus makes it easy to do using the **Applications** command rather than the **Quit** command.

ProDOS Quit Code

We have provided a way for those who use modified versions of the ProDOS quit code to utilize it when exiting from Copy II Plus. The first time Copy II Plus is used and quit from, the quit code is the standard ProDOS code that asks you to type in the prefix and the name of the application you wish to run. To allow you to run your own quit code, you need to do the following:

1. Boot the ProDOS that contains the quit code you wish to use.
2. Run Basic.System.
3. Run the Basic program Quit.Save, provided on the Copy II Plus disk.
   Follow the prompts in the Quit.Save program.
   This program will load the quit code that is stored at $D100-$D3FF and save it to a file called Util.Quit.
   From then on, the **Quit** command in Copy II Plus uses the quit code that is saved in Util.Quit.

Automatic Bit Copy

The two Bit Copy programs are very similar. They have the same options, but one is designed for backing up 5.25" disks, the other for 3.5" disks. Except where noted, any descriptions of Bit Copy apply equally to both Bit Copy programs. It is important to use the 5.25" Bit Copy program with copy protected 5.25" disks and the 3.5" Bit Copy program with copy protected 3.5" disks. Copy II Plus is not designed to copy a protected 5.25" disk to a 3.5" disk or vice versa.

The Bit Copy programs are provided so you can make backup copies of commercial programs that have been copy–protected. Parameters for copying many programs are included on the Copy II Plus disk. All you need to do is type in the name of the program you want to back up, and Copy II Plus does the rest. If you want, you can also enter your own parameters to copy a disk, or use the **Nibble Editor** or **Hi–res Disk Scan** options to examine how a disk is formatted.

> *Note: The Bit Copy programs don't support hard disks or RAM disks, because most copy–protection methods themselves are tied directly to the particular drive circuitry and disk format, and would not work even if you could copy the information onto a hard disk or RAM disk. Copy II Plus accesses the drives directly for best performance.*

There are 13 separate options in the Bit Copy program. You need to use only the first one or two options when making backups of most disks. Other options are a little more involved, and a couple are quite technical in nature. Not everyone will want to explore the more complicated options.

A Brief Word About Parameters

Copy II Plus can back up many protected disks automatically. However, with the increasingly complicated protection methods used, no one automatic method can copy every disk. Some protected disks can't be copied correctly unless certain parameters are changed first. These parameters are values that Copy II Plus uses in copying a disk. If you change one or more of the parameters, this in effect tells Copy II Plus not to copy the disk in the usual way, but to do it this way instead.

The parameter entries for many protected programs are stored on the Copy II Plus disk. Be sure the disk containing the parameter list is in the drive before making a selection. All you need to do is select the name of the program you want to back up. Copy II Plus looks up the parameter changes for that program, makes those changes

for you, and copies the disk. If there is no parameter entry listed for a program you want to back up, we also provide a number of "Try this" entries for your convenience. Manual entry mode is also included for typing in parameter changes yourself.

Getting Updated Parameters

Central Point Software releases updated parameter disks every few months. You can update to the latest disk whenever you like. Be sure to specify the date of your current file so a duplicate is not sent.

To update, you must be a registered Copy II Plus owner. We will need to know the following information:

- ✔ Your customer number
- ✔ The date of your current parameter entry list. To find the date, start up the Bit Copy program and choose **Auto Copy.** When it asks for the name of the program, just press RETURN. The list of entries appears, with the first entry being .PARAMETER FILE, with a date. That's the date of your listing.

Starting Automatic Bit Copy

Boot the Copy II Plus disk. Select the **Copy** option from the Utilities main menu. This submenu appears with the following choices:

```
5  -  Bit Copy 5.25
3  -  Bit Copy 3.5
F  -  Files
D  -  Disk
W  -  Disk w/Format
O  -  DOS
```

Or you may launch the Bit Copy programs directly from ProDOS by typing the pathname. For example:

```
/HARD.DISK/COPYIIPLUS/BITCOPY.SYSTEM
/HARD.DISK/COPYIIPLUS/BC3.SYSTEM
```

Note: *BITCOPY.SYSTEM runs the 5.25" Bit Copy program. BC3.SYSTEM runs the 3.5" Bit Copy program.*

1. Select the 5.25" or 3.5" Bit Copy option by using the mouse, the arrow keys and RETURN, or by pressing 5 or 3.

Note: When you select 5.25" Bit Copy, all subsequent selections from the Bit Copy main menu pertain to 5.25" disks. The same is true for 3.5" Bit Copy. If you start with one format and wish to switch to the other, you must return to the Utilities main menu and select the other format.

The following screen appears only if you have removed the Copy II Plus disk from the drive:

```
Bit Copy 5.25                Slot 5 Drive 1
/COPYIIPLUS


Can't find file:  Bitcopy.System
[ESC] Abort       [Return] Retry
```

Insert the Copy II Plus disk and press RETURN.

The following screen appears:

```
          Copy ][ Plus 5.25 Bit Copy Program 9.0
        (C) 1982-89 Central Point Software, Inc.
  ------------------------------------------------

Slot Number -
```

5.25" Bit Copy: Not all brands of 5.25" disk controller cards correctly identify themselves to the computer as disk controllers, so Bit Copy can't be sure of which slot to use. Type the slot number of your 5.25" disk controller.

3.5" Bit Copy: When Bit Copy 3.5 first starts up, it checks which slots in your computer are for 3.5" drives. If it finds one slot, it knows to use that slot, and the Bit Copy menu appears right away. If it finds more than one slot that can access 3.5" drives, you need to tell Bit Copy which slot it should use. Type the slot number for which 3.5" controller you want to use.

The Bit Copy main menu appears next:

```
          Copy ][ Plus 5.25 Bit Copy Program 9.0
         (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------------

A - Auto Copy
C - Partial Auto Copy
B - Manual Bit Copy
S - Manual Sector Copy
N - Nibble Editor
T - Sector Editor
H - Hi-res Disk Scan
Y - Create New Parm Entry
L - Load Parm Entry
E - Edit Parm Entry
V - Save Parm Entry
R - Rename Parm Entry
D - Delete Parm Entry
P - Print Parm File
Q - Quit

Use arrow keys and [RETURN], mouse, or single letter to
select function
```

Selecting a Bit Copy option works the same way as in the Utilities. **Auto Copy** is always selected with the highlight bar when you first boot into the Bit Copy menu. Use the arrow keys, the mouse, or the single letter of the function to select it.

Auto Copy

1. Select **Auto Copy** when you want to copy a program from the Copy II Plus parameter list Be sure the parameter disk is in the drive. A new screen appears:

```
      Auto Copy

Name:


Enter parm entry name or press [Return] for list of
entries
```

2. Type the name of the program you wish to copy and press RETURN. If you are not sure if it is on the list, just press RETURN. A list of the entries appears.

The first entry name is highlighted. By using the arrow keys you may select any name in the list to be highlighted. If you repeatedly press the arrow keys, the display scrolls to show you all of the entries. Pressing B displays the beginning of the list; pressing E displays the end of the list. Use these keys to highlight the entry you want, then press RETURN to select it. You can also use the mouse to scroll through and select the parm entry you wish.

You can also select to see just part of the parameter entry list. This is especially helpful when you're not quite sure of the spelling for the entry you want. When you're asked for the name, type in just the first few letters of the entry name, then press RETURN. Copy II Plus will show you only those entries that begin with the characters you typed. You can then use the arrow keys and RETURN to select from that partial list.

Once you've selected the entry name — either by typing it in or by selecting it from the list — the parameters to copy that program are loaded from the disk.

The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
------------------------------------------------------------
Original drive:
```

Copy II Plus needs to know what drives you will use to make the copy. If you have two drives, you will probably want to copy from the original disk in drive 1 to a duplicate disk in drive 2. You may change this if you like. If you have only one disk drive, Copy II Plus prompts you when to insert each disk.

3. Type the number of the drive you wish to use for the original disk. The default is 1 which you may accept by pressing RETURN.

   The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
------------------------------------------------------------
Original drive:   1
Duplicate drive:
```

4. Type the number of the drive you wish to use for the duplicate disk. The default is 2 which you may accept by pressing RETURN.

The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Synchronize tracks?      N

Keep track length?       N
-------------------------------------------------------
            - Insert diskettes -

   Return to begin       Q to quit
   ESC    to restart     / to modify
```

The parameter entry you selected has automatically filled in the remaining screen questions. You don't need the Q or / commands here. They're explained later in "Manual Bit Copy." If you decide you don't want to copy the disk, press ESC to go back to the Bit Copy main menu.

5. Insert the original disk you're copying into the original drive, and insert a blank or scratch disk (one you don't mind writing over) into the duplicate drive. Press RETURN to start copying.

Write–Protecting Original Disks

Write–protecting a disk guarantees that the computer can't write or change any information on the disk. Suppose that while using Bit Copy, you accidentally insert the original disk at the wrong time or into the wrong drive. Even if this happens, the information on your original disk cannot be overwritten if the disk is write–protected; the electronics in the disk drive will prevent any program from writing onto a write–protected disk.

5.25" Bit Copy: If you want to be extra safe, put a write–protect tab over the notch on your original disk before you copy the disk. The 5.25" Bit Copy program doesn't *require* you to write–protect the original disk, but we strongly recommend you do so.

3.5" Bit Copy: Before Bit Copy 3.5 will back up a disk, it will require that the disk be write–protected. To write–protect a 3.5" disk, slide the small tab in the corner toward the edge of the disk, uncovering the hole. If you insert an original disk that is not write–protected, Copy II Plus will eject the disk and prompt you to slide the write–protect tab and reinsert the disk. (If for some reason you do not want to write–protect the disk, just reinsert it. Copy II Plus won't check a second time.)

Copy Status

Copy II Plus uses the middle of the screen to give you detailed technical information about each track of the disk as it is read and analyzed. You can ignore most of this information if you want.

The bottom of the screen gives you status information about how the copy is progressing. Copy II Plus goes through several stages in copying each of the tracks on the disk. It must read each track into memory from the original disk, then it must analyze this track. It then writes it out to the duplicate drive. Lastly, it must verify that the track was written correctly, then it can go on to the next track. For some disks, the copy process will include synchronizing each track before reading or writing.

5.25" Bit Copy: There are 35 tracks on a 5.25" disk, numbered 0 to 34, or $00 to $22 in hexadecimal. (Some copy–protected disks use a 36th track, track number $23.) The bottom of the 5.25" Bit Copy screen shows a display like this:

```
                    COPY STATUS
HEX 00000000000000001111111111111112222
TRK 0123456789ABCDEF0123456789ABCDEF0123
------------------------------------
ERR
+.5
```

Beside the words HEX TRK, you see the track numbers in columns, from 00 at the left to 23 at the right. Each column on the screen corresponds to a track on the disk. As the copy process continues, you see status letters, then numbers, appear under each column, to the right of the word ERR. These keep you informed of the progress of the copy. If this particular disk is being copied using half–tracks, then numbers will also appear on the next line down. It says +.5 on this line, because that's where the half–track (.5–track) numbers are shown.

Note: Bit Copy tends to use a lot of memory so that it can correctly record possible strange disk formats and protection methods. For this reason, even if your computer has 1 megabyte of usable RAM, Bit Copy may not read all of an 800K 3.5" disk at one time. This is also true for 5.25" disks with 256K memory.

There are 80 tracks on a 3.5" disk, numbered 0 to 79, or $00 to $4F in hexadecimal. For double-sided disks, each track is further divided into two sides, side 1 and side 2. (Most Apple-format 3.5" disks are double-sided.) The bottom of the 3.5" Bit Copy screen shows a display like this:

```
                                COPY STATUS
0               1               2               3               4
0123456789ABCDEF0123456789ABCDEF0123456789ABCDEF0123456789ABCDEF0123456789ABCDEF
--------------------------------------------------------------------------------
```

You see the track numbers in columns, from 00 at the left to 4F at the right. Each column on the screen corresponds to a track on the disk. As the copy process continues, you see status letters, then numbers, appear on the track/status display under each column. This keeps you informed of the progress of the copy. Two letters normally appear under each column. The top letter is for side 1, the bottom letter for side 2.

These are the status letters that appear:

```
S     Synchronizing track (doesn't always appear)
R     Reading track
A     Analyzing track
W     Writing track
V     Verifying track
M     Track stored in memory (5.25" only)
```

(In some cases, the verifying takes only a fraction of a second, so you may or may not be able to see the V in the status display.)

Errors and Error Numbers

In addition, as each track is finished, a track status number is left on the display. Since you are using the **Auto Copy** function at this point, you should see only 0 on screen. The numbers, and their meanings, are:

0 No error. Track copied correctly.
2 Read error. Cannot read the track with these parameters.
3 Track too long.
4 Duplicate disk is write–protected. Remove the tab.
5 Write verify error. (For 5.25" Bit Copy, most likely cause is duplicate drive speed too fast.) Or if Synch tracks was on and Bit Copy was unable to synchronize them.
6 Nibble count error.
7 Sector edit I/O error.
(Error number 1 is no longer used.)

With copy–protected software, remember that Copy II Plus is trying to copy a disk that was designed not to be copied. A couple of things to keep in mind:

✔ Even if you get errors on one or more tracks (if the error number is not 0), the duplicate disk may still work. The error may be on a part of a disk that's ignored by the program anyway. Copy II Plus also tries its best to copy the track correctly even if there is an error.

✔ If you don't get any errors, it's still possible that the duplicate disk won't work. Without the correct parameters set, Copy II Plus might miss a piece of hidden formatting that the program does need in order to boot.

The best test is always to boot the duplicate disk to see if it runs correctly.

When **Auto Copy** is finished, it displays the message `Press Return` at the bottom of the screen.

Auto Copy also has the capability to print a comment on the screen. If a comment was included in the parameter entry, then Copy II Plus prints the comment as part of the copy process. The comments are usually helpful hints in getting the backups to work. You might see comments like:

```
PUT WRITE-PROTECT TAB ON BACKUP BEFORE USING.


IF BACKUP DOESN'T BOOT, TRY RE-COPYING TRACK 1.
```

Auto Copying again

If you select **Auto Copy** again while still in the Bit Copy program, it behaves a little differently. Suppose you're making two backups of a program called VIDEO GAME. The first time, you can either type the name VIDEO GAME or select it from the parameter list. After the first copy is made, though, the parameters for copying

VIDEO GAME are already loaded. When you select **Auto Copy** a second time, you'll see:

```
                    Auto Copy

      Use 'VIDEO GAME'? Y
```

Press Y for Yes, or just press RETURN, to use the VIDEO GAME parameter entry again.

Whenever a parameter entry is already loaded in the computer, you are asked this question so that you can use the entry again without having to reload it.

If you want to **Auto Copy** a different program from the parameter list, you'll need to reinsert your Copy II Plus disk so it can load the parameter list. Press N for No in response to the above question. Then you can select a new parameter entry name as you did before.

Partial Auto Copy

You may need to try copying a protected original disk a few times before you get a copy that works. Because of the critical disk timing (measured in millionths of a second) and other floppy factors, some disks will not copy exactly the same way every time.

If a backup doesn't work, quite often it's only one track or one group of tracks that wasn't copied correctly. The rest of the disk may be fine. In this case, all you need to do is recopy those tracks on the same duplicate disk. The parameter entries for these disks will usually include a comment telling you what tracks will need to be recopied.

Anytime you want to recopy just a range of tracks on a disk, select the **Partial Auto Copy** option from the main menu. **Partial Auto Copy** lets you choose what range of tracks to copy, but fills in the rest of the parameters for you, like **Auto Copy**.

1. Choose **Partial Auto Copy** from the Bit Copy menu.
2. Type in the name of the program you wish to copy. If it is already loaded, just press RETURN.
3. Enter the drive number when prompted for the original and duplicate disks. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
```

The next question is not filled in for you as it was before. The prompt reads:

```
Enter start track:
```

4. Type the number of the track you want to start copying. You can just press RETURN if you want to start with track 0. If you are attempting to copy tracks from an unsuccessful **Auto Copy**, be sure you write down the tracks that had errors so you can type them in here. The next question is:

   ```
   Enter end track:
   ```

5. Type the number of the last track you want copied, or just press RETURN to copy up to track $22 for 5.25" disks, or track $4F for 3.5" disks. If you enter the same number for both start and end tracks, then only the one track is copied.

   Note: Some programs don't use every track on the disk, and the parameter entries for those programs won't copy the unused tracks. If the track range you enter is not found in the parameter entry at all, then nothing is copied.

   Any additional questions are filled in for you as before.

6. Insert your original and duplicate disks (or just the original if you have only one drive), then press RETURN to start copying. Copy II Plus copies just the range of tracks you specified, setting all the parameters that apply to those tracks.

HD Parameter Entries (3.5" Bit Copy)

For the 3.5" Bit Copy program, many of the parameter entries for Apple IIGS software include the designation (HD), which means a backup made with that entry is modified, as part of the copy process, to work on a hard disk. These entries also work when making a 3.5" backup from a protected 3.5" disk.

1. Select the **Auto Copy** option from the Bit Copy main menu.
2. Select the appropriate (HD) parameter from the parameter list.
3. Return to the Utilities main menu when the backup is finished by pressing Q and then pressing RETURN.
   Be sure the Copy II Plus disk is in the drive.
4. Select **Copy Files** from the Utilities menu.
5. Copy the application file(s) from the backup you just made to your hard disk.

The program should then work correctly from the hard disk. If the program doesn't run from the hard disk, either the parameter is incorrect or the program isn't designed to run on a hard disk.

If you can file copy the 3.5" backup to another 3.5" disk and that second disk runs, then the parameter is correct but the program has some type of limitation which may prevent it from running on a hard disk. Or perhaps the copy protection method has been changed since this parameter entry was written.

> ***Note for Apple IIGS users who have Central Point or Laser UDC cards and 3.5" drives:*** *There are a few Apple IIGS programs which do not work with a UDC card, because of trickeries in the copy protection used on the disk. The (HD) parameter entries work by removing the copy protection from the backup during the copy process. If an (HD) or UDC entry is available, use* ***Auto Copy*** *to back up the problem disk. The backup should work correctly with your UDC.*

Helpful Things to Know When Using Bit Copy

Many copy-protected programs can be backed up with Copy II Plus without any special parameter changes at all. These programs are not included in the list of parameter entries, but can be backed up with the special entry called **Try Standard**. **Try Standard** can be found in the alphabetical list of **Auto Copy** parameter entries. Whenever you want to back up a program that is not included in the parameter entry list, first try copying it using **Try Standard**.

If the provided parameter entry still won't make a working backup — or if the program you want to copy is not in our parameter list — there are several special parameter entries that you can try. Each of these entries begins with the word "**Try,**" as in **Try Header** and **Try Sync**, and can be found in the alphabetical list of parameter entries.

These **Try** entries are designed to copy many protected disks. Each one uses a slightly different copy method. Select one of the **Try** entries with **Auto Copy**, and use that entry to try backing up your disk.

There are some very good but rather complicated reasons why there will never be one copy method which will back up every copy-protected disk perfectly. (Some of these are explained in the appendices.) That's where the parameter entries come in. The parameter list is constantly being updated to include new protection methods as well as new improved entries for previous entries.

Occasionally you may find that a parameter entry won't back up the program it's designed to copy. Why not? Keep in mind that the software publishers who copy-protect their products will sometimes—without fanfare—change the protection method used on the disk. When this happens a new parameter entry is needed to back up the disk. The old parameter entry still backs up the older versions of the program. Or perhaps the supplied parameter entry is for a newer version of a program, and you have an old version. You'll sometimes find alternate parameter entries for a single program listed for this very reason.

In addition, the disk copy process itself is not perfect. The Apple disk drive circuitry has quirks of its own, and won't always read the same track exactly the same way every time. There are also subtle differences between disk drives. (For example, some 5.25" drives can handle quarter-tracking a little better than others.)

There are a few things you can do which will often help:

- ✔ Try it again! If your backup of a program doesn't work, try copying it again. If you get errors on certain tracks, try recopying just those tracks again using **Partial Auto Copy**. If you have two drives, also try reversing the direction of the copy (copy from drive 2 to drive 1).

- ✔ Try another machine. Due to differences in circuitry, this can really make a difference when using 5.25" parameters that require quarter tracking.

- ✔ For 5.25" disks, check your drive speeds. The speed of your duplicate drive is much more critical than the speed of the original drive. *Ideally*, your duplicate drive should be spinning at the same speed as *the drive which originally made the disk you're trying to back up*, which is a little hard to determine. As a more general rule, bit copy programs will work best if the duplicate drive is slowed down a little. If you get error 5 when backing up a disk, your duplicate drive is probably too fast for bit copying.

- ✔ Using Manual Bit Copy, set parameter 3E=02 or 3E=02 and 55=03. (55=03 by itself is already included in the **Try Header** parm.)

You can use the Utilities' **Verify Drive Speed** option to check your drive speeds. The optimum speed for normal use is 200.0 MS. (Larger numbers mean slower speeds.) If you have two drives, we suggest you set your original drive to spin right at 200.0 MS., which is perfect, and set your duplicate drive to spin between 200.5-201.5 MS., which is well within tolerance and will also help the bit copy process. (In a few cases, when noted in the parameter entries, you may need to slow your duplicate drive further to make a working backup. In addition, with a few programs that use the synchronized tracks option, it IS best to have both original and duplicate drives spinning at close to the same speed.)

The 3.5" drives monitor and dynamically adjust their own speed track by track as they operate, so there is no need to adjust the drive speed of a 3.5" drive.

A number of protected programs check the write–protect notch when they start up. If your original disk is write–protected, then write–protect your backup before you begin using it.

If the **Try** entries don't work, then a new parameter entry is needed to back up the program. Some of our users will be interested in determining parameters for themselves; many others won't. As we said earlier, figuring out copy–protection methods can be extremely complicated; it's not for everybody. We provide some information in the appendices to help you, but there is no definite guide that can be followed. The people who design copy–protection methods try to make it as difficult as possible.

As new parameters are developed by either Central Point Software or many of our customers, we add these new parameters to the list. We expect to make updated lists available every few months; you, of course, can update when you choose.

If none of the above methods work, you might want to drop us a quick note to let us know the name of the program and the program version number. (See the Technical Support appendix for information on how to contact us.) We'll add it to our request list.

Quit

1. Choose the **Quit** option from the Bit Copy main menu when you want to exit out of Bit Copy and run another program.
   If you launched the Bit Copy program from the Utilities main menu, the options you see are:

```
Press [RETURN] to enter Utilities
Press [ESC] to re-enter bit copy
Press CONTROL-RESET to reboot
```

2. Press RETURN to go back to the Utilities menu.
   Be sure the Copy II Plus disk is in the drive.
3. Press ESC to go back to the Bit Copy main menu.
4. Press CONTROL-RESET to boot another disk.

If you launched the Bit Copy program via a ProDOS pathname (example: `/Hard.disk/Copyiiplus/Bitcopy.system`), then the options you see listed when you select **Quit** are:

```
Press [Q] to exit to ProDOS
Press [ESC] to re-enter bit copy
Press CONTROL-RESET to reboot
```

1. Press Q to exit to ProDOS. The ProDOS system itself will ask you to enter a new prefix and the name of the .SYSTEM file you want to run next.
2. Press ESC to go back to the Bit Copy main menu.
3. Press CONTROL-RESET to boot another disk.

Manual Bit Copy

Manual Bit Copy is the option to use if you want to set the parameters yourself before copying a disk. Perhaps you have parameters for backing up a program written down on paper, but not yet stored as a parameter entry on disk. Or if you're familiar with the Copy II Plus parameters, you may want to experiment with changing them while copying disks. **Manual Bit Copy** lets you enter these changes.

1. Select **Manual Bit Copy** from the menu using the arrow keys and RETURN or by pressing B or by using the mouse.

```
          Copy ][ Plus 5.25 Bit Copy Program 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------

A - Auto Copy
C - Partial Auto Copy
B - Manual Bit Copy
S - Manual Sector Copy
N - Nibble Editor
T - Sector Editor
H - Hi-res Disk Scan
W - Create New Parm Entry
L - Load Parm Entry
E - Edit Parm Entry
V - Save Parm Entry
R - Rename Parm Entry
D - Delete Parm Entry
P - Print Parm File
Q - Quit

Use arrow keys and [RETURN], mouse, or single letter to
select function
```

The following screen appears:

```
             Copy ][ Plus 5.25 Bit Copy 9.0
          (C) 1982-89 Central Point Software, Inc.
-----------------------------------------------
Original drive:
```

Copy II Plus needs to know what drives you will use to make the copy. If you have two drives, you will probably want to copy from

the original disk in drive 1 to a duplicate disk in drive 2. You may change this if you like. If you have only one disk drive, Copy II Plus will prompt you when to insert each disk.

2. Type the number of the drive you wish to use for the original disk. The default is 1 which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
------------------------------------------------------
Original drive:    1
Duplicate drive:
```

3. Type the number of the drive you wish to use for the duplicate disk. The default is 2 which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
```

4. Type in the number of the track you wish to start copying. This number must be entered in hexadecimal. For decimal-hexadecimal conversions, see Appendix E. The default is 0 which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22
```

5. Type in the number of the track you wish to end the copy process. The default for a 5.25" disk is 22 which you may accept by pressing RETURN or clicking the mouse. The default for a 3.5" disk is 4F which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
          Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1
```

6. Type in the spacing of tracks you wish to use.
Most disks use adjacent tracks (tracks 0, 1, 2, 3, etc.). These are copied with a track increment of 1. The default is 1 which you may accept by pressing RETURN or clicking the mouse.

5.25" Bit Copy: Apple 5.25" drives can be positioned to read from any half–track or even quarter–track boundary. The only limitation is that in most cases, to work reliably, the tracks of information must be spaced at least one track increment apart. For example, a protected disk could use tracks 0, 1.5, 3, 4.5, etc. This would be copied with a track increment of 1.5. You can enter half–tracks and quarter–tracks in response to the START TRACK, END TRACK, and TRACK INCREMENT questions. Half–tracks are numbers that end in .5; quarter–tracks end in .25 or .75.

3.5" Bit Copy: Apple 3.5" drives can step only whole tracks at a time. The START TRACK, END TRACK, and TRACK INCREMENT values can be any whole numbers such as 1, 2, 3, etc.

If you are doing a 3.5" copy, the following question appears after you have typed in the track increment:

```
Number of sides:
```

In most cases, just press RETURN to accept 2 as the number of sides. If you have a single sided disk you want to copy, type 1 instead.

The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Synchronize tracks?      N
```

7. Enter Y for yes or RETURN for no.
   If you answer Y, Copy II Plus maintains the track–to–track alignment of the data from the original disk to the duplicate. Synchronizing tracks slows down the copying somewhat, so you'll probably want to use it only when you think the disk you're copying requires it.
   The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Synchronize tracks?      N

Keep track length?       N
```

8. Enter Y for yes or RETURN for no.
   This is also known as nibble counting, and if selected, it will cause the duplicate disk to have the same number of nibbles per track as the original disk. A nibble is 4 bits, which is half a byte. Nibble counting will help back up disks that require it, but takes longer and can otherwise make the disk slightly less reliable. Answer Y for yes if you want to keep the track length.

   Note: *For interested readers, more information on track spacing, synchronized tracks, and nibble counting can be found in Appendix B.*

The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Synchronize tracks?      N

Keep track length?       N
-------------------------------------------------------

             -- Insert diskettes --
Return to begin                  Q to quit
ESC to restart                   / to modify
```

9. Insert the original and target disks in their respective drives.
10. Press RETURN to begin.
    Press Q if you wish to quit the Bit Copy program entirely.
    Press ESC to return to the Bit Copy main menu.
    Press / to modify parameters.

Modifying Parameters

You may need to change one or more parameters before copying the disk. Every parameter has both a parameter number and a value. For example, parameter number $31 determines whether or not Copy II Plus will fix invalid bytes on the disk. If the value of parameter $31 is 1, then Copy II Plus will fix invalid bytes; if the value of parameter $31 is 0, then it won't. Other parameters have different effects. Parameters are explained in detail in Appendix C, and specific parameters are listed in Appendix D.

Changing Parameters

1. Follow the directions for doing a **Manual Bit Copy**. When you have answered all the questions, and this screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Synchronize tracks?      N

Keep track length?       N
-------------------------------------------------------

             -- Insert diskettes --
Return to begin                 Q to quit
ESC to restart                  / to modify
```

2. Press / to enter the parameter change mode.
The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Synchronize tracks?      N

Keep track length?       N
-------------------------------------------------------

                    - Parameter change -

                  Change what parameter:
```

3. Type the number of the parameter you want to change and press RETURN or click the mouse. (Please refer to Appendix D for complete details on all the parameters that can be changed.) Copy II Plus then asks:

```
To what value:
```

The current value of the parameter is displayed under the flashing cursor.

4. Type the new value and press RETURN or click the mouse.
   If you want to keep the current value, just press RETURN or click the mouse.

   After you've entered the new value, Copy II Plus returns to the `Change what parameter` question so that you may change another parameter. When you're finished changing the parameters you want, just press RETURN or click the mouse instead of typing a parameter number.

   Important: *If you want to restore all parameters to their original default values press / and change parameter $FF. This is a special parameter. Instead of asking* `Change what value?`*, it displays:*

```
— Restore parameters —

Are you sure? Y
```

Press Y or RETURN to restore all parameters to their original values.

Now you'll be back to this menu:

```
— Insert diskettes —

Return to begin        Q to quit
ESC to restart         / to modify
```

5. Insert the disk you want to copy into the original drive and insert a blank disk into the duplicate drive. Press RETURN to begin copying.

As each track is copied, you see the copy status letters and track status numbers appear across the bottom of the screen (described earlier under **Auto Copy.**) Additional technical information (see the appendices) appears in the middle window. It may look something like:

```
------------------------------------------------------------
TRACK:   00      START:  6C48        LENGTH:      1824

   FF    FF    FF    FF    FF    FF    FF    FF
   D5    AA    96    FF    FE    AA    AA    AA
   AA    FF    FE    DE    AA    EB    FF    FF
   FF    FF    FF    FF    FF    FF    D5    AA
   AD    B6    DB    DC    F4    F3    BB    BD
   CF    97    9A    AE    AE    96    AD    AC
   9A    AB    97    B2    B2    AD    AB    9A

SOURCE:  1881  OBJECT:            SYNC
------------------------------------------------------------
```

The TRACK number simply tells you which track is being copied. The START value is the address within the memory buffer where Copy II Plus found the start of the track. The LENGTH value is how many bytes long (minus any "big gap") the track data is.

Next is a block of hexadecimal bytes from the disk which Copy II Plus determined to be the track start. Sync bytes are shown in inverse on the screen (bold in the above illustration), and the actual track start is the first byte in the second row.

On the last line, the SOURCE number is the total number of bytes on the original track, including a possible sync field before the data. A number also appears for OBJECT, showing the number of bytes that were written to the duplicate disk. When nibble counting is used (when you answer Yes to the KEEP TRACK LENGTH question), this number will change as Copy II Plus adjusts the number of bytes being written to match the SOURCE byte count. On the right, you'll see either HEADER or SYNC for each track. This describes which method Copy II Plus used to determine the start of the track.

Manual Sector Copy

The **Manual Sector Copy** option provides an alternate way of copying some protected disks. Rather than reading an entire track at a time, **Manual Sector Copy** reads each sector from the track. It then formats and writes each sector on the duplicate disk. This option can back up normal, or almost normal, disks more reliably, and can handle a few protection methods more readily than **Manual Bit Copy**. However, **Manual Sector Copy** is not designed to copy disks whose formatting differs too greatly from DOS sectors.

1. Select **Manual Sector Copy** from the Bit Copy menu.

The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:
```

Copy II Plus needs to know what drives you will use to make the copy. If you have two drives, you will probably want to copy from the original disk in drive 1 to a duplicate disk in drive 2. You may change this if you like. If you have only one disk drive, Copy II Plus will prompt you when to insert each disk.

2. Type the number of the drive you wish to use for the original disk. The default is 1 which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:    1
Duplicate drive:
```

3. Type the number of the drive you wish to use for the duplicate disk. The default is 2 which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
```

4. Type in the number of the track you wish to start copying. This number must be entered in hexadecimal. For decimal-hexadecimal conversions, see Appendix E. The default is 0 which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22
```

5. Type in the number of the track you wish to end the copy process. The default for a 5.25" disk is $22 which you may accept by pressing RETURN or clicking the mouse. The default for a 3.5" disk is $4F which you may accept by pressing RETURN or clicking the mouse. The following screen appears:

```
            Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1
```

6. Type in the spacing of tracks you wish to use.
Most disks use adjacent tracks (tracks 0, 1, 2, 3, etc.). These are copied with a track increment of 1.

   For start track, end track, and track increment, you should only use whole track numbers, not half–tracks or quarter–tracks.

   If you are doing a 3.5" copy, the following question appears after you have typed in the track increment:

```
Number of sides:
```

   In most cases, just press RETURN to accept 2 as the number of sides. If you have a single sided disk you want to copy, type 1 instead.

   The following screen appears:

```
          Copy ][ Plus 5.25 Bit Copy 9.0
        (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:          1
Duplicate drive:         2

Enter start track:       0
Enter end track:         22

Track increment:         1

Using sector copy

-------------------------------------------------------

                    -Insert diskettes-
Return to begin                        Q to quit
esc to restart                         / to modify
```

If you need to change any parameters before starting the sector copy, press / to change them now.

Note: When you use ***Manual Bit Copy*** *or* ***Manual Sector Copy****, Copy II Plus does not change the parameters back to their original values. If you need to copy more than one range of tracks, the parameters you set for the first range will still be set unless you change them again. However, when you copy a program with* ***Auto Copy*** *or* ***Partial Auto Copy****, Copy II Plus restores all parameters to their original values before it reads the new parameter settings from the parameter entry. That way, you can* ***Auto Copy*** *several disks in a row without worrying about the previous parameter settings. The entry you choose also automatically selects either Bit Copy or Sector Copy for you.*

7. Insert the disks into the appropriate drives, then press RETURN to start the copy.

Important*: If you want to restore all parameters to their original default values from* ***Manual Bit Copy*** *or* ***Manual Sector Copy****, press / and change parameter $FF. This is a special parameter. Instead of asking* `Change what value?`*, it displays:*

```
— Restore parameters —

Are you sure? Y
```

Press Y or RETURN to restore all parameters to their original values.

Bit Copy Technical Tools

This chapter explains the various options that allow you to examine and modify disks and files. An understanding of hexadecimal, disk formatting, and assembly language is helpful when using the technical tools provided in Copy II Plus.

Nibble Editor

You can use the **Nibble Editor** option to see the actual bytes stored on any track of the disk. This can be invaluable for learning about disk formatting, or helping to determine what protection method or methods a disk uses. When you select the **Nibble Editor** option, you can view the track data, but you can't change it.

1. Select **Nibble Editor** from the Bit Copy main menu.
   The following screen appears:

```
                    Copy ][ Plus 9.0
        (C) 1982-89 Central Point Software, Inc.
------------------------------------------------------
Original drive:
```

   Copy II Plus needs to know what drive contains the disk you wish to examine.
2. Type the number of the drive you wish to use. The default is 1 which you may accept by pressing RETURN. The following screen appears:

```
                    Copy ][ Plus 9.0
          (C) 1982-89 Central Point Software, Inc.
-------------------------------------------------------
Original drive:   1

Enter start track: 00

Enter end track:   22

Track increment:   01

Synchronize tracks? N
```

Note: Copy II Plus doesn't ask for a duplicate drive since you're not doing any copying. It does ask for start track, end track, and track increment so that you can nibble edit several tracks in a row if you want.

3. Enter the starting track number. The default is track 00 which you may accept by pressing RETURN.
4. Enter the ending track number. The default is $22 for a 5.25" disk and $4F for a 3.5" disk. You may accept the default value by pressing RETURN.
5. Enter the track increment. The default value is 1 which may be accepted by pressing RETURN.
6. Answer Y or press RETURN for N to the synchronize tracks question. If you answer yes, Copy II Plus aligns each track immediately before reading the data from that track.
7. Insert the disk you want to examine into the drive and press RETURN. The start track you specified is read into the memory buffer.

The memory buffer is simply a large portion of the computer's memory set aside for storing the bytes that are read from the track. The Nibble Editor reads two or three revolutions of the track into this buffer. In most cases it starts reading from any arbitrary point on the circular track. This means if you read the same track twice, the data will probably not be in the same place in the buffer each time.

If you selected SYNCHRONIZED TRACKS, then the Nibble Editor seeks and synchronizes itself to a point on another track (usually track 0), then immediately seeks back and begins reading. If you read the same track twice using SYNCHRONIZED TRACKS, the data appears within a few bytes of the same place each time. (This is also the same synchronizing that's done during a bit copy.)

A display similar to this appears:

```
                    COPY ][ PLUS 9.0
          (C) 1982-89 CENTRAL POINT SOFTWARE, INC.
------------------------------------------------------------

TRACK: 00   START: 5F00   LENGTH: 44FF

5EE0: 80 80 80 80 80 80 80 80    VIEW
5EE8: 80 80 80 80 80 80 80 80
5EF0: 80 80 80 80 80 80 80 80
5EF8: 80 80 80 80 80 80 80 80
5F00: 9E AE AE DC E6 AF AB B9   <-5F00
5F08: F5 E6 E6 DF DA F6 CF F9
5F10: D3 DD FE EF F3 B5 F6 CF
5F18: F7 B5 F3 CE D7 FC CE EA
5F20: DE 96 FA BE F3 CE F7 B5

------------------------------------------------------------

A To analyze data                Esc To quit

? For help screen                / Change parms

Q For next track                 Space To re-read
```

The first line of the Nibble Editor display indicates what track you are currently editing, its start address in the computer's memory, and its length. Since no analysis has been done yet, this is the start address and length of the entire buffer, not of the track data. Beneath this is the actual track image. It is shown as the computer memory address followed by 8 hexadecimal bytes (or 16 hexadecimal bytes in the 3.5" Bit Copy) per line. The word VIEW to the right lets you know you are in VIEW mode (there is also a CHANGE mode, described later), and you can scroll through the track buffer. The address at the right marked by <– is the actual memory address of the byte that's under the flashing cursor. Sync bytes are shown in inverse.

Several options are displayed in the bottom window. You can ask Copy II Plus to perform its track analysis by pressing A. The track analysis routines, using the current parameter settings, determine the start and end of the track data, then move the cursor to the track start and change the START and LENGTH values at the top to reflect the track size rather than the memory buffer size.

Pressing Q quits this track and moves on to the next track. ESC exits the editor and returns you to the Bit Copy main menu, and SPACE will re–read the track and position the cursor back to the beginning of the memory buffer. / operates just as it does when copying disks, allowing you to change parameters.

If you press ? (you must hold the shift key down), you are presented with a help screen which shows you what other commands are available from the Nibble Editor:

```
                    Nibble Editor Commands
Beginning   B                 C     Change nibble
Up 32       T                 F     Find nibbles
Up          I                 R     Repeat find
Left        J                 K     Right
Down        M                 S     Toggle sync
Down 32     V                 Q     Next track
End         E                 ?     Help
Reset beg   Ctrl-B            P     Print track
Reset end   Ctrl-E            Rtn   Return to edit
```

CTRL-B and CTRL-E are used to establish a new track beginning or track end at the current cursor position. The START and LENGTH values will change, so you can use these commands to calculate the distance (in bytes) between any two bytes in the buffer.

T allows you to move up 32 bytes at a time. V allows you to move down 32 bytes at a time.

C allows you to change nibbles, and you will notice the VIEW status becomes CHANGE when C is pressed. You may then enter any string of hex bytes separated by spaces and they will be placed at the current cursor position.

F allows you to find a string of bytes in the buffer. You see the prompt FIND appear in the lower right of the nibble edit display when you select F. You can enter any 1 to 3 byte sequence for the editor to find. Spaces are optional. If the string is found, the cursor moves to the first byte of the string. If it is not found, the cursor moves to the end of the track buffer. You can also enter the single byte "00" to find the next sync byte in the buffer. Pressing R repeats the find command for the last specified string.

S toggles the byte at the current cursor position between sync (shown in inverse) and standard (normal), converting standard bytes to sync, and sync bytes to standard.

P allows you to print a track. It starts printing at the current cursor location and extends to the end of the buffer if no analysis has been done, or to the track end if analysis has been performed. The printer slot number and page length are Copy II Plus parameters (parameter numbers $48 and $4A) and may be changed at any time. The sync bytes in the buffer are printed with their high bits cleared. (For example, a sync $FF will be printed as a $7F.)

When examining a track with the nibble editor, using /, SPACE, and A in sequence allows you to view a track, make any parameter changes you wish, then re-read and

analyze the track using the new parameters. This analysis is the same that Copy II Plus uses when copying a disk.

Using the Nibble Editor from Manual Bit Copy

As mentioned earlier, if you choose the **Nibble Editor** option from the Bit Copy main menu, you can read the track and make changes to it in memory, but you can't write those changes back to the disk. If you do want to make changes to the disk itself, there is a different method for entering the **Nibble Editor**.

1. Choose **Manual Bit Copy**, selecting the tracks you want to edit.
2. Set parameter $0B to 2.
   This tells Copy II Plus to "Copy with nibble editor entry." It reads a track from the original disk, then takes you into the Nibble Editor so you can edit that track.
3. Press Q to quit the editor, when you're finished editing.
   Copy II Plus then resumes the copy process, writing the edited track to the duplicate disk. (If you want to read and write the same disk, then set both the original and duplicate drives to the same drive number.)

When using the editor from **Manual Bit Copy** rather than the **Nibble Editor** option, the **A** to analyze, / to change parameters, and SPACE to re–read commands are not available. Copy II Plus has already set parameters and read and analyzed the track as part of the copying process before entering the nibble editor.

If you're interested in better understanding disk formatting and protection methods, we suggest you begin by using the **Nibble Editor** to examine a standard DOS or ProDOS disk, identifying the various address and data fields described in Appendix A. Then try examining and comparing the formats of various protected disks.

Sector Editor

The **Sector Editor** allows you to directly view and change the data on any sector of the disk. This is handy for people interested in looking inside files or Track/Sector Lists, etc. to learn more or to fix problems. It can also be used with the Bit Copy options for copying certain protected disks. You should use care when working with the **Sector Editor**, to avoid accidentally erasing or modifying important data on the disk.

A good knowledge of hexadecimal, bytes, and ASCII is helpful when using the **Sector Editor**. Appendix A is a reference on disks, tracks, sectors, and blocks. Please refer to it if you need more information. Due to the highly technical nature of the Sector Editor, Central Point Software does not provide technical support for it.

Note: The ***Sector Editor*** *in the 5.25" Bit Copy program is designed to work only with 5.25" floppy drives; similarly, the* ***Sector Editor*** *in the 3.5" Bit Copy is designed to deal only with 3.5" drives. These options use customized methods for properly dealing with strange sector formats and copy-protection methods (see "Patch" option below), which isn't the same as the generic methods required by hard disks and RAM disks.*

1. Choose the **Sector Editor** option from the Bit Copy main menu. The following screen appears:

```
Sector editor                              Drive 1

   Original drive:      1
```

2. Enter the number of the drive you wish to use or press RETURN or click the mouse for the default drive. The following screen appears:

```
Sector Editor                                          Drive 1

00      00 00 00 00 00 00 00     00     ..............
08      00 00 00 00 00 00 00     00     ..............
10      00 00 00 00 00 00 00     00     ..............
18      00 00 00 00 00 00 00     00     ..............
20      00 00 00 00 00 00 00     00     ..............
28      00 00 00 00 00 00 00     00     ..............
30      00 00 00 00 00 00 00     00     ..............
38      00 00 00 00 00 00 00     00     ..............
40      00 00 00 00 00 00 00     00     ..............
48      00 00 00 00 00 00 00     00     ..............
50      00 00 00 00 00 00 00     00     ..............
58      00 00 00 00 00 00 00     00     ..............
60      00 00 00 00 00 00 00     00     ..............
68      00 00 00 00 00 00 00     00     ..............
70      00 00 00 00 00 00 00     00     ..............
78      00 00 00 00 00 00 00     00     ..............
80      00 00 00 00 00 00 00     00     ..............

Track   $      Sector   $                DOS 3.3
[?]-Help screen
```

3. Press ? to see the following help screen:

```
Sector Editor Help Screen          Drive 1

Arrow keys  Move cursor
B           Jump to beginning
E           Jump to end
A           Jump to address
R           Read sector
+           Read next sector
-           Read previous sector
W           Write sector
P           Patch Read/Write
H           Enter hex values
T           Enter text
L           List (disassemble)
D           Dump to printer
S           Scan for bytes
ESC         Quit

Press RETURN
```

These commands are explained later in this section.
There are some important differences between sectors on 5.25" disks and sectors on 3.5" disks.

Reading Sectors (5.25" Bit Copy)

1. Select **Sector Editor** from the Bit Copy main menu.
2. Select the drive that contains the disk you wish to examine.
3. Press R for Read to read a sector on a 5.25" disk.
   You are prompted to enter the track and sector numbers of the sector you want to read.
4. Enter the hexadecimal track number and press RETURN.
5. Enter the hexadecimal sector number and press RETURN.
   All numbers used in the **Sector Editor** are hexadecimal. An invalid character or an invalid number will cause the speaker to beep. After you enter the track and sector numbers, the sector is read from the disk into the buffer. You should see a display similar to:

```
SECTOR EDITOR                          DRIVE 1

00- 00 00 03 00 FE 43 4F 50  ....~COP
08- 59 49 49 59 4C 55 53 00  YIIPLUS.
10- 00 00 00 00 00 00 00 00  ........
18- 00 00 00 00 6F AB 00 00  ....o+..
20- 00 00 C3 27 0D 06 00 06  ..C'....
28- 00 18 01 26 50 52 4F 44  ...&PROD
30- 4F 53 00 00 00 00 00 00  OS......
38- 00 00 00 FF 08 00 1E 00  ...#....
40- 00 3A 00 6F AB 00 00 00  .:.o+...
48- 00 21 00 20 11 A9 00 00  .!. .)..
50- 02 00 2B 55 54 49 4C 2E  ..+UTIL.
58- 53 59 53 54 45 4D 00 00  SYSTEM..
60- 00 00 FF 26 00 36 00 F0  ..#&.6.p
68- 68 00 6F AB 00 00 00 00  h.o+....
70- E3 00 20 5C AB 00 00 02  c. \+...
78- 00 2E 42 49 54 43 4F 50  ..BITCOP
80- 59 2E 53 59 53 54 45 4D  Y.SYSTEM


TRACK $00, SECTOR $0B    DOS 3.3

[?]-HELP SCREEN
```

Seventeen lines of the sector are displayed at a time, consisting of a hex address followed by a dash, then 8 hex data bytes (each byte is a two digit hexadecimal number), then the same 8 bytes as ASCII characters on the right. The double cursor appears as > < over both the first hex value and the first character. The characters on the right may or may not make sense. (In the example above, the filenames for this disk can be read on the right, along with other values that were never intended to be printed as characters.)

To understand the addresses on the left, think of the data bytes numbered from $00 as the first byte of the sector to $FF as the last byte. The top line shows the first 8 bytes, bytes $00 through $07; the next line shows bytes $08 through $0F; the next shows bytes $10 through $17, etc. The address number before the dash tells you how many bytes into the sector each line is ($00–, $08–, $10–, etc.). The address number of a byte is not the same as the value of that bytes. In the example, the addresses of the first four bytes on the second line are $08, $09, $0A, and $0B. The values of those bytes are $59, $49, $49, and $59.

Reading Sectors (3.5" Bit Copy)

When you first enter the **Sector Editor**, at the bottom of the screen you'll see BLOCK on the left, then TRACK, SECTOR, and SIDE to the right. If you press the M key (to

change Modes), TRACK, SECTOR, and SIDE will appear on the left, with BLOCK to the right. Pressing M again will change the Mode back to BLOCK on the left.

1. Select **Sector Editor** from the Bit Copy main menu.
2. Select the drive that contains the disk you wish to examine.
3. Press R to read a sector.
   Copy II Plus asks for whichever option is listed first on the left. If BLOCK is to the left, you'll be asked to enter a block number. If TRACK, SECTOR, and SIDE are to the left of BLOCK when you press R to read, then you are asked to enter track, sector, and side numbers.
4. Type in the desired block number (in hexadecimal) and press RETURN.
   Type in the three numbers (in hexadecimal) if you are using the TRACK, SECTOR, and SIDE mode, pressing RETURN each time.
   The corresponding track, sector, and side numbers are filled in for you and that sector (block) is read.
   All numbers used in the **Sector Editor** are hexadecimal. An invalid character or an invalid number will cause the speaker to beep. After you enter the block number, the block is read from the disk into the buffer. (Or if in track and sector mode, the sector from the specified track is read into memory.)

   After you've read a block, the block number is shown in decimal (in parentheses) after the hexadecimal number (with a $ dollar sign). (See Appendix A for more information about these terms.)

   In addition to the 512 bytes of data, each sector on a 3.5" disk also contains 12 bytes of "tag" information. These bytes are used only on Macintosh–format disks, and are always zero (00) on Apple–format disks. The **Sector Editor** lets you see the values of the tag bytes at the top of the **Sector Editor** display:

```
SECTOR EDITOR                                                DRIVE 1

TAGS- 00 00 00 00 00 00 00 00 - 00 00 00 00                  .......

 000- xx xx xx xx xx xx xx xx - xx xx xx xx xx xx xx xx  .......
 010- xx xx xx xx xx xx xx xx - xx xx xx xx xx xx xx xx  .......
 020- xx xx xx xx xx xx xx xx - xx xx xx xx xx xx xx xx  .......
   etc.
```

Moving the Cursor

Both the 5.25" and 3.5" Bit Copy programs use the arrow keys for moving the cursor through the buffer. The buffer display will scroll up or down to keep the cursor on

the screen. B moves the cursor directly to the beginning of the buffer; E moves the cursor to the end.

You can also move the cursor to any address in the sector or find out what address the cursor is currently at. Press A for Address. You'll see:

```
ENTER ADDRESS: nn
```

An address number is displayed. This address is simply how many bytes into the sector the cursor is. If you don't want to move the cursor, just press RETURN. If you want to move to a new address, type the new address number, then press RETURN. The cursor immediately jumps to the new position in the buffer.

Reading Again

If you want to read a different sector from the disk, you can press R again, and enter new numbers. You can also read the next higher numbered sector on the disk by pressing [+], or read the previous sector by pressing [–].

Changing Bytes

You can change the data in the sector buffer by entering either new hex values or new text characters.

To Enter Hex Values

1. Move the cursor to the appropriate place and press H for Hex. The cursor over the hexadecimal value changes to a blinking underline.
2. Enter the new value over the old. Pressing RETURN advances you to the next byte, and pressing ESC takes you out of hex entry.

To Enter Text

1. Position the cursor and press T for Text. The cursor over the text character changes to a blinking underline.
2. Type new characters. Copy II Plus enters those characters into the buffer and advances the cursor.
3. Press ESC to finish text entry.
   While entering text, any control characters typed (including the arrow keys and RETURN but not including ESC) will be placed directly into the buffer.

Writing

1. Press W to write a sector to the disk.

You are prompted for track and sector (or block) numbers. If you want to write back to the same sector, just press RETURN to accept the same values. If you want to write to a different sector, enter new values.

A Quick Tutorial on Sector Editing

With the options presented so far, you can do most sector editing. Editing a sector consists of reading the sector, changing the appropriate bytes, then writing the changed sector back to the disk. Here's a step–by–step method for making a change to a sector on the disk:

1. Do not sector edit a commercial disk! Make a copy of the disk first, then sector edit the copy.

2. Choose the **Sector Editor** option and select the desired drive number. Insert the disk you want to edit.

3. Press R for Read, and enter the track and sector or block numbers of the sector you want to edit. Copy II Plus reads the sector into the memory buffer.

4. Position the cursor using the appropriate keys to the address where you want to make changes.

5. Press H and enter new hex values, or press T and type new text characters to replace the old. If you're entering several hex values in a row, you can press RETURN after entering each byte to advance to the next position. Press ESC to finish the entry.

6. Press W for Write to write this changed sector back to the disk.

Disassembly

The Sector Editor can disassemble and list any 6502 machine language code that may be in a sector. Position the cursor on the first byte you want to disassemble and press L for **List Disassembly**. The sector buffer display is replaced by 20 lines of disassembled code. The cursor also advances through the sector by the number of bytes disassembled. Press L to disassemble another 20 lines, or RETURN to go back to the buffer display.

Printer Dumps

Using the **Printer Dump** option, you can print either the buffer display or a disassembly listing. This option will normally print through slot 1. (If your printer card is in another slot, first change the value of parameter $48 to the slot number.)

To print the sector buffer, press D for printer dump. All 32 lines (256 bytes) of the sector will be printed. To print a disassembly listing, first press L to disassemble the code on the screen, then press D. Twenty lines of disassembly listing are printed. Press either L or D to print another 20 lines. Press RETURN to stop printing and go back to the screen buffer display.

Scan for Bytes

Another feature in the **Sector Editor** is the ability to scan for a pattern of bytes anywhere on the disk or within a file. If you haven't read any sectors yet, this option will scan the entire disk. If you have read a sector, it will scan from the current position to the end of the disk.

1. Press S to scan for bytes.
   You can enter the bytes to scan for as either hex values or text characters. A question appears:

   ```
   SCAN FOR [H]EX OR [T]EXT?
   ```

2. Type H or T.
   If you select H, the prompt is:

   ```
   ENTER HEX:
   ```

   Type in the hex values (one or two digits each) that you want to scan for, separated by spaces.

   If you select T, the prompt is:

   ```
   ENTER TEXT:
   ```

   Type in the characters you want to scan for.

   You can use the left arrow key to go back and correct mistakes, and the right arrow key to go over values already typed.

3. Press RETURN.

The program then rapidly scans the disk, looking for the bytes you specified. If it finds them, it stops and displays that sector, with the cursor over the last byte of the pattern. If it can't find the pattern, it says BYTES NOT FOUND.

If you want to scan for another occurrence of the same pattern, just press S, then press RETURN twice to accept the previous answers you gave to the two questions. The program will continue scanning.

Patch

Another **Sector Editor** option is P, for Patch Read/Write Routines. Normally the **Sector Editor** can read only standard formatted disks. Some protected programs use a slightly modified sector format, so that the disk cannot be read with a normal DOS. The **Patch** option lets you read or write these changed sectors. Other protected disks might use a very different disk format that does not contain sectors at all. The **Sector Editor** cannot read these disks.

We recommend that you use the Patch option only if (1) you're sector editing a backup of a commercial program and you have instructions on what Patch option to use, or (2) you're familiar with disk and sector formatting. Appendices A and B provide information about sector formats.

The following examples are for the **5.25" Sector Editor**. The differences in the **3.5" Sector Editor Patch** option are minor, and are discussed below.

5.25" Bit Copy: To show how the patch option works, remove the disks from your drives (just to be on the safe side) and press P for **Patch**. A screen similar to the following appears:

```
Sector Editor Patcher              Drive 1

DOS 3.3
DOS 3.3 Patched
DOS 3.2
DOS 3.2 Patched
Custom
-----------------------------------------------
DOS 3.3

            Address            Data

          Prolog:    D5 AA 96 D5 AA AD
   Wanted epilog:    DE AA    DE AA EB FF FF
     Read epilog:    DE AA    DE AA EB FF FF
  Check checksum?    Yes      Yes
    Check epilog?    Yes      Yes
     Check track?    Yes
                  Data encoding: 6&2
                  Checksum seed:  00
                 Checksum result:=00

Use arrow keys & [Return] to select
patch option, [ESC]-Exit
```

The menu at the top of the screen lets you select what type of sector you can read or write. You can select normal DOS 3.3 (which is actually for any normal 16–sector disk, including ProDOS or DOS 3.3) or 3.2 (for 13–sector disks), or DOS 3.3 patched or DOS 3.2 patched. The patched items adjust the Copy II Plus read/write routines enough to read many protected disks, while still reading normal sectors almost as reliably.

Right below the dashed line, the display shows which patch option is currently selected (in the example, DOS 3.3). The rest of the display shows the internal values and settings that make up that particular patch option.

If you want to select another patch option, use the arrow keys to display that option in inverse, then press RETURN. The display below the dashed line changes to reflect the new patch option. For this example, select `DOS 3.2 patched`. Notice that it now says `DOS 3.2 patched` below the dashed line.

Press ESC to go back to the **Sector Editor** screen. Beside the track and sector numbers, the display now shows `DOS 3.2 patched`, which is the new patch option you just selected.

3.5" Bit Copy: The Patching options for the 3.5" Sector Editor are:

```
Normal
Patched
Custom
```

The `Normal` option reads and writes sectors on 3.5" disks with all the error checking that would normally be done by a program. The `Patched` option adjusts the Copy II Plus read/write routines enough to read many protected disks, while still reading normal sectors almost as reliably. (The `Custom` option is described below.)

> *Note: When you leave the Sector Editor, if you use* ***Manual Sector Copy*** *next, the read/write routines will stay patched. If you choose* ***Auto Copy****, then the* ***Auto Copy*** *routines will always set things back to normal before following the instructions in the parameter entry.*

How to Set Patched Routines

1. Select the **Sector Editor** from the Bit Copy main menu.
2. Specify the drive you wish to use.
3. Press P.
4. Press the arrow keys to highlight the option you want from the list shown on your screen above the dotted line.
5. Press RETURN. The display below the dashed line changes to show the new option.
6. Press ESC to go back to the Sector Editor screen. You can now read or write sectors using the new patch option.

Custom Patching

The last option in the Patch menu is `Custom`. Custom patching lets you tailor the read/write routines to access a wide variety of possible protected-sector formats. A good technical understanding of sector address and data fields is essential for what follows.

The sector parameters on the screen are used by Copy II Plus when either reading or writing sectors. The `Read epilog` and `Checksum result` fields give you information about the sector that was last read. They're blank if you haven't read any sector yet. You can change all of the other fields to determine what kind of sector to read.

When you select `Custom` from the patch menu, an inverse cursor appears over one of the data values. To move the inverse cursor forward through the list of values, you can press RETURN, SPACE, or the right arrow key. To move backwards, press the left arrow key. When the cursor is over any hex value, you can type a new value to

change it. If the cursor is over a Yes–No response, typing Y will change it to Yes and N to No. If the cursor is at the Data encoding question (5.25" only), you can type 5 to use 5&3 encoding, or 6 to use 6&2 encoding. Press ESC to leave Custom patching and go back to the patch menu. Press ESC again if you want to return to the Sector Edit buffer display.

When reading, both address and data prologs must match the Prolog fields. Volume is ignored. Track number is "partially" ignored if you answer No to the Check Track question. That is, Copy II Plus will seek to the proper track, but will not re–seek if the track number in the address field differs. Sector number must match. Address and data field checksums and epilogs can be checked or ignored. If epilogs are checked, then the first two bytes of each epilog must match the first two bytes in the Wanted epilog fields. The actual epilog bytes read appear in the Read epilog fields. The Checksum seed value is the starting value used when exclusive–ORing the data field into memory. It can range from $00 to $3F for 6&2 encoding or $00 to $1F for 5&3 encoding. For normal sectors, this byte should be $00 to read the data correctly. The data Checksum result is formed by exclusive–ORing the running data checksum with the checksum byte on disk. If this byte is nonzero, the data checksum test fails. This means either the sector was written with a different Checksum seed value, or there's an error in the data field, or the data checksum byte at the end of the data field is wrong. (The 3.5" Patch menu includes three checksum seeds and three checksum result values.)

When reading a sector, Copy II Plus tries to find an address field and data field pair on the track that passes all the tests. If it fails after many tries, it gives up and prints an "I/O ERROR" message. You can sometimes find out how far it got by checking the Patch display after you get the error. If it can find a correct address prolog, it will finish reading the address field and the address Read epilog values will be filled in. If it finds a correct data prolog, it will read the rest of the data field and the data Read epilog and Checksum result values will be filled in.

When writing, it must first read the appropriate address field, then write a new data field over the old. The address field parameters behave as described above. The new data field prolog is written using the data Prolog bytes. The data is exclusive–OR'ed and written using Checksum seed as a starting value. This should be $00 to write normal sectors. If the data Check epilog field is set to YES, then the Wanted epilog bytes will be written as the data epilog. If Check epilog is set to NO, then the Read epilog bytes are used. This allows the routines to automatically write the same epilog it read. It writes 5 epilog bytes (rather than 2 or 3) because a few protected disks check for these extra bytes.

Hi–Res Disk Scan

The **Hi-res Disk Scan** option is a quick graphical tool to help you determine which tracks or half–tracks on a disk contain useful data, and which tracks are blank. It does this by showing you the general pattern of sync bytes and invalid bytes on any tracks you specify.

Hi-res Disk Scan reads each track into the track buffer, then divides it into groups of 41 bytes each. If there are any invalid bytes or sync bytes in the group, Copy II Plus plots a dot on the high–resolution graphics screen. If there are no invalid or sync bytes in the group, it leaves that point black. The dots for each track are plotted in a vertical line, from top to bottom of the screen.

1. Select **Hi-res Disk Scan** from the Bit Copy main menu.
2. Answer the questions concerning drive, track range, and synchronized tracks.
3. Insert the disk you want to scan, then press RETURN.

   The **Disk Scan** screen appears, with the hexadecimal track numbers ($00 to $23 for 5.25" disks, $00 to $4F for 3.5" disks) at the bottom of the screen. Vertical lines or dots appear above each track number as the track is scanned. Press ESC if you want to exit out before it's finished, or press any key to exit when it's done.

Each track is plotted in a vertical line over the track number. The dots are the sync fields between the sectors. The short stripe on each track is the longer sync field at the start of the track.

If you scan a normal DOS disk on the (unwritten) half–tracks, you'll see irregular patterns of stripes and dots. This is caused by the drive trying to read bytes from the whole tracks on either side of the half–track, leaning toward one track or the other.

The patterns will not line up from one track to the next. The timing used when stepping from track to track is not the same as when the disk was written, so each pattern begins at a different point around the circular track.

If you scan a disk that has never been formatted or written to, you will see a solid stripe for each track. This is because an unformatted disk contains many invalid bytes around each track, which show up as white. Unused tracks on a protected disk will also appear as white stripes. (The patterns for a 3.5" disk are similar in meaning to those of a 5.25" disk. There are simply more stripes, because the 3.5" disk has more tracks.)

The **Hi-res Disk Scan** option provides you with a quick way to see some of the peculiarities of a protected disk. You can use **Disk Scan** to help locate the more interesting tracks, then use the **Nibble Editor** to examine those tracks more closely.

Parameter Entries

This chapter describes the Bit Copy options that allow you to create and edit your own **Auto Copy** parameter entries, and add these to the list of parameter entries already on the Copy II Plus disk. If you've found out from a friend (or read in a magazine or computer newsletter, or received in-house parms from Central Point Software, etc.) what the Copy II Plus parameters for backing up a program are, then you might want to make a new parameter entry in the list for copying that program. You'll need to know how to create a new entry, type in the special parameter values, and save the new entry to disk. If you've discovered how to back up a program yourself, you'll also need to understand what the individual parameter values mean, so you can make an entry that does what you want.

The syntax used for creating a parameter entry is described first, then the options for changing parameter entries are explained.

Create New Parm Entry

Each parameter entry is a set of special instructions which Copy II Plus can use when backing up a particular program with **Auto Copy**. The instructions tell Copy II Plus how to set start and end track, track increment, any parameter changes, etc., before copying the disk. These parameter changes are the same as those used in **Manual Bit Copy** and **Manual Sector Copy,** which were described in the last chapter.

The following table shows the main instructions you use in writing parameter entries. Each instruction is described first, then followed by short examples where appropriate.

Syntax	Explanation
`Txx-Tyy`	Copies from track xx to track yy. In other words, selects a START TRACK of xx and an END TRACK of yy.
`T0-T22`	Copies from track $0 to track $22.
`T11-T1B`	Copies from track $11 to track $1B.
`T1.5-T7.5`	Copies from track 1.5 to track 7.5. (These are half-tracks.)
`T3.75-TE.75`	Copies from track 3.75 to track E.75 (quarter-tracks).
`T4-T5`	Copies tracks $4 and $5.
`Txx`	Copies only track xx. Set both START TRACK and END TRACK to xx.
`T0`	Copies only track $0.
`T21`	Copies only track $21.
`STEP zz`	Selects a track increment of zz.
`STEP 2`	Selects a track increment of 2 (which would copy every other track).
`STEP 1.5`	Selects a track increment of 1.5.
`SYNC`	Answers Yes to the `SYNCHRONIZE TRACKS` question.
`KEEP`	Answers Yes to the `KEEP TRACK LENGTH` question.
`xx=yy`	Sets parameter number xx to value yy.
`3E=2`	Sets parameter $3E to 2.
`10=97`	Sets parameter $10 to $97.
`RESTORE`	Restores all parameters to their original values. This command should always be on a line by itself.
`SECTOR COPY`	Does a sector copy rather than a bit copy. If no tracks are specified (see below), then it copies the entire disk. If tracks are listed, it only sector copies those tracks.
`"COMMENT"`	Any comments in the parameter entry should be in quotes and on separate lines. The comments will be displayed on the screen during copying. You can have more than one line of comments, but each line should be enclosed in quotes.

The instructions that do a copy need to be separated by commas. Here are a few examples of instructions alone or combined together:

Syntax	Explanation
`T0`	Copy Track 0
`T0-T22`	Copy Tracks 0 - 22
`TA-TE, SYNC`	Copy Tracks 0A - 0E with sync on
`T0-T22, KEEP`	Copy Tracks 0 - 22 with nibble count on
`T4-T5, SYNC, KEEP`	Copy Tracks 4 - 5 with sync and nibble count on
`T0-T8, STEP 2`	Copy Tracks 0 - 8 copying every other track
`T1.5-T7.5, STEP 1.5`	Copy Tracks 1.5 - 7.5 with an increment of 1.5
`T0, 3E=2`	Copy Track 0, set parameter 3E to 2
`T2-T22, E=D4, F=AB, 10=97`	Copy Tracks 2 - 22, set parameters E to D4, F to AB, and 10 to 97

Remember that some protected disks use different protection methods on different tracks of the disk. These disks often require several passes through the bit copy, each pass selecting a different track range and setting different parameters. When Copy II Plus reads a parameter entry to copy a disk, it reads all of the instructions from one line of the entry, sets the appropriate track numbers, parameters, etc., then does the copy. Then it reads the next line of the entry to do the next pass (if there is one). When creating the entry, you need to remember that all the instructions for one pass should be together on a line, and different passes should be on different lines.

Here is an example of a multi–pass parameter entry:

`T0`	First copy just track 0, no parameter changes.
`T1.5-T7.5, 3E=2`	Then copy half–tracks 1.5 to 7.5, after setting parameter $3E to $2.
`T11-T21, SECTOR COPY`	Then sector copy tracks $11 to $21.
`T22, KEEP, 9=1`	Lastly copy track $22, keeping track length (do nibble counting), after setting parameter 9 to 1.

3.5" Bit Copy only: If a track (T5) or a range of tracks (T7–T3E) is specified, Bit Copy will ordinarily copy both sides of each track. If you add a `SIDE` number (for example, T5, SIDE 1), it copies just the desired side of the track or tracks.

The best examples can be found in the parameter entries stored on the Copy II Plus disk. We'll explain shortly how you can load and see these parameter entries.

Sector Edit Parameters

The Bit Copy program can also do automatic sector editing to the duplicate drive, controlled by a parameter entry with **Auto Copy**. Sector editing is a novel method used to help back up certain protected disks.

On some protected disks, most of the program is stored using fairly normal DOS–type sectors, but one or two tracks contain special marks which a bit copy program may have trouble duplicating. When the program is loaded, it looks for these special marks on the disk. If it doesn't find them, it knows that this is a copy and not the original disk, and does not run.

The sector edit approach is to actually modify part of the program stored on the duplicate disk so that when it boots, it simply ignores the fact that the marks are absent. The modification can either remove the protection check or ignore the results of the check after the test has been done. Determining what kind of change to make to a specific disk is usually a major programming task. If you already know what needs to be changed, though, it is fairly easy to make the change. (The **Sector Editor** option lets you make changes by hand.)

If an **Auto Copy** parameter entry calls for sector editing, Copy II Plus automatically does the sector edit to the duplicate disk. The only time you need to be aware of this is if you want to create your own parameter entries that include sector editing.

The sector edit instructions need to specify:

- ✔ Which track and sector is to be modified and,
- ✔ Whether it is a DOS 3.3 or 3.2 type sector (for 5.25" disks) and,
- ✔ If the read/write routines should be patched (see the **Sector Editor** section in "Bit Copy Technical Tools" for a description of patched) and,
- ✔ Any other parameters that may need to be set (for custom patching) and,
- ✔ The addresses in the sector to be changed along with their new values.

> ***Important:*** *Sector editing should always be done to a copy of a commercial disk, never to the original!*

Here, in the correct order, are the parameter entry instructions needed to do sector editing:

`SECTOR EDIT,`	This starts the sector edit.
`TRACK xx,`	Track number,
`SECTOR yy,`	Sector number,
`DOS 3.3,`	*5.25" disks:* DOS 3.3 for 16 sector disks,
`SIDE z`	*3.5" disks:* Side number,
or `BLOCK zzzz`	*3.5" disks:* Block number (alternate to track, sector, side)
(optional) `PATCHED`	PATCHED option if desired,
(optional parameter changes),	Any other parameter changes,
`aa:dd,`	The position (address) in the sector to change, and the data to change it to,
`aa:dd/dd/dd`	Changes to adjacent bytes in the sector.

Here are a few examples to clarify this:

5.25" Bit Copy

```
SECTOR EDIT, TRACK 0, SECTOR 8, DOS 3.3, A0:60
```

This example edits the sector at track 0, sector 8, which is a DOS 3.3–type (16–sector format) sector. The byte at address $A0 is changed to a $60, then the sector is written back to the disk.

```
SECTOR EDIT, TRACK 22, SECTOR 1, DOS 3.3, PATCHED, 59=97,
14:00, D1:2F/AF/32
```

This edits track $22, sector 1 as a DOS 3.3–type (16–sector format) sector, using patched read/write routines. Parameter $59 is set to $97. The byte at address $14 is changed to a $00, then the three bytes starting at address $D1 are changed to $2F, $AF, and $32.

3.5" Bit Copy

```
SECTOR EDIT, TRACK 4F, SECTOR 7, SIDE 2, 1FF:00
```

This example edits the sector at track $4F, sector 7, side 2. The byte at address $1FF is changed to a $00. (This happens to be the last byte on the last sector of a double–sided 3.5" disk.)

```
SECTOR EDIT, BLOCK 63F, PATCHED, 59=97, 14:00, 15D:2F,AF,32
```

This edits block $63F (specifying again, this time by block number, the last sector on the disk), using patched read/write routines. Parameter $59 is set to $97. The byte at

address $14 is changed to a $00, then the three bytes starting at address $15D are changed to $2F, $AF, and $32.

If an I/O error occurs while Copy II Plus is trying to sector edit the duplicate disk, an error 7 appears in the status display.

Creating a Parm Entry

1. Select **Create New Parm Entry** from the Bit Copy main menu.
2. Enter the name of the program at the `Name:` prompt.
   You must enter at least one character for this field. After you enter a new entry name, a * appears by the name. Parameters on the Copy II Plus disk that were submitted by users all have a * by the name. Parameters that were tested and verified by Central Point Software do not have a *.
3. Enter your name at the `By:` prompt or press RETURN to skip it.
4. Press RETURN.
   You are now in the editing screen to create a new parm entry.
5. Type in your parm entry, using the syntax rules listed in the preceding tables. The following rules apply to the type of bit copy that you are entering:

   5.25" Bit Copy: The left arrow key deletes characters. The right arrow key puts back characters. To move the cursor, press ESC. The blinking underline cursor will change to an inverse plus–sign. Pressing the arrow keys moves the cursor. Press any other key to change back to a normal cursor. After you've pressed ESC to make the cursor an inverse plus–sign, you can also press ? to see a help screen of `Parm Entry Editor Commands`.

   3.5" Bit Copy: The DELETE key delete characters. Pressing the Open-Apple key and the Delete key puts back characters. To move the cursor, use the arrow keys. You can also press ? to see a help screen of `Parm Entry Editor Commands`.

   For either Bit Copy, when you press RETURN to end a line or move the cursor to another line, Copy II Plus checks the line to make sure it contains only valid parameter entry instructions. If there is an error, Copy II Plus prints an error message at the bottom of the screen and leaves the cursor on the line with the error.

   Here are some examples of incorrect instructions with the error messages they produce:

```
T6-T5        END TRACK < START TRACK
```

The start track number needs to be less than the end track number.

```
TQ           BAD TRACK NUMBER
```

Q is not a valid track number.

```
XYZABC123    SYNTAX ERROR
```

Copy II Plus can't make sense of what you typed. It's not a valid parameter entry instruction. Also, you will get a syntax error if you type an "O" instead of a "0."

You can also print the parameter entry on your printer. Press CONTROL-P any time the cursor is in the instruction area. Copy II Plus displays the printer slot number (slot 1, unless you change it) and ask you to press RETURN to print the entry.

6. Press ESC (to get the inverse + cursor) then CONTROL-Q (5.25" Bit Copy) or ESC (3.5" Bit Copy) when you want to quit out of the parameter entry and go back to the Bit Copy main menu.

To test the parm, you can select **Auto Copy** from the Bit Copy main menu. It asks if you wish to use the parm <Parm Name> (which should be the one you just created.) Or you may wish to save your entry first, then load it using **Auto Copy.**

Load Parm Entry

This Bit Copy option lets you select a parameter entry from the disk, load it into memory, then see and modify the instructions that make up the entry.

1. Choose **Load Parm Entry** from the Bit Copy main menu.

The following screen appears:

```
LOAD PARM ENTRY

NAME:


Enter Parm Entry Name or
Press Return for List of Entries
```

2. Enter the name of the parameter entry you want to load, or press RETURN to see a list of all of the parameter entries. You can select the entry name from the list, just as in **Auto Copy**. The parameter entry edit screen appears. Here is a sample edit screen:

```
NAME: RASTER BLASTER

BY: BUDGECO
---------------------------------------
T0
T5-T11, STEP 4, A=2, E=AD, F=DE, 55=3, 4
4=1, 45=10
T6-T12, STEP 4
T7.5-TF.5, STEP 4
T1.5-T3.5 STEP 2
"RETRY TRACK ZERO UNTIL BOOTS"
---------------------------------------
```

The first line shows the name of the parameter entry. The `By:` line shows the software publisher's name. (This line may be blank in some entries.) Below the dashed line are the bit copy instructions that make up the entry. If a line is too long it will wrap around to the next line on the screen.

You can make changes to this parameter entry. By pressing RETURN twice, you keep the `Name` and `By` information. Otherwise, you can type new names over the old. This is handy if you want to create a new parameter by modifying an old one. The original entry on the disk remains unchanged.

3. Edit the entry using the instructions found in the "Creating a New Parm Entry" section.
4. Press ESC (to get the inverse + cursor) then CONTROL-Q (5.25" Bit Copy) or ESC (3.5" Bit Copy) when you want to quit out of the parameter entry and go back to the Bit Copy main menu.

Edit Parm Entry

With the **Edit Parm Entry** option, you can look at or modify whatever parameter entry is currently stored in memory. When you select **Edit Parm Entry** from the Bit Copy menu, Copy II Plus displays the parameter entry edit screen, the same one used in **Load Parm Entry**. As before, you can change the `Name` and `By` lines, or press RETURN to accept the current lines. Then you can use the editing keys to change the instructions that make up the parameter entry as discussed in the section "Creating a New Parm Entry." Press ESC (to get the flashing + cursor) then CONTROL-Q (5.25" Bit Copy) or ESC (3.5" Bit Copy) to exit.

Note: The message "Buffer Full" appears if you press ESC too many times.

Save Parm Entry

After you've made changes to a parameter entry or created your own parameter entry, you write it to disk with the **Save Parm Entry** option.

1. Choose **Save Parm Entry** if you want to to save a parm entry back to the disk to make it permanent.

   If there is already a parameter entry with that name stored on the disk, Copy II Plus prints:

   ```
   Entry already exists
   REPLACE IT?
   ```

2. Press Y or RETURN to replace the old entry with the new. Press any other key if you don't want to save it.

   Note: You should normally save parameter entries onto your work copy of Copy II Plus. The 5.25" parameter entries are recorded in two files on the disk, called PARM.KEY and PARM.DATA. The 3.5" entries are recorded in PARM35.KEY and PARM35.DATA. The corresponding Bit Copy program looks for these files when it saves an entry. If it can't find the files, it creates them on the disk, then saves the parameter entry onto them. This is handy if you want to store your own parameter entries onto another ProDOS disk. However, if you always want to save the entry onto the Copy II Plus disk, you need to be sure the disk is in the drive before you select ***Save Parm Entry****.*

The Copy II Plus 5.25" disk is nearly full, and has room for only a few more parameter entries. If you want to add a number of new parameter entries, do this: Make a copy of the Copy II Plus disk, then delete the file UTIL.SYSTEM from the copy. You'll then have a disk which boots directly to the Bit Copy program and has plenty of room for more parameter entries.

Rename Parm Entry

The **Rename Parm Entry** option allows you to change the name of parameter entries stored on disk.

1. Choose which parameter entry to rename by either typing in the old name or pressing RETURN and selecting the name from the entry list. Copy II Plus asks for NEW NAME.
2. Type the new entry name. Remember that this can be 1 to 29 characters long, and can include any printing character except for an asterisk or underline.
3. Press RETURN. The new name is written to the disk.

Delete Parm Entry

1. Choose **Delete Parm Entry** to remove an entry from the list.
2. Type the name of the entry to delete or press RETURN to choose from the parameter entry list.
3. Press RETURN to delete the entry.

Print Parm File

The **Print Parm File** option prints out either the entire alphabetized list of parameter entries, or just a range of entries. This option is convenient to find other parms listed for the same manufacturer.

1. Choose the **Print Parm File** option from the Bit Copy main menu. Copy II Plus asks:

```
STARTING ENTRY:

ENDING   ENTRY:
```

2. Type in either an entire entry name or the first few letters of a name, or just press RETURN.

Copy II Plus prints out every entry between (and including) the starting and ending entry you specify. For example, if you type "J" for a starting entry and "N" for an ending entry, it prints all of the entries that begin with J, K, L, M, or N. If you type "TRY" for both starting and ending entries, it will print all the parameter entries that begin with TRY.

If you press RETURN for the starting entry, the print–out starts with the first entry of the parameter list. If you press RETURN for the ending entry, it prints to the last entry of the parameter list. So to print the entire list, just press RETURN twice.

Possible Parameter List Errors

If there is a problem when loading, saving, creating, or editing a parameter entry, Copy II Plus prints an error message on screen. This is a summary of possible errors:

```
- WRITE PROTECT ERROR -

PLEASE REMOVE WRITE PROTECT TAB FROM DISK
```

This error occurs if you're trying to save, rename, or delete a parameter entry on the disk. Remove the write–protect tab from the disk and try again.

```
THE PARM ENTRIES ON THIS DISK HAVE BEEN DESTROYED
```

This message means that the files that contain the parameter entries are somehow damaged. The parameter entry you requested cannot be loaded. You should make a new work copy from your original Copy II Plus disk, and use this new copy from now on.

```
- WRONG DISK -

PLEASE INSERT A PARM FILE DISK
```

Copy II Plus could not find the parameter entries on this disk. You probably have the wrong disk in the drive.

```
- I/O ERROR -

UNABLE TO LOAD OR SAVE PARM ENTRY
```

It can't read this disk. Either the information on the disk has been damaged, or the wrong disk is in the drive.

```
- DISK FULL -
```

INSERT ANOTHER DISK TO SAVE PARM ENTRY

There is no more room on this disk for saving parameter entries. You'll need to either delete any entries that you don't want, or start saving new entries onto another ProDOS disk. (See "Save Parm Entry" for more information.)

- PARM ENTRY DIRECTORY FULL -

Copy II Plus can keep track of up to 752 parameter entries on a disk. You just tried to save the 753rd entry. Delete the entries you don't want anymore, or start saving new entries onto another ProDOS disk.

- PARM ENTRY NOT FOUND -

You typed in a parameter entry name (or the first few letters of the entry name), and Copy II Plus couldn't find it in the list. You may have misspelled the name of the entry.

- ENTRY ALREADY EXISTS -

You're trying to rename a parameter entry, and the name you chose is already in the parameter entry list. You can't have two entries with the same name.

Appendix A: Disks and Disk Hardware

This appendix is included as a concise reference on disks and disk hardware. It explains disk formatting and storage, and most of the terms needed before exploring disk protection methods. It is, however, a reference rather than a tutorial. For more complete information, and some useful examples for 5.25" disks, we suggest the books "Beneath Apple DOS" or "Beneath Apple ProDOS" by Quality Software. Also, an appendix in Apple's DOS Programmer's manual describes DOS file formats, and "Understanding the Apple II" (also by Quality Software) describes the disk hardware in greater depth.

This reference assumes that you are familiar with computer concepts such as hexadecimal, binary, bytes, bits, and subroutines.

ProDOS, DOS 3.3, Blocks, Sectors

The Copy II Plus Utilities can work with disks created by two different Apple disk operating systems: DOS 3.3 and ProDOS. DOS 3.3, as originally supplied by Apple, is designed to work only with 35–track 5.25" floppy disks. ProDOS is capable of handling 5.25" disks, 3.5" disks, RAM disks, hard disks, and any other disk device that follows certain conventions required by ProDOS. Both of these operating systems perform a number of tasks, including saving or writing files onto the disk, loading or reading files from the disk, and keeping track of where on the disk the files are stored.

Depending on what program is being run, DOS may need to access anywhere from one byte up to thousands of bytes from the disk at any one time. What is needed is a way to divide the information into manageable chunks.

ProDOS divides any disk device into numbered blocks, each block containing 512 bytes of data. A disk might have, for example, 280 blocks, numbered 0 to 279. For *5.25" disks only*, each block is actually made up of two sectors paired together, each sector containing 256 bytes of data (as described below). This pairing of sectors is handled by ProDOS's low–level floppy disk routines, however. The ProDOS file system is concerned only with whole blocks.

DOS 3.3, not having to handle other kinds of disk devices, divides a 5.25" disk directly into 256–byte sectors.

When a file is saved to disk, DOS 3.3 breaks the file into 256–byte chunks, looks on the disk for sectors that are not currently in use, saves the chunks into the free sectors, makes a record on the disk of which sectors the file uses (so it can find the file later), and marks the sectors in use. ProDOS is similar, except that it always works with 512–byte blocks.

5.25" Disks – Tracks and Sectors

The data on a normal 5.25" disk is stored in 35 circular tracks, numbered 0 through 34 ($00 through $22 in hexadecimal.) The outermost track is track $00; the innermost track is track $22.

The disk drive, controlled by DOS, can position the read/write head (similar to the tape head in a cassette deck) under any one of the tracks. As the disk spins over the head, the drive can read or write the information on that track. The information is actually recorded on the underside of the disk.

Each circular track is divided (like a pie) into 16 sectors. The sectors on each track are numbered 0 through 15 ($00 through $0F). Each sector stores 256 bytes of usable data. DOS 3.3 always reads and writes information a sector at a time.

There are (35 tracks * 16 sectors =) 560 sectors on a standard formatted 5.25" disk. A disk can store a total of (560 sectors * 256 bytes per sector =) 143,360 bytes (140K).

Apple DOS 3.3, ProDOS 8 and ProDOS 16, GS/OS, Apple Pascal, CP/M, and Apple /// SOS all use the same track and sector formatting on 5.25" disks. However, the way the sectors are used for file storage varies greatly with each operating system.

3.5" Disks – Tracks, Sectors, Sides, Blocks

The data on a 3.5" disk is stored on 80 circular tracks. The tracks are numbered 0 to 79, or $00 to $4F in hexadecimal.

Most 3.5" disks are formatted as double–sided, which means they contain information on both the bottom and top surfaces of the disk media. Each of the 80 circular tracks is therefore divided into two sides. The 3.5" drives have two read/write heads, one for the bottom surface and one for the top. The disk drive can position these heads — as one unit — under and over any track of the disk.

Each circular track (or side) is divided like a pie into several sectors. Each sector stores 512 bytes of usable data. The number of sectors per track is not constant for the whole disk, but varies depending on the track number.

Actually, each sector holds 524 bytes of data: the 512 data bytes are preceded by 12 tag bytes. On Apple II–format 3.5" disks, the 12 tag bytes are always zero, and are ignored during normal reads and writes. The 524–byte format is used for compatibility with the 3.5" disk format for Apple Macintosh computers, which store file tag information, related to file recovery, into the 12 bytes.

The outer tracks have a greater circumference (greater distance around the circle) than the inner tracks, and therefore have more media for storing information. The 3.5" disk format takes advantage of this for greater storage capacity, storing more sectors per track on the outer tracks:

Tracks		Sectors/track	Numbered	
0-15	($00-$0F)	12	0-11	($0-$B)
16-31	($10-$1F)	11	0-10	($0-$A)
32-47	($20-$2F)	10	0-9	($0-$9)
48-63	($30-$3F)	9	0-8	($0-$8)
64-79	($40-$4F)	8	0-7	($0-$7)

For 3.5" disks, blocks and sectors are really the same thing; they're just numbered differently. A double–sided 3.5" disk contains a total of 1600 blocks or sectors. When thought of as sectors, they're numbered within each track and side as 0 to 11 (as shown in the table above). When thought of as blocks, they're numbered for the entire disk, 0 to 1599 ($0000 to $063F in hex). For example, block $0000 is the same as track $00, side 1, sector $0. Block $000C is the same as track $00, side 2, sector $0. Block $063F is the same as track $4F, side 2, sector $7 (the last block on the disk.)

Because of the varying number of sectors per track, the conversion from block numbers to equivalent track, side, and sector numbers is a little less than straightforward. The Copy II Plus 3.5" **Sector Editor** lets you read any sector or block, and shows the numbers in both forms.

Disk Hardware: Reading & Writing Bytes, Speed

Most of this section deals with 5.25" drives, but 3.5" drives are very similar. The differences for 3.5" drives are discussed in the next section.

A 5.25" drive spins the disk at about 5 revolutions per second, or .2 seconds = 200 milliseconds per revolution.

The bytes on the disk (and the bits that make up those bytes) must be written at evenly spaced intervals around the circular track. Since the disk media is passing over the read/write head at a fairly constant speed, that means each bit must be

written onto the media at the right moment, in order to be placed onto the correct spot on the disk.

The timing involved in accessing the disk, especially when writing, must be precise. This makes disk access very timing critical.

When writing a single byte to the disk, DOS sends the byte to a special data latch on the disk controller card. The hardware on the card then writes the 8 bits of the byte, one bit at a time, onto the disk media passing over the head. The hardware writes one bit every 4 usec (microseconds, or millionths of a second). It takes 32 microseconds to write all 8 bits of the byte (4 usec per bit * 8 bits per byte.)

To write many bytes, DOS sends bytes to the data latch at exact 32 microsecond intervals, so that when the hardware has finished writing one byte, it receives the next byte to write.

If another byte isn't sent to the latch at the end of 32 microseconds, then the hardware begins writing individual zero bits onto the disk, a zero bit every 4 microseconds, until another byte is sent to the latch.

Any byte value can be written to the disk. However, only some values can be read back reliably, due to the Apple disk format and the nature of floppy disks in general.

When reading, the disk hardware waits until it reads one bit from the disk, then gathers the next 7 bits to form an 8–bit byte. This is one of the fundamental limitations. Every byte read from the disk has its high bit set. If a byte is to be read back correctly, it must be written to the disk with its high bit set.

The other limitation is that the circuitry can't reliably read more than 2 zero bits in a row. If there are too many zeros in a row, the circuitry will begin reading some of them incorrectly as ones.

Bytes that have more than 2 consecutive zero bits are considered invalid bytes, because they cannot be read reliably. If an invalid byte stored on the disk is read back, it may or may not be read correctly as another invalid byte or as a valid byte.

If a byte is read back as invalid, then some invalid byte is stored on the disk, though it may not be the byte that was read (since the circuitry may have read it wrong.)

Since not all possible byte values can be read correctly, information being written to the disk must usually be encoded in some way first, so that only valid bytes are written. DOS does this encoding for every sector it writes.

Another problem in reading the disk is finding where one byte ends and the next byte begins. The data on the disk is stored simply as a long stream of bits. Here is an example bit stream:

```
1 1 0 1 0 1 0 1 1 0 1 0 1 0 1 0 1 0 0 1 0 1 1
```

The hardware could read a byte starting with any of the one bits. If the starting point is wrong, then the bytes read will be completely wrong. What is needed is a way to synchronize the hardware to the correct byte boundaries.

To synchronize the hardware to the bytes when reading, special bytes called sync bytes are written onto the disk with every sector. A sync byte is written by sending an $FF (binary 11111111) to the disk data latch, then waiting 40 microseconds before writing the next byte. The $FF is written during the first 32 microseconds, then the hardware writes 2 zeros to the disk before a new byte is sent to the latch. Sync bytes are sometimes referred to as 10–bit bytes (8 bits for the $FF + 2 zero bits).

If several sync bytes are written one after another, the following pattern will be stored on the disk:

```
1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1, etc.
```

When reading this pattern from the disk, if the hardware is already in sync, it will read 8 ones (to make an $FF byte), skip the 2 zeros (because it's waiting for another one bit), read the next 8 ones (to make another $FF), skip 2 more zeros, and so on. To DOS, sync $FF's look just like normal $FF's.

Often, however, the hardware will be out of sync when it begins reading the sync bytes. (For example, it may begin with the fifth one bit of the above pattern, and read back binary 11110011, or $F3.) Because of the 10–bit pattern being read 8 bits at a time, sync bytes have an interesting property. After reading at most 5 sync bytes, the hardware will always fall into sync with the bytes stored on the disk.

Other 9 and 10 bit patterns can also be used to synchronize the disk hardware, but 10–bit $FF's are the most common.

The total number of bits that can fit on a track is determined by how fast the disk is spinning when it is written to. If the disk is spinning at a slower than usual speed, then the bits will be written more closely together on the track. This means more bits are written before the track has completed a full revolution.

Unfortunately, the quality of the disk media imposes limits on how closely the bits can be packed reliably on the disk. The standard disk speed of 200 milliseconds per revolution was chosen as a good compromise between reliability and high data storage.

A standard disk speed also needs to be maintained for compatibility from one disk drive to the next. For example, a drive spinning at the slow speed of 210 milliseconds per revolution might be able to format, read, and write its own disks reliably, but it will have great difficulties reading a disk that was made on a drive that spins at a correct 200 milliseconds.

If a drive spins at the correct speed, 50,000 bits will fit around the track. This can translate to 6520 ($1978) 32–usec bytes, or 5000 ($1388) 40–usec sync bytes.

Disk Hardware – 3.5" Drives

A 3.5" disk spins faster than a 5.25" disk. The rotational speed also varies: It spins more slowly on the outer tracks (about 150 milliseconds per revolution), to accommodate the greater number of sectors, and faster on the inner tracks (about 100 milliseconds per revolution) for the fewer sectors there.

The hardware writes a bit every 2 microseconds. It takes 16 microseconds to write all 8 bits of the byte. The timing for writing bytes isn't as critical as it is for 5.25" disks, because the Apple 3.5" circuitry provides its own timing for writing a new byte every 16 microseconds. The disk routines must simply be ready to give it the next byte soon enough. If the disk routines don't deliver the next byte in time, the hardware leaves write mode, not writing any more bytes to the disk until it has been reset.

Since the timing is fixed at 16 microseconds, or exactly 8 bit times, the disk routines can't use delays to directly write 10–bit sync bytes. However, it can write a repeating pattern of bytes which ends up on the disk as a series of sync bytes. The usual pattern is:

```
$FF     $3F     $CF     $F3     $FC     $FF
```

which is the bits:

```
11111111 00111111 11001111 11110011 11111100 11111111
```

Notice that this makes the usual bit pattern on disk (as described earlier) for sync bytes:

```
1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1, etc.
```

Contents of a Sector

In order to read any given single sector, DOS must move the read/write head to the right track then begin reading bytes, waiting for that sector to pass by the head.

Every sector is made up of an address field and a data field. The address field contains information such as which sector this is and what the volume number of the disk is. The data field contains the actual information desired, such as a part of a file.

This is a breakdown of a sector on a 5.25" disk:

Sync field: between 5 and 40 sync $FF's. This guarantees that the hardware is in sync when reading the sector.

Address Field:

Prolog: D5 AA 96. These 3 bytes act as a marker, "A Sector Begins Here". The DOS read routines look for this pattern first. When it finds the pattern, it knows that the rest of the address field follows.

Volume number: 2 bytes. The volume number of the disk is stored next (in every sector) in an encoded form that uses only valid disk bytes. The encoding used here is called "4–and–4 encoding", and uses 2 bytes to store the 1–byte volume number. (A table of 4–and–4 encoded numbers is in Appendix E.)

Track number: 2 bytes. The track number is also stored in the address field of each sector, using 4–and–4 encoding. It is included so that in case the read/write head is lost and over the wrong track, DOS can find which track it's on by reading an address field, then move from there to the correct track.

Sector number: 2 bytes. The hard sector number, 4–and–4 encoded. (See below for hard and soft sectors.)

Checksum: 2 bytes. Another 4–and–4 encoded number that is used to verify that the volume, track, and sector numbers are correct.

Epilog: DE AA. This marks the end of the address field.

Possible glitch bytes: See below.

Sync field: about 5 to 10 more sync $FF's.

Data Field:

Prolog: D5 AA AD. These three bytes mark the beginning of the data field. The encoded data always follows.

Data: 342 bytes. The 256 bytes of information are stored here, encoded as 342 valid disk bytes. The encoding scheme used is called "6–and–2 encoding", and involves some rather complicated bit rearranging, exclusive–ORing, and translation (through a lookup table) to valid disk bytes. The part of DOS that does the encoding and decoding is fast and efficient, but the 342 disk bytes bear little resemblance to the 256 data bytes they represent.

Checksum: 1 byte. This byte is used to help verify that there are no errors in the 342 data bytes.

Epilog: DE AA. These bytes mark the end of the data field and the end of the sector.

This is the breakdown of a sector on a 3.5" disk:

Sync field: between 5 and 100 sync $FF's. This guarantees that the hardware is in sync when reading the sector.

Address field:

Prolog: D5 AA 96. These 3 bytes act as a marker, "A Sector Begins Here". The 3.5" controller's read routines look for this pattern first. When it finds the pattern, it knows that the rest of the address field follows.

Track number: 1 byte. The track number is stored in the address field of each sector, translated to a valid disk byte. A table of the translated disk values is in Appendix E. (Actually, the track number, ranging from $00 to $4F is a 7–bit value, but the disk translation handles values only up to 6 bits. The highest bit of the track number is stored two bytes later.)

Sector number: 1 byte, as a translated valid disk value.

Side number and track high bit: 1 byte, translated. The side number for this side of the track and the high bit of the track number are combined together as a binary number in the form: n0000t, where n represents the side number (0 for side 1, 1 for side 2), and t represents the high bit of the track number. This 6-bit binary number is then translated to a valid disk byte.

Number of sides and interleave value: 1 byte, translated. The number of sides used on this disk and the "interleave value" are combined together as a binary number in

the form: s0iiii, where s represents the number of sides (0 for single–sided, 1 for double–sided) and iiii represents the interleave value. (Interleave is described below.) This 6–bit binary number is then translated to a valid disk byte.

Checksum: 1 byte, translated, used to verify that the previous data values are all correct.

Epilog: DE AA. This marks the end of the address field.

Possible glitch bytes: See below.

Sync field: about 5 to 10 more sync $FFs.

Data Field:

Prolog: D5 AA AD. These 3 bytes mark the beginning of the data field. The encoded data always follows.

Sector number: 1 byte, translated. The translated sector number is stored here.

Data: 699 bytes. The 512 bytes of information (preceded by the 12 bytes of tag information) are stored here, encoded as 699 valid disk bytes. The encoding scheme is a variation of the 6–and–2 encoding scheme used on 5.25" disks; it involves a different method of bit rearranging (every 3 data bytes are converted to 4 consecutive disk bytes), 3 overlapping loops of exclusive–ORing, and translation to valid disk bytes. The 699 disk bytes bear little resemblance to the 524 data bytes they represent.

Checksum: 3 bytes. These 3 bytes, resulting from the 3 overlapping exclusive–OR loops, are used to help verify that there are no errors in the 699 data bytes.

Epilog: DE AA. These bytes mark the end of the data field and the end of the sector.

Reading, Writing, and Formatting

A 3.5" drive controller (whether built into the computer or on a plug–in card) contains its own programming for handling reading and writing blocks and formatting the disk. ProDOS itself simply makes requests to the controller to perform the reading and writing as it needs them. Most other kinds of ProDOS–compatible disk devices, such as hard disks and RAM disks, are the same way.

A 5.25" drive controller contains only enough programming to boot a disk; it does not provide for reading and writing sectors or formatting the disk. DOS 3.3 has its own set of internal routines (called RWTS, for Read Write Track Sector) for accomplishing this. ProDOS also has its own set of internal routines for reading and writing blocks

(pairs of sectors) on 5.25" disks. It does not provide for formatting 5.25" disks, though. A separate application that includes its own formatting routines, such as Copy II Plus or Apple's Filer program, must be run to do this. Copy II Plus contains its own optimized 5.25" routines for formatting, reading, writing, verifying, etc.

When either reading or writing a sector, DOS (or whatever programming is doing the disk access) must first find the correct sector. It calls a read address field routine that looks for and reads the next address field to pass by the read/write head. DOS then checks the track and sector numbers from this address field to see if this is the desired sector. If it is not, DOS continues to look for the correct one. If it can't find the desired sector within a certain number of tries, it gives up and returns an error.

When reading, after DOS finds the right address field, it calls a routine to read the data field, which will be passing by the read/write head within a couple hundred microseconds.

When writing, after finding the correct address field, DOS calls a routine to write a new data field over the old one. The calls themselves aren't timed exactly, so DOS might begin writing the new data field a few bits earlier or later than the old data field. This produces a "glitch" on the disk where writing begins, since the new bits aren't in sync with the previous bits on the disk.

Another glitch occurs at the end of the data field, when DOS stops writing new information.

When DOS reads the disk, these glitches often throw the hardware out of sync with the bytes on the disk. That's why both address and data fields are preceded with sync fields, so that the hardware can get back into sync.

During normal use, data fields are rewritten, but not address fields. When a disk is formatted, both address and data fields are written onto the disk.

In formatting each track, DOS writes a very large initial sync field, then all of the sectors for that track in one revolution of the disk. This wipes clean any old information that might have been on the track. The data fields written are empty. (When read and decoded, the sectors contain all zero bytes.)

The initial sync field is large enough that the last sector put onto the track will overwrite the beginning of the sync field as the disk completes one full revolution.

If the disk is spinning too fast (5.25" disks only), then the entire initial sync field (and possibly part of the first sector) will be overwritten, which means the formatting failed. If the disk is spinning more slowly than usual, then the remaining part of the sync field which was not overwritten will be very large.

When DOS 3.3 begins formatting a 5.25" disk, it writes and rereads the first track a few times, adjusting the sizes of the sync fields between each sector (changing the amount of data written onto the track) so that the remaining initial sync field is about the same size as as the other sync fields. This certainly isn't necessary, but it spaces the sectors around the track a little more evenly.

A 3.5" controller double–checks and adjusts the drive speed during formatting, so the remaining part of the initial sync field is about the same size on all 3.5" disks.

Hard and Soft Sectors (5.25" disks)

Before writing a sector, DOS must "pre–nibblize" the 256 data bytes into 342 disk bytes to be written. After reading a sector, DOS must "post–nibblize" the 342 disk bytes back into 256 data bytes. Because of the time this takes, the next sector to read or write has already passed by before DOS is ready to access it. DOS is fast enough, though, to access every other sector as it passes under the head.

To make disk access fast yet simple, DOS 3.3 re–maps the sector numbers in memory so that if a program asks for consecutive sector numbers, DOS will actually access every other disk sector for speed. The sector numbers asked for by a program (including the Copy II Plus Utilities) are called soft sectors. The sector numbers actually stored on the disk are called hard sectors. For example, if you access soft sectors $7, $6, $5, and $4 in that order, DOS 3.3 will look on the disk for hard sectors $1, $3, $5, and $7.

For ProDOS, 8 blocks fit on each 16–sector track. The blocks are numbered 0 – 7 on track 0, 8 – 15 on track 1, 16 – 23 on track 2, etc. Similar to DOS 3.3, the numbering between blocks and hard sectors is done in a special way to keep disk access fast.

Here is a table that shows the hard sector numbers for a track, the corresponding DOS 3.3 soft sector numbers, and the ProDOS block numbers (divided into part 'a' and part 'b' since each block is 2 sectors long):

Hard Sector	DOS 3.3 Soft Sector	ProDOS Block Number
0	0	0-a
1	7	4-a
2	E	0-b
3	6	4-b
4	D	1-a
5	5	5-a
6	C	1-b
7	4	5-b
8	B	2-a
9	3	6-a
A	A	2-b
B	2	6-b
C	9	3-a
D	1	7-a
E	8	3-b
F	F	7-b

To translate the hard sector number into the actual 4–and–4 encoded sector number stored in the address field, see Appendix E.

Interleave (3.5" disks)

Before writing a block, the 3.5" controller must "pre–nibblize" the 512 data bytes (plus the 12 "zero" tag bytes) into 699 disk bytes to be written. After reading a block, the controller must "post–nibblize" the 699 disk bytes back into 512 data bytes. The pre–nibblize and post–nibblize routines take different amounts of time on different types of drives and controllers.

A UniDisk 3.5 drive, for example, actually contains an internal computer which performs the pre– and post–nibblizing within the drive, transferring the finished 512 bytes of data to and from the Apple. Because of the time this takes, three additional sectors have passed by before the internal controller is ready to access another sector.

For an Apple 3.5 drive connected to an Apple IIGS, the 3.5" controller inside the GS performs the pre– and post–nibblizing. One additional sector passes by during this time.

Because the controller isn't fast enough to access consecutive sectors on the track, Apple–format 3.5" disks are formatted with the sector numbers out of order, or interleaved, on each track. Here is the order of the sectors for the different track groups:

Track		Sectors/track	Sector numbers in order (hex)
0–15	($00–$0F)	12	0 3 6 9 1 4 7 A 2 5 8 B
16–31	($10–$1F)	11	0 3 6 9 1 4 7 A 2 5 8
32–47	($20–$2F)	10	0 5 3 8 1 6 4 9 2 7
48–63	($30–$3F)	9	0 7 5 3 1 8 6 4 2
64–79	($40–$4F)	8	0 2 4 6 1 3 5 7

Notice that with this order, consecutive sector numbers are always four sectors apart, so the disk has an interleave of 4. This allows an application to request consecutive block or sector numbers, accessing the blocks as fast as a Unidisk 3.5 drive allows.

This interleave is formatted into the hard sectors on the 3.5" disk (the sector numbers are actually out of order), as opposed to the soft sector renumbering that occurs with 5.25" disks (the hard sector numbers on disk are in order, but a lookup is done from the soft sectors that a program requests).

Macintosh disks are formatted (by block) the same way as Apple II–format 3.5" disks, with two exceptions: (1) The 12 tag bytes within each Macintosh block normally contain information related to file recovery, rather than containing zeros. (2) Macintosh disks are formatted with an interleave of 2 (rather than 4), which means consecutive sector numbers are two sectors apart around the track.

You could copy a Macintosh disk using the Utilities' **Copy Disk w/Format** option. However, the Macintosh tag information would be lost, and the interleave of the resulting disk would be wrong. This would cause disk access to the copy to be slower than the original disk, because the sectors aren't in the proper order for fast, efficient access. Similarly, you could copy an Apple II–format 3.5" disk using the **Sector Copy** option in the Apple Macintosh version, but again the interleave would be wrong, causing disk access to the copy to be slower.

The **Sector Copy** option in the Copy II Plus 3.5" Bit Copy program, however, correctly copies any tag information, and also preserves the interleave of the original disk on the copy. Both Macintosh disks and Apple II 3.5" disks can be copied with Bit Copy 3.5.

> *Note: The Macintosh HFS file system-the way the Macintosh uses blocks-is very different from Apple II ProDOS. The Copy II Plus Utilities and other ProDOS utilities are not designed to catalog or work with Macintosh files.*

Appendix B: Disk Protection Methods

In Appendix A, the format of a normal DOS 3.3 or ProDOS sector was given. Standard disk copy programs look for this format on every track of the disk. If the prologs and epilogs can be found in the right places and the checksums match with the data, then the Disk Operating System can be confident that the data itself is correct. This helps to produce a very reliable copy.

The simplest protection methods change this format slightly. Since a normal DOS can't find the byte patterns it's looking for, it doesn't know how to make sense of the disk data. It gives up and prints an error message such as "I/O ERROR". In other words, any change from a standard disk format, if it was put there to make copying more difficult, can be considered a protection method. The sophistication of the changes varies greatly. Many protected formats bear no resemblance to standard sectors at all.

There are two possible approaches to copy protection. The first is to store the program information on the disk in such a way that a bit copier can't reproduce all of it. When you try to boot the copy, the program is incomplete and won't run. The second approach is to store the program in a reasonably normal form, but also put special bytes or patterns which are difficult to copy somewhere on the disk. When you boot this, the program loads correctly, but then promptly begins by checking that the special bytes are still on the disk. If they are missing or incorrect, the program will not run.

Why Can't a Bit Copy Program Copy Everything?

There are a few reasons for this. The most pervasive one has to do with the fact that on a circular track, there is no defined beginning or end. A bit copy program must begin reading at some arbitrary point around the track, and then make sense of what it reads. After reading two or three revolutions of the track into a memory buffer, the bit copy program can find any given byte from the track two or three times in the buffer. The number of bytes between these identical images is how many bytes were on the original track.

If all drives spun at exactly the same speed, then the bit copier could, starting at any byte, write the correct number of track bytes onto the duplicate disk. These bytes would exactly fill the circular track on the duplicate disk. The last data byte written would fall just before the first one on the track. But if the duplicate drive spun too fast, then the end of the track image would overwrite the beginning, destroying part

of the data. If the drive spun too slowly, then there would be a gap between the beginning and the end. This is unacceptable, since the gap or the overlap could end up in the middle of a data area. Disk drive speed varies too much (even on a given drive) to copy a track this way.

Most disks are written with first a large sync field, then the data area. The end of the data area overlaps part of, but not all of, the sync field as the disk completes a full revolution. (See Appendix A.) The size of the remaining sync field is determined by how fast the drive that made the disk was spinning. If a bit copy program can identify the beginning and ending of the data area, it can also write a large sync field before the data area. The resulting sync field may be a slightly different size than on the original, but in most cases that doesn't matter.

Therefore, one of the tasks for a bit copy program is to identify the start and end of the useful data area on each track. Then when it writes the track, it can let the sloppiness caused by varying drive speeds fall outside of this data area, where it can hopefully be ignored. Many protection methods involve making it difficult for a bit copy program to find the start and end of the track data.

The first protection methods involved very simple changes, since there weren't any programs yet available that could copy these disks. When bit copy programs that could back up these disks were developed, more complicated protection methods were invented. New copy programs were released to copy the new protection methods, and new methods were created to beat the bit copy programs. This cycle still continues. The following descriptions start off with the easier changes and progress to some of the state of the art methods currently in use.

Changed Address and Data Headers

As mentioned earlier, standard disk copy programs expect to find normal sectors on the disk, with correct prologs, epilogs, checksums, etc. These header values can also provide clues to a bit copy program to help it find the track start and end, since it knows that a sync field usually precedes every D5 AA 96 address prolog.

Since Apple DOS looks for these bytes when reading a sector, changing these to new values (e.g. D5 AA 97) will cause any normal copy program to fail. Prologs, epilogs, track numbers, and checksums have all been changed in various methods. This was one of the first and most simple disk protection methods developed, but even today most disks employ this as one of their protection methods.

Changed Sync Bytes

The first bit copy programs didn't look for address prologs at all. Instead, they looked for the large sync $FF fields and determined that a track started right after one of these. Soon, many copy-protected disks used both changed address headers and changed sync fields. One of the most popular changes was to write sync $FE's rather than $FF's. The bit copiers responded by being able to recognize a range of values as sync bytes, including both $FE and $FF.

Some disks instead had large gaps of invalid bytes (bytes with more than two consecutive zeros), followed by only the minimum number of sync bytes required by the hardware. Without familiar headers or large sync fields, the bit copy programs had nothing to use to reliably determine the start of a track. However, the invalid bytes couldn't be important data areas, since they can't even be read reliably, and so were probably part of the track-end gap. With this knowledge, new bit copy programs were written that included subroutines to convert invalid bytes to some known value, usually sync bytes.

About this time, the concept of parameters was introduced to bit copy programs. It became obvious that no single set of algorithms would be able to automatically handle all types of copy protection. The user needed to be able to turn certain routines on or off, and to set the operating values for others.

Synchronized Tracks

Another way to copy-protect a disk is to change nothing that is visible on the track, just change the alignment of the information from track to track. When DOS formats a disk, the tracks are always written with a certain circular alignment, due to the timing consistency of the formatting routine. As an example of this alignment, suppose a program reads sector 0 from track 0, then immediately steps to track 5 (which always takes the same amount of time), then begins looking for a sector. The first sector to pass under the head will always be sector $C, because sector $C just happens to lie in the right place for this to happen.

Most copy programs and formatting programs all produce different alignments, because they spend varying amounts of time on each track before stepping to the next track. This usually doesn't hurt anything. However, a copy-protected disk can be created with a certain fixed alignment, then this alignment can be checked by the protected program whenever the disk is booted. If the alignment differs, then the program knows this is a copy and not the original disk, so it refuses to run.

Bit copy programs began including an option to handle synchronized tracks (not to be confused with sync bytes). They copy not only the data, but whatever track alignment is on the original disk as well.

Half Tracks

This method appeared about the same times as synchronized tracks. The Apple 5.25" disk drive can actually position to 70 different tracks, not 35. Unfortunately, the read/write head used in the drive is too wide to write complete tracks on every track boundary. It would overwrite the information stored on adjacent tracks. So DOS actually steps the head twice for every track on the disk, giving the familiar 35 tracks. But since it is possible to position the head to any of the 70 half–tracks, some disks shift the data and start using tracks on half–track boundaries. For example, rather than writing information on tracks 0, 1, 2, 3, etc., they might use 0, 1.5, 2.5, 3.5, etc. Any possible pattern can be used, as long as the increment is at least one whole track.

There is no easy, foolproof way to determine what half–tracks are used by a protected 5.25" disk. In general, if you try to read (with the **Nibble Editor**) a track or half–track that was never written to, you will see large areas of invalid bytes. If data was written to the half–tracks on either side, you may see a few areas that look like valid track data, as the wide read head occasionally picks up these bytes from either side. The **Hi-res Disk Scan** option can help you find the half–tracks containing valid data. (Try using **Hi-res Disk Scan** on a normal 5.25" disk, setting the track increment to .5 to see the invalid half–tracks along with the valid tracks.)

Copy II Plus can position the drive head over any half–track, or even quarter–track. To do quarter–tracking, the bit copy program instructs the drive to begin stepping from one half–track to the next, then it stops the positioning while the read/write head is still moving. The head is left positioned about halfway between the two half–tracks.

An Extra Track?

The hardware can (on most drives) write one extra track after the last track on the disk. This would be track $23. Since a normal copy program doesn't suspect that an extra track exists, it won't try to copy it. This is part of the reason bit copy programs such as Copy II Plus allow you to specify start and end tracks to copy.

Bit Insertion

Remember that sync bytes are bytes written with extra zero bits on the end. Groups of sync $FFs are written to ensure that the hardware will synchronize to the data on

the disk. Well, nothing prevents you from putting an extra bit on the end of other bytes, as long as the maximum number of consecutive zeros is not exceeded. Whenever the program must access the disk frequently (for reading data files or other information), this method is easy, since it doesn't interfere with any DOS routines. This is why so much business software uses it.

Whenever one of these programs is booted, it finds the spot on the disk where it knows these special bit–inserted bytes should be. It then uses a carefully timed routine to determine if the extra bits are there. (See Appendix A for the timing between bits and bytes.) If not, it knows this is a copy, and refuses to run.

Earlier bit copy programs could not determine which bytes on the disk were sync (9 or 10 bit) bytes. The timing involved in reading and storing each byte into memory and checking for sync at the same time makes this very difficult. The early copy programs instead made educated guesses as to where the sync bytes were. The more recent versions of Copy II Plus use a more sophisticated read routine and can determine sync with a fairly high degree of reliability. These bytes appear in the **Nibble Editor** as inverse.

Nibble Counting

You can adjust the speed of your Apple 5.25" disk drives. They normally run at about 300 rpm (200 milliseconds per revolution), but this can vary significantly, even on a single drive. As mentioned earlier, this affects the number of bytes that will fit on a track. Some software publishers take advantage of this fact. When making a commercial disk, the duplication program will write a track, then re–read it to find out how many bytes (or nibbles – both terms are used) are on the track. It then writes this count on the disk somewhere. When the disk boots, this count is compared to the actual number of bytes on the track and if they are equal (or within a specified tolerance), the program will run. However, even very small speed variations will affect the number of bytes on a track, so it is unlikely that your drives will produce the exact same count as the drive which was used to produce the original disk.

Bit copy programs respond by varying the nibble count somewhat without adjusting the drive speed. (The method used is explained in Appendix C.) Note that the nibble count naturally comes closest if the speed of the duplicate drive closely matches the speed of the drive that the disk was originally made on. The speed of your original and duplicate drives do not have to exactly match each other to do accurate nibble counting. (Remember that adjusting drive speed applies only to 5.25" drives; 3.5" drives dynamically adjust their rotational speed from one track range to another.)

Long Tracks

Some 5.25" protected programs are written with a large amount of data on each track. The drives that make these disks are slowed down slightly so that the extra data will fit. If you try to copy the disk with a normal–speed duplicate drive, the end of the long track will overwrite the beginning, creating an unbootable disk. This is one possible cause of an error 5 (write verify error) when backing up a disk with Copy II Plus.

When this protection method is used, the best solution is to simply adjust your 5.25" drive to a slightly slower speed so that the track will fit on the duplicate disk. Unfortunately, if you leave your drive at a slower speed, it may be slightly less reliable when accessing normal–speed disks (disks that were made on a drive that spins at the correct speed). If you have two drives, here is a compromise suggestion: Set drive 1 to spin at 200 milliseconds per revolution for greatest reliability. Then set drive 2 to spin at a slower 200.5 to 201.0 milliseconds, which will help back up protected disks while still maintaining good reliability.

Write–Protect Check

When you use a disk that has a tab over the write–protect notch, this does two things. The electronics in the drive prevent any program from writing to the disk, and a flag is set which the program can check to see if the disk is write–protected. Some commercial disks have no notch, and so are permanently write–protected.

Some protected programs (that have no notch in the disk) check the write–protect flag when they are booted. If the flag says not write–protected, then the program knows that this is an ordinary notched disk, and must be a copy rather than the original disk. It will then hang, or reboot, or ask you to insert the original. (It could also trash the data on your backup.) If you put a write–protect tab over the backup before you boot it, then the program cannot use this to determine that a copy is running.

There is no ready way to determine when this protection method is being used. If you want to be on the safe side, if the original disk is write–protected, always put a write–protect tab on your duplicate disk before you boot it. If the original is not write–protected, don't put a tab on the backup.

Non–sync Sync

A few protected programs use a pattern of normal 8–bit bytes to synchronize the hardware to the disk data. This pattern usually has to be fairly long and consist of the proper bytes in order to synchronize correctly. If this method is used, then 9 and 10 bit sync bytes are not needed, making it more difficult for bit copy programs to determine the track start and end.

This covers the main methods currently in use. It should be noted that several disks use combinations of the above methods just to make things more complicated: radically different sector formats, with different headers on different tracks, short sync fields or almost no sync at all, half–tracks, etc. ad infinitum.... In some cases, the combinations form almost a new protection method in itself. Here is one example:

Spiral Tracks

This method combines synchronized tracks with half–tracks to store data in an unexpected way. Remember from the discussion of half–tracks that the 5.25" Apple disk read/write head is too wide to write complete tracks on every half–track boundary. But this doesn't prevent it from writing a smaller amount of information on each half–track (just a portion of the circular track), as long as it won't interfere with the data on adjacent half–tracks. A disk with spiral tracks is created by writing about 1/4 the normal amount of information stored on a track, then stepping to the next half–track and doing the same. This process is repeated until all the information is written to the disk. Since each track portion is short, it never overwrites or interferes with the track portion on the half–track before or after it. If you try to copy this disk without synchronizing, the half–track images will overwrite each other, and the copy will not work. Copying is made even trickier because the read/write head on the original drive may pick up some information from the adjacent half–tracks, making it harder to find the track start and end.

One technique that helps to copy a disk that uses spiral tracks is to read and write on quarter–tracks, between two half–tracks. The drive can read the two track arcs on either side in one revolution of the disk.

Appendix C: Routines and Special Parameters

This appendix describes the methods Copy II Plus uses to copy a disk, and how the various special parameters affect the copy process. Each parameter has both a number and a name. The name provides a quick way to remember what each parameter does. If a parameter represents a disk byte value, it can be stored normally (for example, $FF) to represent a normal 8–bit byte, or with its high bit clear ($7F) to represent a sync byte. If the byte is part of a byte pattern to search for in the buffer, a zero value in the parameter means "match anything for this byte".

Bit Copying

When bit copying, Copy II Plus begins with the READ A TRACK routine. This simply reads bytes from the original drive until it fills the buffer. Copy II Plus uses one of two possible read routines. It normally uses the routine that checks if each byte is a sync (9 or 10 bit) byte as it reads it. However, if you change parameter 56 (OLD.READ) from 0 to 1, Copy II Plus will use the old read routine which reads everything as nonsync (8 bit) bytes.

Every byte read by the drive has its high bit set. If it is a normal 8 bit byte, Copy II Plus stores it in memory as it was read, with its high bit set. If it is a sync byte, Copy II Plus clears the high bit (subtracts $80 from the number), and stores this new value in memory. When the track buffer is displayed, all numbers with their high bit clear are displayed in inverse with the high bit set again. For example, a sync $FF from the track is stored in memory as a $7F, and is displayed on the screen as an inverse $FF. This information is helpful when setting some of parameters discussed later.

If parameter 9 (CLEAN?) has been changed from 0 to 1, then the CLEAN SYNC FIELDS routine is called next. This routine looks for the areas between the end of each data field and the beginning of the next address field, and between the end of each address field and the beginning of the following data field, and sets all bytes within these areas to standardized sync (usually sync $FFs; the actual value is stored in STAND, parameter 7). To find the end of the address or data field, it usually looks for the epilog bytes DE AA XX, but these values are from parameters 19, 1A, and 1B (ADDRESS.END) and can be changed. To find address or data start, it matches the first two bytes from either ADDRESS.START (parameters E and F) or DATA.START (parameters 1C and 1D), which usually contain D5 AA.

If parameter 31 (FIX.INVALID?) is changed from 0 to 1, then Copy II Plus next calls the FIX INVALID BYTES routine. This routine scans the buffer for occurrences of invalid bytes. There are bytes that the hardware cannot read reliably (those with more than two consecutive zero bits). It will replace any invalid bytes with standardized sync bytes (from STAND, parameter 7). These are the bytes it will convert to standard sync:

81	82	83	84	85	86	87	88	89	8A
8B	8C	8D	8E	8F	90	91	98	A0	A1
A2	A3	B0	B1	B8	C0	C1	C2	C3	C4
C5	C6	C7	C8	D0	D1	D8	E0	E1	E2
E3	E8	F0	F1	F8					

In addition, Copy II Plus always looks for $80s in the track buffer and changes them to standard sync, whether or not parameter 31 is set to 1.

It then calls the STANDARDIZE SYNC routine, if parameter 8 (STANDF) has been changed from 0 to 1. This routine looks for nonstandard sync fields and changes them to standard sync. It is good for cleaning up sync fields that contain a mixture of sync bytes, and a few other stray values.

It looks for fields of at least SYNC.# (parameter 6) bytes that have been marked as sync by the read routine. The field can contain up to GLITCH.SIZ (parameter 32) consecutive bytes that are not sync. The bytes are then all converted to standard sync, the value contained in parameter 7, STAND. If CHANGE (parameter 33) is 1, the glitch bytes are also changed; if CHANGE is 0, they're left alone.

The next task of Copy II Plus is to find the start and end of the track data. There are two different methods it can use to determine the track start. The methods it uses are controlled by parameter 55, FIND.START. If this is set to 3, Copy II Plus will try first by header. If this fails, then it will try by sync. If set to 1, it will try first by sync, then header. When it finds the track start, it will display either HEADER or SYNC in the center window to show you which method it used.

The FIND HEADER routine looks for an address header (part of or all of the address field) to determine the track start. It tries to find the pattern of bytes from ADDRESS.START up through ADDRESS.END (parameters E to 1B) in the track buffer. If it can match the first MATCH bytes (parameter A), then this is the track start. The ADDRESS.START table contains 3 bytes for the address prolog, and 8 bytes for the encoded volume, track, sector, and checksum. ADDRESS.END immediately follows and contains the address epilog bytes. A zero byte in any of these parameters will match any value from the track buffer. The FIND HEADER routine often requires several parameter changes before it can find the track start, since many protected disks use changed headers. If no match is found, this routine fails, and the FIND SYNC routine is tried.

The FIND SYNC routine will attempt to find the track start by looking for the largest group of valid sync bytes in the first part of the track buffer. The sync field must be at least SYNC.# (parameter 6) bytes long. It can contain small glitches of non–sync or invalid bytes. The track start is set to the end of this field. Since most disks have a large sync field before the track start, this routine will correctly find the track start most of the time. If no valid sync fields can be found, this routine fails, and the FIND GAP routine is tried.

Copy II Plus then must determine the end of the track data. It looks for a duplicate image of the track start later in the buffer, then moves back over the last sync field or other garbage that may be present. You can also have it set the track end as a fixed number of bytes after the track start. Lastly, you can have it set the track end to a fixed number of bytes after the last data prolog.

The standard track end finder first skips TRKMIN (parameter 3) pages past the track start. It then starts looking for at least EMATCH (parameter 50) bytes that match the track start. This is the repeat image of the track start later in the buffer. It then backs up over any sync field or other garbage that may be at the end of the track. The sync field can contain up to GLITCH.SIZ (parameter 32) consecutive non–sync glitch bytes. This point is the track end.

If you want to instead set the track end by cutting the track off a certain number of bytes from the track start, change parameter 44 (CUT?) from 0 to 1. The number of bytes to cut from (the desired track length) should be stored as a two–byte number in CUT.HIGH (parameter 45) and CUT.LOW (parameter 46).

Note: This parameter exists only in the 5.25 inch bit copy.

If you want to set the track end a fixed number of bytes after the last data prolog (usually D5 AA AD), then set parameter B3 (ALTEND?) to 1. This routine is helpful when the big gap is full of garbage and you want to set the track end precisely at the right spot. Set the pattern to look for in parameters B4–BC (ENDPAT). Set the length of this pattern in parameter BD (ALTMAT). Lastly, put the number to add to the matched pattern to set the track end in parameters 45 (CUT.HIGH) and 46 (CUT.LOW). ENDPAT defaults to the standard data prolog (D5 AA AD), and ALTMAT is set to the length of this pattern, 3. All you have to change is the length to add (CUT.LOW and CUT.HIGH) and ALTEND? to enable this routine.

If parameter 4F (SDFLTR) is changed from 0 to 1, Copy II Plus adds an extra check as it analyzes the data for track start and end. SDFLTR stands for Single Density FiLTeR. This check verifies that the data between track start and track end does not contain more than 1 consecutive zero in each byte. If it does, Copy II Plus continues to look for another track start and end. This check is most useful when copying disks

that use track arcing and contain 4–and–4 encoded data; it helps keep spurious data in adjacent half–tracks from confusing the bit copy program.

If the track data is more than TRKMAX (parameter 2) pages long, it assumes the analyze routines failed. If Copy II Plus cannot find the track start using any of the methods selected by parameter 55, it re–reads and re–analyzes the track up to EREAD (parameter 0) times. If it still cannot find the track start, then a READ ERROR occurs. An error number 2 appears in the status display, and Copy II Plus simply grabs a block of data from the buffer that would be about the correct length for a normal disk, and uses this for track start and end.

If parameter 34 (BIT.FLAG) has been changed from 0 to 1, then the BIT INSERT routine is called next. This routine scans through the track data looking for a pattern of up to 5 bytes. If this pattern is found, the matching bytes in the buffer can be changed to either sync or non–sync bytes. This routine can be used when the protected program is checking that a certain byte on the track is a sync byte. However, note that in nearly all cases, Copy II Plus will correctly identify all sync bytes automatically as it reads the track, so the BIT INSERT routine is not needed often. The exception is when 9–bit sync bytes are used, as the read routine can not always correctly distinguish these from 9–bit bytes due to the tight timing requirements and limited flexibility of the 65C02 processor.

The 5 bytes that BIT INSERT tries to match are stored in the BIT.TABLE, parameters 35 through 39. The pattern matching ignores the high bits of each byte. The values in the table can have their high bits either cleared to 0 or set to 1. This indicates whether the bytes should be written as sync or normal bytes. When a match is found, the corresponding high bits in the track buffer are also set or cleared, will will cause the write routine to write them as normal (8 bit) or sync (9 or 10 bit) bytes. Any zero values in the BIT.TABLE will match anything.

Copy II Plus then calls the WRITE TRACK routine to write the track data in memory to the duplicate disk. It starts writing from a few bytes before the track start to include the preceding sync field (if there is one), and continues to the track end. It writes all sync as either 9 or 10 bit bytes, depending on the value of BITS, parameter 3E. If BITS is set to 1, 9 bit bytes will be written; if set to 2, 10 bit bytes are selected. If the value of parameter 4D, ERASE, is 1, then the entire track is erased to sync $FF's before the track data is written. If ERASE is changed to 0, or if the track increment is less than one, then the track is not erased first, and only 16 bytes are written before the selected track start (this is to prevent overwriting adjacent half–tracks).

If parameter 47 (VERIFY?) is left at one, it then immediately calls WRITE VERIFY to verify that the track just written is correct. (If changed to 0, it will not verify.) This routine simply checks that the track start was not overwritten by the track end (track too long). If this test fails, Copy II Plus first calls the TRACK CHOPPING routine. This chops a track that is too long by shortening all the sync fields to a length

specified in KEEP (parameter 3D). The chopped track is rewritten and verified again. If the verify still fails after EWRITE (parameter 2) retries, a write verify error (error 5) appears in the status display. WRITE VERIFY also fails if there is no disk in the duplicate drive.

If you've answered Yes to the KEEP TRACK LENGTH question, or changed parameter 4B (DONIB?) from 0 to 1, Copy II Plus next calls the NIBBLE COUNTING routine. This routine computes the number of bytes (nibbles) on the original disk and tries to maintain that count on the duplicate disk. It works by converting some of the normal bytes to 9 or 10 bit bytes if there are too many bytes on the duplicate disk, or by converting sync bytes to 8 bit bytes if there are not enough. (This works on the principle that by adding bits to some bytes, the bytes take up more space on the duplicate track, so fewer of them are needed to fill the track.) It calculates the number of bytes to convert based on the current setting of BITS (9 or 10 bit sync?), and the difference between the length of the original track and the length of the duplicate track. The difference is compared to TOLERANCE (parameter 4C) and if it is less than or equal to this number, the nibble count succeeds. Otherwise, it compares again and rewrites the duplicate track. It may take several tries before the nibble count matches. If there is more adjustment to do but no more bytes which can be changed, a nibble count error (error 6) is displayed for this track.

If you've answered Yes to the SYNCHRONIZE TRACKS question or changed parameter D (DOSYNC) from 0 to 1, Copy II Plus also maintains SYNCHRONIZED TRACKS as it copies. This routine makes sure that the information on the duplicate disk has the same track–to–track alignment as on the original disk. SYNC.TRACK (parameter C) is the reference track to synchronize with (usually track 0). SYNC.START (parameters 22 through 2F) is a table of bytes to match to find the start of the reference track. It currently contains the address field bytes for sector 0. SYNC.MATCH (parameter 30) is the number of bytes in the table to match. If the SYNC.START bytes cannot be found on the reference track, Copy II Plus will spin the disk indefinitely looking for them. This will only happen if you're trying to synchronize on a nonbootable disk. Press CONTROL-RESET to recover.

If parameter 51 (DYNAM) is changed from 0 to 1, the DYNAMIC HEADER CHANGE routine is also used. Some disks change the address header for each track on the disk. They usually store the new header at the end of the current track. Using this routine, you can tell the Bit Copy program where to find the new header and it will dynamically update the address header table.

The new header is found by adding the offset in parameters 52 and 53 (DYNAM.LOW and DYNAM.HIGH) to the start of the track. Parameter A (MATCH) is used to determine the length of the header (number of bytes to fill into the header table). Parameter 54 (FILL.ORDER) determines whether to fill the header table forwards (0) or backwards (1).

Sector Copying

The sectors from each track are read from the original disk, then formatted and written onto the duplicate disk. Without any parameter changes, normal DOS 3.3 and 3.2 disks can be copied reliably. By changing a few parameters, many protected disks can also be copied.

The parameters used in sector copying are very similar to the custom patch values that are used in the **Sector Editor**. A good knowledge of address and data field formats helps in understanding these parameters.

When reading, Copy II Plus looks for address prolog bytes that match APRO, parameters 57 through 59. The seed value to use when calculating the address field checksum is in parameter 5A, ASEED. Address checksum errors are detected if parameter 5B, ACHKF, is nonzero. The first two address epilog bytes are checked against AEPI (parameters 5C and 5E) if AEPIF (parameter 60) is nonzero.

The three data prolog bytes must match DPRO, parameters 61 through 63. The data checksum seed value is stored in parameter 64, DSEED. The data field checksum is tested if DCHKF, parameter 65, is nonzero. The first two data epilog bytes must match DEPI (parameters 66 and 67) if DEPIF (parameter 6B) is nonzero.

If DOSFLG, parameter 77, is zero, then the sector copier will automatically try to copy using DOS 3.2 format first. If this fails, then it tries copying using DOS 3.3 (same as ProDOS) format. If DOSFLG is nonzero, it tries only DOS 3.3 format.

When writing, the three APRO bytes are used for the address prolog. The seed value in ASEED is used to determine the address checksum. If AEPIF is nonzero, then the 4 epilog bytes from AEPI (parameters 5C through 5F) are written. If AEPIF is zero, then the address epilog bytes read from the original disk are used instead.

The three data prolog bytes are used from DPRO. DSEED is used as a starting seed value in writing the data field and checksum. If DEPIF is nonzero, the 5 epilog bytes from DEPI (parameters 66 through 6A) are used. If DEPIF is zero, then the data epilog bytes read from the original disk are used instead.

During writing, if parameter 76, FNYFLG, is nonzero, then 5 funny sync bytes are written before each address field. These bytes help copy some protected disks, including the older PFS series disks. Rather than writing the last 5 sync $FF's, the five bytes from FUNNY (parameters 6C through 70) are written. The number of extra zeros to add to each funny bytes are stored in TIME, parameters 71 through 75.

For the 3.5" Bit Copy, parameter 64 is instead called TRKFLG. If left at 0, it will allow incorrect track and side numbers in the address field of a sector. If set to FF, it requires that the track and side values be correct. Parameters 6C, 6D, and 6E (DTSEED1, DTSEED2, DTSEED3) are the three checksum seed values for the data field.

Special 5.25" Bit Copy Parameters

The following are special routines that have been developed to handle disks that otherwise could not be copied for backup. These routines only exist in the 5.25" Bit Copy. The 3.5" Bit Copy will develop its own set of special routines as needed which will be documented as they evolve. Please note that these parameters are very technical in nature and require a high degree of experience to be used properly.

Parameter 78 (LSPARM) – Sector Copy Only

This routine was originally developed to handle a protection method that remarkably enough first appeared on Locksmith 5.0, hence the name "LSPARM". It has since appeared on numerous disks and is perhaps one of the most widely used protection methods. This parameter also will set an automatic check for "Prolok" protected disks, a scheme that burns a laser hole into the disk and checks for the bad data.

Here's how this parm works:

When set to 1, LSPARM writes a special sector specified by parms A1 (track number) and A2 (sector number). This sector is an empty sector filled with some E7 bytes where the number of zero bits written after each E7 varies (some have none, others have 1, still others have 2). When the protection method checks the disk, it knocks the data out of sync so it can see these extra zeros as data bits. If the right number of zeros is not appended to each byte, then the disk is assumed to be a copy. There are currently three different patterns of zeros written with these E7 bytes, and the pattern is specified by parameter A3 (LCKPAT).

It is difficult to determine the exact pattern used. However, it is easy to spot this protection method with the **Nibble Editor**. Look for a sector with some highlighted E7's in it. Then, use the 4X4 encoding chart in Appendix E to determine the number of this sector. Put the track number and sector number in parameters A1 and A2. Most disks use pattern number 1 (parameter A3), so try this first. If the copy still won't boot, try a different pattern number in parm A3. Note that some disks (such as Crossword Magic 4.0) use multiple sectors protected in this manner with different patterns for each sector.

If you are using parm 78 to duplicate Prolok disks, just set this parm to 1. If any tracks contain a single bad sector, this sector will overlay the sector 180 degrees

around the disk. This fools the Prolok protection method into thinking it has found a real laser–burned disk as it reads the first bad sector, writes to the second copy (to see if the error is a bad spot in the media itself), then reads the first copy of the sector again. Since it thinks it has written this sector (which would clear up an electronic error), it believes the backup disk is real as it doesn't know it has been fooled by a duplicate copy of this sector.

Parameter 79 (KARATE) – Bit Copy Only

This parameter was developed for the programs "Karateka" and "Bank Street Speller" by Broderbund, and is one of the most complicated parameters in Copy II Plus. The primary difficulty in making a functional backup of these disks is that there are no obvious sync bytes on most tracks and the track prolog bytes change from track to track. This prevents the standard Header and Sync track–start finding routines from working.

The way these disks boot is to read a table of headers out of a certain sector which is written in 4X4 encoded format. The placement of this sector can be on any track (including half tracks). Further, the placement within this sector of the table of header bytes (track start bytes) is in different places on different disks. If this weren't enough, the header table is indexed in a rather odd way by the track number being read and the indexing method is different between the two disks.

To complicate matters even more, every 256th byte of the data on these tracks must be written as a 36 microsecond byte (9 bits – one extra zero) in order for the data to be read properly as the data read routines on the original disk are slow when crossing a page boundary.

To copy this disk, the parm KARATE is set to a non–zero value. If it is a "1", then a Karateka disk is assumed. If it is a "4", then a Bank Street Speller disk is assumed. It needs to know this to use the right indexing method into the track header table.

The next parm, number 7A (KTRACK) is the track number (in quarter tracks) where the sector containing the header table can be found. The parm numbers 7B–7D specify a three–byte header to locate the start of this special sector. (This sector has no ID – it begins with the prolog and the bytes immediately following are the 4X4 encoded (FM) data bytes.)

When the 5.25 bit copy program sees a non–zero value in the KARATE parm, it goes into a build mode whereby the head is stepped to the specified track and the header (track start) table is read and decoded from the special sector. It then puts the first track's prolog into ADPRO1–ADPRO2. When this is done, it steps back out to the track to be copied and sets an internal flag that says the build mode is complete so that for future tracks, it will just look up the prolog bytes from the table it has just created from the special sector. It can now find the proper start of each track just like

the original program can – it looks it up in the table it read from the master disk. For each track to be copied, the prolog bytes are first looked up from the table and put into ADPRO1–ADPRO2. The track is then read, then written, and it goes on to the next track, getting the prolog bytes from the table.

Between the read and write phase, another routine is called to set every 256th byte in the buffer as sync so that it can be read properly by the original programs slow data read routine.

Parameter7E, (DZLDRAW) – Bit Copy Only

This routine is used to write a field of special sector ID's (sector address fields without any accompanying data). Each ID consists of 3 prolog bytes, then a 4X4 encoded byte, then 3 epilog bytes followed by 2 zero bytes. This protection method works by knowing that the zero bytes on the original disk that separate all these IDs will be read unreliably (the drive will add 1 bits, causing the copy to be more reliably read but in the wrong way). Thus, it is not possible to copy this field of IDs with a standard bit–copy program. This routine writes this field on the specified track so that it can be found.

The routine is enabled by putting a 1 in parameter 7E. Specify the prolog bytes in parms 98–9A (RG1–RG3). Specify the epilog bytes in parms 9B–9D (RG4–RG6).

Parameter 7F (SPELL) – Bit Copy Only

This parameter will cause a blank track of all FF bytes (not sync) to be written. The read data will be ignored – this is a write only parm. Some disks check for a track of all FF's with a set number of non–FF bytes. Since there are no sync bytes on the original track, you can't specify the track start by using a single byte as it can be read as several possible bytes depending upon how out–of–sync the track is read.

To use this routine, set parameter 7F to the number of non–FF bytes you want to appear (including the track splice) on the target disk. It will write this many AA bytes separated by 256 standard FF bytes. This method first appeared on "Sensible Speller" which is where it got its name.

Parameters 80–97 (OUTSYNC) – Sector Copy Only

These parameters are used to write a standard data field a specified number of bits out–of–sync. The sector's address field and data prolog bytes are written normally. Then 1 to 4 extra data prolog bytes are written. During one of these, the disk controller's data latch is reset, causing only some of the bits of that extra data prolog byte to be sent to the disk. The original disk, when reading these special sectors will do the same reset of the latch when reading the data, and expect to get a good sector when these bits are discarded.

Here are how each of these parameters work:

OUTSYN (parm #80)– enables this routine and sets the number of microseconds out–of–sync to write the data. The following table describes these values:

FF	don't write or read out of sync (default)
00	write 16 usec out of sync (discard 4 bits)
01	write 20 usec out of sync (discard 5 bits)
02	write 24 usec out of sync (discard 6 bits)
03	write 28 usec out of sync (discard 7 bits)

Note: The low nibble is used to set the number of bits out–of–sync to write. If you need to specify a different number of bits to read out–of–sync (sector copy does a read–after–write verify), then put it in the high nibble.

OSBYTE (parm #81) – specifies which extra data prolog byte to reset the latch when writing.

DTPRO4 (parm #82) – 1st extra (4th total) data prolog byte.
DTPRO5 (parm #83) – 2nd extra (5th total) data prolog byte.
DTPRO6 (parm #84) – 3rd extra (6th total) data prolog byte.
DTPRO7 (parm #85) – 4th extra (7th total) data prolog byte.
DTPRO8 (parm #86) – 5th extra (8th total) data prolog byte.

NUMSEC (parm #87). Some disks that use this method will mix standard sectors with out–of–sync sectors on the same track. This parm will tell sector copy how many out–of–sync sectors to write (the standard sectors must be copied on a separate pass for this track).

SECTBLE (parm #88–97). This is the table of sector numbers to write out–of–sync. The number of sectors in this table is specified in parm NUMSEC (see above).

Parameter 9E (HDRTRK) – Sector Copy Only

This parameter, when set to 1, will cause the first and third address prolog bytes (ADPRO1, ADPRO3) to be logically OR'd with the current track number. This allows sector copy to be used to backup "Math Blaster" (and others) that require one of the address epilog bytes to be sync, but use variable address prologs.

Parameter 9F (ULTFLG) – Bit Copy Only

This parameter, when set to 1, will set the ninth byte after the address prolog to sync and set the immediately following byte to an invalid byte ($80). It looks for all occurrences of the currently set address prolog bytes (usually D5 AA 96), then looks

9 bytes ahead and checks this byte for the value stored in parm A0 (ULTVAL). It then sets this byte as sync and replaces the following byte with $80. Used for "Ultima IV" (and others), however, it is more reliable to backup these disks with sector copy, putting appropriate bytes into the sector epilog parms.

Parameter A4 (CHGBYTE) – Bit Copy Only

These parameters are used to replace bytes in the bit copy buffer with other bytes. It can be used to overlay up to 3 bytes into the buffer at a specific offset – usually to put in an invalid byte, but it can also put checked–for bytes after the track has been desynchronized by invalid bytes. It is used by "King's Quest", "Master Type", and several others.

This routine looks for the pattern specified in CHGPAT, of length CHGLEN, then adds an offset stored in CHGLOW and CHGHI. It then replaces existing bytes with the bytes in CHGBYT1–3. If any of these bytes are zero, it does not replace the existing byte.

CHGBYT1 (parm # A4)	first byte to overlay
CHGBYT2 (parm # A5)	second byte to overlay
CHGBYT3 (parm # A6)	third byte to overlay
CHGLOW (parm #A7)	low offset address
CHGHI (parm #A8)	hi offset address
CHGPAT (parm #a9)	pattern to look for (9 bytes)
CHGLEN (parm #b2)	length of above pattern to check

Parameter BE (LONGD5) – Sector Copy Only

This parameter, when set to 1, will cause the first address prolog byte (ADPRO1) to be written as a 36 usec (9–bit) byte on all even numbers sectors, and as a 40 usec (10–bit) byte on all odd numbers sectors. The default is 0, so normally, all ADPRO1 bytes will be written as 32 usec (8–bit) bytes.

Appendix D: Summary of Parameters

Here is a summary of all the Bit Copy parameters. The parameter number is listed first, followed by the original (or default) 5.25" value for the parameter (a few of the 3.5" values are different), the parameter name we've given, and a brief description of what the parameter is for. A few parameter numbers are blank. These are parameters that were used in earlier versions of Copy II Plus, but are no longer needed.

Parm Num.	Orig. Value	Parm Name	Description
00	01	EREAD	Number of read retries if track can't be read or analyzed.
01	01	EWRITE	Number of write retries if write verify fails.
02	1A	TRKMAX	Maximum track length in pages (for error checking).
03	10	TRKMIN	Minimum track length in pages.
04	--		
05	--		
06	01	SYNC.#	Minimum number of sync to constitute a valid sync field for Standardize Sync routine.
07	7F	STAND	Standardized sync value to replace with, for Fix Invalid Nibbles, Clean Sync Fields, and Standardize Sync.
08	00	STANDF	Use Standardize Sync routine? 1=yes, 0=no.
09	00	CLEAN?	Use Clean Sync Fields routine? 1=yes, 0=no.
0A	0B	MATCH	Number of bytes to match with ADDRESS.START table when finding track start by header.

Parm Num.	Orig. Value	Parm Name	Description
0B	01	DISPLAY	01=see track display when copying, 02=enter nibble editor each track, 00=no display.
0C	00	SYNC.TRACK	Track to synchronize to with Synchronize Tracks routine.
0D	00	DOSYNC	Synchronize tracks? 1=yes, 0=no.This is also set by SYNCHRONIZE TRACKS question.
0E	D5	ADDRESS.START	Table of bytes to match with when finding track start by header. Zero bytes match anything.
OF	AA		
10	96		
11	00		
12	00		
13	00		
14	00		
15	AA		
16	AA		
17	00		
18	00		
19	DE	ADDRESS.END	Bytes to match in Clean Sync Fields.
1A	AA		
1B	00		
1C	D5	DATA.START	Bytes to match in Clean Sync Fields.
1D	AA		
1E	AD		
1F	DE	DATA.END	Bytes to match in Clean Sync Fields.
20	AA		
21	00		

Parm Num.	Orig. Value	Parm Name	Description
22	D5	SYNC.START	Bytes to match on reference track in Synchronize Tracks. 3.5" Bit Copy:all bytes must be filled in.
23	AA		
24	96		
25	00		
26	00		
27	00		
28	00		
29	AA		
2A	AA		
2B	00		
2C	00		
2D	DE		
2E	AA		
2F	00		
30	0B	SYNC.MATCH	Number of bytes on reference track to match with SYNC.START table in Synchronize Tracks routine.
31	01	FIX.INVALID?	Use Fix Invalid Nibbles routine? 1=yes, 0=no.
32	02	GLITCH.SIZ	Number of consecutive non–sync bytes that are allowed in a sync field, for Standardize Sync routine.
33	01	CHANGE	In Standardize Sync routine, convert non–sync bytes to sync also? 1=yes, 0=no.
34	00	BIT.FLAG	Use Bit Insert routine? 1=yes, 0=no.
35	DE	BIT.TABLE	Table of bytes to match with for Bit Insert routine.
36	AA		
37	6B		
38	00		
39	00		
3A	04	END.GLITCH	Maximum number of consecutive non–sync bytes that are allowed in the last sync field before track start.
3B	--		
3C	--		

Parm Num.	Orig. Value	Parm Name	Description
3D	0C	KEEP	Number of bytes to shorten all sync fields to, in Track Chop routine.
3E	01	BITS	Number of zero bits to add to all sync bytes when writing.
3F	--		
40	--		
41	--		
42	--		
43	00	PAGE.OVF	Ignore sync fields longer than 256 bytes when looking for track start? 1=yes, 0=no.
44	00	CUT?	Cut track end off a fixed number of bytes from track start? 1=yes, 0=no.
45	08	CUT.HIGH	High byte: Number of bytes to cut from track start.
46	1F	CUT.LOW	Low byte: Number of bytes to cut from track start.
47	01	VERIFY?	Verify track after writing? 1=yes, 0=no.
48	01	PRSLOT	Printer slot number, for printing track buffer or parameter entry.
49	--		
4A	3B	PLINE	Number of lines per page to print when printing track buffer.
4B	00	DONIB?	Do nibble counting? 1=yes, 0=no. This is also set by KEEP TRACK LENGTH question.
4C	01	TOLERANCE	How closely (number of bytes) nibble count must match.
4D	01	ERASE	Erase entire track to 32 usec $FFs before writing track data? 1=yes, 0=no.

Parm Num.	Orig. Value	Parm Name	Description
4E	--		
4F	00	SDFLTR	Don't allow track data to contain bytes with more than 1 consecutive zero? (Continue analyzing?) 1=yes, 0=no.
50	0B	EMATCH	Number of bytes to match to find repeat of track start.
51	0	DYNAM	Do Dynamic Header Change? 1=yes, 0=no.
52	07	DYNAM.LOW	Low byte: Number of bytes from track start to find new header.
53	08	DYNAM.HIGH	High byte: Number of bytes from track start to find new header.
54	01	FILL.ORDER	Fill in header backwards (1) or forwards (0).
55	01	FIND.START	Find track start by (2) sync then header, or (3) header then sync.
56	00	OLD.READ	Use old Read Track routine that does not detect sync? 1=yes, 0=no.
Parameters $57 through $77 are used when sector copying a disk.			
57 58 59	D5 AA 96	APRO	Address prolog bytes to match.
5A	00	ASEED	Checksum seed for address field.
5B	FF	ACHKF	Check for address field checksum error? FF=yes, 00=no.
5C 5D 5E 5F	DE AA EB FF	AEPI	Wanted address epilog bytes. Match epilog read against first two of these.

Parm Num.	Orig. Value	Parm Name	Description
60	FF	AEPIF	Address epilog flag:Check epilogs when reading? Use wanted epilog bytes rather than read epilog bytes when writing? FF=yes, 00=no.
61 62 63	D5 AA AD	DPRO	Data prolog bytes to match.
64	00	DSEED	5.25" Bit Copy: Checksum seed for data field.
64	00	TRKFLG	3.5" Bit Copy: Require correct track and side values in address field? FF=yes, 00=no.
65	FF	DCHKF	Check for data field checksum error? FF=yes,00=no.
66 67 68 69 6A	DE AA EB FF FF	DEPI	Data epilog bytes to match.
6B	FF	DEPIF	Data epilog flag: Check epilogs when reading? Use wanted epilog bytes rather than read epilog bytes when writing? FF=yes, 00=no.
6C 6D 6E 6F 70	93 F3 FC FF FF	FUNNY	5.25" Bit Copy: Funny sync bytes to write before address field
71 72 73 74 75	02 02 01 02 02	TIME	5.25" Bit Copy: Number of zero bits to add to each FUNNY byte when writing.
76	00	FNYFLG	5.25" Bit Copy: Write FUNNY bytes rather than the last 5 sync $FFs before each address field? FF=yes, 00=no

Parm Num.	Orig. Value	Parm Name	Description
77	00	DOSFLG	5.25" Bit Copy: Try copying DOS 3.3 only,rather than trying DOS 3.2 first? FF=yes, 00=no.
6C	00	DTSEED1	3.5" Bit Copy: Checksum seeds for data field.
6D	00	DTSEED2	
6E	00	DTSEED3	
78–BE	--		Special, see "Special Parms" in Appendix C.
FF	--	RESTORE	If you access this special parameter manually, it restores all parameters back to their original values.

Appendix E: Number Conversion Tables

The table below shows how to convert between decimal, hexadecimal, and binary numbers. A thorough tutorial on number systems is beyond the scope of this manual. Suffice it to say that decimal (base 10), hexadecimal (base 16), and binary (base 2) simply provide different ways of expressing any number. Decimal 11 is exactly the same as hex $0B and binary 00001011. A single hex digit is called a nibble or nybble; a binary digit is a bit. Many computer concepts and disk values can be expressed more readily using hex or binary than with decimal. That's why Copy II Plus uses hexadecimal numbers for some values.

The fourth column includes the corresponding Apple 5.25" disk 4–and–4 encoded values (in hexadecimal) for each number. The last column includes the corresponding 6–and–2 translated valid disk values (in hexadecimal). There are only 64 translated values possible, so this column does not continue for the entire table. (Since not all of the 256 possible byte values can be stored reliably on a disk, some form of encoding or translation to valid disk bytes is always necessary before the information is written to disk. See Appendix A for how 4–and–4 encoded numbers and 6–and–2 translated numbers are used on a disk.)

Dec	Hex	Binary	4–and–4	Translated
0	$00	00000000	AA AA	96
1	$01	00000001	AA AB	97
2	$02	00000010	AB AA	9A
3	$03	00000011	AB AB	9B
4	$04	00000100	AA AE	9D
5	$05	00000101	AA AF	9E
6	$06	00000110	AB AE	9F
7	$07	00000111	AB AF	A6
8	$08	00001000	AE AA	A7
9	$09	00001001	AE AB	AB
10	$0A	00001010	AF AA	AC
11	$0B	00001011	AF AB	AD
12	$0C	00001100	AE AE	AE
13	$0D	00001101	AE AF	AF
14	$0E	00001110	AF AE	B2
15	$0F	00001111	AF AF	B3
16	$10	00010000	AA BA	B4
17	$11	00010001	AA BB	B5

Dec	Hex	Binary	4–and–4	Translated
18	$12	00010010	AB BA	B6
19	$13	00010011	AB BB	B7
20	$14	00010100	AA BE	B9
21	$15	00010101	AA BF	BA
22	$16	00010110	AB BE	BB
23	$17	00010111	AB BF	BC
24	$18	00011000	AE BA	BD
25	$19	00011001	AE BB	BE
26	$1A	00011010	AF BA	BF
27	$1B	00011011	AF BB	CB
28	$1C	00011100	AE BE	CD
29	$1D	00011101	AE BF	CE
30	$1E	00011110	AF BE	CF
31	$1F	00011111	AF BF	D3
32	$20	00100000	BA AA	D6
33	$21	00100001	BA AB	D7
34	$22	00100010	BB AA	D9
35	$23	00100011	BB AB	DA
36	$24	00100100	BA AE	DB
37	$25	00100101	BA AF	DC
38	$26	00100110	BB AE	DD
39	$27	00100111	BB AF	DE
40	$28	00101000	BE AA	DF
41	$29	00101001	BE AB	E5
42	$2A	00101010	BF AA	E6
43	$2B	00101011	BF AB	E7
44	$2C	00101100	BE AE	E9
45	$2D	00101101	BE AF	EA
46	$2E	00101110	BF AE	EB
47	$2F	00101111	BF AF	EC
48	$30	00110000	BA BA	ED
49	$31	00110001	BA BB	EE
50	$32	00110010	BB BA	EF
51	$33	00110011	BB BB	F2
52	$34	00110100	BA BE	F3
53	$35	00110101	BA BF	F4
54	$36	00110110	BB BE	F5
55	$37	00110111	BB BF	F6
56	$38	00111000	BE BA	F7
57	$39	00111001	BE BB	F9
58	$3A	00111010	BF BA	FA
59	$3B	00111011	BF BB	FB
60	$3C	00111100	BE BE	FC
61	$3D	00111101	BE BF	FD
62	$3E	00111110	BF BE	FE

Dec	Hex	Binary	4–and–4
63	$3F	00111111	BF BF
64	$40	01000000	AA EA
65	$41	01000001	AA EB
66	$42	01000010	AB EA
67	$43	01000011	AB EB
68	$44	01000100	AA EE
69	$45	01000101	AA EF
70	$46	01000110	AB EE
71	$47	01000111	AB EF
72	$48	01001000	AE EA
73	$49	01001001	AE EB
74	$4A	01001010	AF EA
75	$4B	01001011	AF EB
76	$4C	01001100	AE EE
77	$4D	01001101	AE EF
78	$4E	01001110	AF EE
79	$4F	01001111	AF EF
80	$50	01010000	AA FA
81	$51	01010001	AA FB
82	$52	01010010	AB FA
83	$53	01010011	AB FB
84	$54	01010100	AA FE
85	$55	01010101	AA FF
86	$56	01010110	AB FE
87	$57	01010111	AB FF
88	$58	01011000	AE FA
89	$59	01011001	AE FB
90	$5A	01011010	AF FA
91	$5B	01011011	AF FB
92	$5C	01011100	AE FE
93	$5D	01011101	AE FF
94	$5E	01011110	AF FE
95	$5F	01011111	AF FF
96	$60	01100000	BA EA
97	$61	01100001	BA EB
98	$62	01100010	BB EA
99	$63	01100011	BB EB
100	$64	01100100	BA EE
101	$65	01100101	BA EF
102	$66	01100110	BB EE
103	$67	01100111	BB EF
104	$68	01101000	BE EA
105	$69	01101001	BE EB
106	$6A	01101010	BF EA
107	$6B	01101011	BF EB

Dec	Hex	Binary	4–and–4
108	$6C	01101100	BE EE
109	$6D	01101101	BE EF
110	$6E	01101110	BF EE
111	$6F	01101111	BF EF
112	$70	01110000	BA FA
113	$71	01110001	BA FB
114	$72	01110010	BB FA
115	$73	01110011	BB FB
116	$74	01110100	BA FE
117	$75	01110101	BA FF
118	$76	01110110	BB FE
119	$77	01110111	BB FF
120	$78	01111000	BE FA
121	$79	01111001	BE FB
122	$7A	01111010	BF FA
123	$7B	01111011	BF FB
124	$7C	01111100	BE FE
125	$7D	01111101	BE FF
126	$7E	01111110	BF FE
127	$7F	01111111	BF FF
128	$80	10000000	EA AA
129	$81	10000001	EA AB
130	$82	10000010	EB AA
131	$83	10000011	EB AB
132	$84	10000100	EA AE
133	$85	10000101	EA AF
134	$86	10000110	EB AE
135	$87	10000111	EB AF
136	$88	10001000	EE AA
137	$89	10001001	EE AB
138	$8A	10001010	EF AA
139	$8B	10001011	EF AB
140	$8C	10001100	EE AE
141	$8D	10001101	EE AF
142	$8E	10001110	EF AE
143	$8F	10001111	EF AF
144	$90	10010000	EA BA
145	$91	10010001	EA BB
146	$92	10010010	EB BA
147	$93	10010011	EB BB
148	$94	10010100	EA BE
149	$95	10010101	EA BF
150	$96	10010110	EB BE
151	$97	10010111	EB BF
152	$98	10011000	EE BA

Dec	Hex	Binary	4–and–4
153	$99	10011001	EE BB
154	$9A	10011010	EF BA
155	$9B	10011011	EF BB
156	$9C	10011100	EE BE
157	$9D	10011101	EE BF
158	$9E	10011110	EF BE
159	$9F	10011111	EF BF
160	$A0	10100000	FA AA
161	$A1	10100001	FA AB
162	$A2	10100010	FB AA
163	$A3	10100011	FB AB
164	$A4	10100100	FA AE
165	$A5	10100101	FA AF
166	$A6	10100110	FB AE
167	$A7	10100111	FB AF
168	$A8	10101000	FE AA
169	$A9	10101001	FE AB
170	$AA	10101010	FF AA
171	$AB	10101011	FF AB
172	$AC	10101100	FE AE
173	$AD	10101101	FE AF
174	$AE	10101110	FF AE
175	$AF	10101111	FF AF
176	$B0	10110000	FA BA
177	$B1	10110001	FA BB
178	$B2	10110010	FB BA
179	$B3	10110011	FB BB
180	$B4	10110100	FA BE
181	$B5	10110101	FA BF
182	$B6	10110110	FB BE
183	$B7	10110111	FB BF
184	$B8	10111000	FE BA
185	$B9	10111001	FE BB
186	$BA	10111010	FF BA
187	$BB	10111011	FF BB
188	$BC	10111100	FE BE
189	$BD	10111101	FE BF
190	$BE	10111110	FF BE
191	$BF	10111111	FF BF
192	$C0	11000000	EA EA
193	$C1	11000001	EA EB
194	$C2	11000010	EB EA
195	$C3	11000011	EB EB
196	$C4	11000100	EA EE
197	$C5	11000101	EA EF

Dec	Hex	Binary	4–and–4
198	$C6	11000110	EB EE
199	$C7	11000111	EB EF
200	$C8	11001000	EE EA
201	$C9	11001001	EE EB
202	$CA	11001010	EF EA
203	$CB	11001011	EF EB
204	$CC	11001100	EE EE
205	$CD	11001101	EE EF
206	$CE	11001110	EF EE
207	$CF	11001111	EF EF
208	$D0	11010000	EA FA
209	$D1	11010001	EA FB
210	$D2	11010010	EB FA
211	$D3	11010011	EB FB
212	$D4	11010100	EA FE
213	$D5	11010101	EA FF
214	$D6	11010110	EB FE
215	$D7	11010111	EB FF
216	$D8	11011000	EE FA
217	$D9	11011001	EE FB
218	$DA	11011010	EF FA
219	$DB	11011011	EF FB
220	$DC	11011100	EE FE
221	$DD	11011101	EE FF
222	$DE	11011110	EF FE
223	$DF	11011111	EF FF
224	$E0	11100000	FA EA
225	$E1	11100001	FA EB
226	$E2	11100010	FB EA
227	$E3	11100011	FB EB
228	$E4	11100100	FA EE
229	$E5	11100101	FA EF
230	$E6	11100110	FB EE
231	$E7	11100111	FB EF
232	$E8	11101000	FE EA
233	$E9	11101001	FE EB
234	$EA	11101010	FF EA
235	$EB	11101011	FF EB
236	$EC	11101100	FE EE
237	$ED	11101101	FE EF
238	$EE	11101110	FF EE
239	$EF	11101111	FF EF
240	$F0	11110000	FA FA
241	$F1	11110001	FA FB
242	$F2	11110010	FB FA

Dec	Hex	Binary	4–and–4
243	$F3	11110011	FB FB
244	$F4	11110100	FA FE
245	$F5	11110101	FA FF
246	$F6	11110110	FB FE
247	$F7	11110111	FB FF
248	$F8	11111000	FE FA
249	$F9	11111001	FE FB
250	$FA	11111010	FF FA
251	$FB	11111011	FF FB
252	$FC	11111100	FE FE
253	$FD	11111101	FE FF
254	$FE	11111110	FF FE
255	$FF	11111111	FF FF

Appendix F: Extra Memory

Both the Utilities **Copy Disk** and **Copy Files** options and both Bit Copy programs can take advantage of extra memory in your computer so that fewer disk swaps are needed for the copy. An internal Copy II Plus Memory Manager section within all programs invisibly handles this extra memory.

Below is a brief discussion of the Copy II Plus Memory Manager. You don't need to know this information to use Copy II Plus. It's provided here for your reference only.

There are several different kinds of memory that can be added to an Apple or Apple–compatible computer: expansion RAM in the Apple IIGS, numbered–slot Apple style (or Laser 128EX) Memory Expansion RAM, and auxiliary–slot RAM boards for the Apple IIe or IIc. Unfortunately, all memory is not created equal. The extra memory does not appear to the computer as just more main memory. Each kind of expansion memory appears in a different way and requires a different method to access. This means that for an application program to use the various kinds of memory, additional programming must be written to handle each. The Copy II Plus Memory Manager does this handling.

The Memory Manager can access extra memory in two ways:

- ✔ It can make use of available expansion memory in an Apple IIGS.
- ✔ If there are one or more ProDOS–compatible RAM disks available, it will find the one RAM disk that has the most free space, and use that remaining space without disturbing other files on the RAM disk.

With those two methods, it can get memory from:

- ✔ Apple IIGS expansion memory, whether or not that memory is set up (from the Control Panel) as a RAM disk.
- ✔ A numbered–slot memory board, such as the Apple 1 Meg Memory Expansion Board, the Applied Engineering RamFactor board, or the AST SprintDisk.
- ✔ The slot 5 memory expansion in the Laser 128 EX series.
- ✔ The slot 4 memory expansion in a newer Apple IIc if equipped with a IIc Memory Expansion Card.
- ✔ An Apple IIe (or IIc) auxiliary–memory board if it has already been set up as a RAM disk, such as the Applied Engineering RamWorks boards set up with

their ProDrive RAM disk software, or the CheckMate Technology MultiMate board set up with their RAM disk software.

The Memory Manager section of course takes up memory itself. It must reside in the main memory of the computer in order to work with the other kinds of memory. This leaves less room in main memory for the rest of the program and for data areas. The saying "You need money to make money" could be adapted as "You need memory to get memory." For this reason:

✔ In the Utilities **Copy Disk** option, the Memory Manager requires more than 128K of memory built into the computer in order to access additional memory.

✔ All of the programs included in Copy II Plus require 128K minimum RAM. However, all of the programs can take advantage of extra memory through the Memory Manager.

Large Memory Boards

The Utilities program supports the use of extra memory cards as ProDOS RAM disks. Memory cards that plug into or are assigned to a numbered slot don't need any special setup, because the card itself contains the special ROM code that lets ProDOS (and Copy II Plus) recognize it as a RAM disk. Examples of numbered slot memory cards are:

- Apple 1 meg Memory Expansion Board
- Applied Engineering RAMFactor board
- Laser 128EX internal slot 5 memory expansion
- Apple IIc (newer versions) internal slot 4 memory expansion
- Apple IIGS Control Panel RAM disk

Memory cards that are auxiliary slot based need to be set up before Copy II Plus can work with them. This is because these cards are simply large memory boards and mean nothing to ProDOS unless a RAM disk driver program is first installed to make the memory look like a RAM disk. Examples of auxiliary slot based memory cards are:

- Applied Engineering RAMWorks board
- CheckMate Technology MultiMate board
- Applied Engineering Z-RAM board for the IIc.

These auxiliary slot memory boards come with a setup or utility disk. One of the programs on the disk creates the RAM disk driver. To use the memory board as a RAM disk, you first need to run this program to install the RAM disk driver into ProDOS. Once this is done, the memory now appears to ProDOS as a large RAM disk. ProDOS and Copy II Plus will now treat the RAM disk as any ProDOS compatible disk. These RAM disks appear as slot 3 drive 1 or slot 3 drive 2,

depending on the particular installing program. They are not disconnected by Copy II Plus, unlike ProDOS's small slot 3 drive 2 RAM disk. If you see /RAM disconnected in the drive display, that is the ProDOS small RAM disk, not the large one set up by your installation program.

If you want to keep the large RAM disk intact, you should not press CONTROL-APPLE-RESET to cold boot another disk. If you do this, the RAM disk installation you did will be lost and you will have to run the memory board set up program again. You should run or switch to whatever ProDOS application you want to use next.

Appendix G: Drive and Slot Combinations

There are many configurations of Apple II and compatible systems in use. With the advent of 3.5" drives, RAM disks, and ROM disks comes a bewildering array of choices in how your particular system views the drives you have connected to it. The following tables shows how Copy II Plus views the various configurations of computers and the drives that are attached to them.

Apple IIe with Disk Controller card in Slot 6:

The Apple IIe views the drives in the actual slot they reside in. In most configurations, this would be a 5.25" drive in Slot 6 which would be Drive 1. A second 5.25" drive connected to that same card would be Slot 6, Drive 2. A 3.5" drive in slot 5 would be seen as Slot 5, Drive 1. A hard disk in slot 7 would be Slot 7, Drive 1, etc.

Apple IIc (Enhanced with UniDisk support)

Internal 5.25" drive:	Slot 6, Drive 1
External 5.25" drive:	Slot 6, Drive 2
External 3.5" UniDisk drive:	Slot 5, Drive 1

Apple IIc+

Internal 3.5" drive:	Slot 5, Drive 1
External 5.25" drive:	Slot 6, Drive 1
External 3.5" drive:	Slot 5, Drive 2

Laser 128 with ROM versions below ROM 4.0

Internal 5.25" drive:	Slot 6, Drive 1
External 5.25" drive:	Slot 6, Drive 2

Laser 128 and 128EX with ROM versions 4.0 to 5.x

Internal 5.25" drive:	Slot 6, Drive 1
External 5.25" drive:	Slot 6, Drive 2
External 3.5" drive:	Slot 7, Drive 1

Laser 128, 128EX, and 128EX/2 with ROM version 6.0 and above (Has daisy chain ability)

Internal 5.25" drive:	Slot 6, Drive 1
External 5.25" drive:	Slot 6, Drive 2
External 3.5" drive (first one)	Slot 7, Drive 1
External 3.5" drive (second one)	Slot 7, Drive 2

Apple IIGS

The GS offers a wealth of combinations in part due to its flexibility with the SmartPort. The following combinations are by no means definitive, but merely some of the most commonly seen.

RAM disk mapped as the boot device	Slot 5, Drive 1
1st 3.5" drive	Slot 5, Drive 2
2nd 3.5" drive	Slot 2, Drive 1
1st 5.25" drive	Slot 6, Drive 1
2nd 5.25" drive	Slot 6, Drive 2

RAM disk (NOT the boot device)	Slot 5, Drive 2
1st 3.5" drive	Slot 5, Drive 1
2nd 3.5" drive	Slot 2, Drive 1
1st 5.25" drive	Slot 6, Drive 1
2nd 5.25" drive	Slot 6, Drive 2

1st 3.5" drive	Slot 5, Drive 1
2nd 3.5" drive	Slot 5, Drive 2
1st 5.25" drive	Slot 6, Drive 1
2nd 5.25" drive	Slot 6, Drive 2

If you have a hard disk connected to your computer that has been partitioned into several volumes, Copy II Plus will only "see" the first two partitions, considering them as Slot x, Drives 1 and 2. This is a limitation of ProDOS 8 and not of Copy II Plus.

Appendix H: Technical Support

Central Point Software is backed up by a technical support staff trained to provide you with fast, courteous service. If you need assistance beyond what the manual can provide, please write or call us with the information listed in the Technical Support Checklist below.

Mail

Write to: Central Point Software, Inc.
15220 NW Greenbrier Pkwy., Suite 200
Beaverton, OR 97006
Attn: Technical Support

FAX

You can also FAX the information about your problem.
Our FAX number : (503) 690-8083

Phone

(503) 690-8080.
Dial 1 then extension 5708 anytime after the automated attendant has answered; you do not need to listen for the message to be completed. Our business hours are 8-5 PST, Monday-Friday.

It would help if you called from a phone next to the computer you're having problems with. Your computer should be turned on and ready to go.

Bulletin Board System

For the latest Copy II Plus updates and new information, dial into our BBS. The phone number is (503) 690-6650.

Technical Support Checklist

Before contacting Central Point Software for technical assistance, please try to recreate the problem to provide us with an exact sequence of events. If the problem reoccurs, contact us by mail, FAX, or phone with the following information:

❑ 1. Central Point Software product: The name and version # of Copy II Plus you are having difficulty with.

- ❑ 2. System Information: Please include this information, along with the computer brand and model, in your written correspondence or have it accessible when contacting us by phone.

- ❑ 3. Disk drives: The brand names, sizes, partition sizes and partitioning software.

- ❑ 4. Additional hardware: The brand names of additional hardware installed in your computer (particularly specialty video cards, memory boards, turbo boards, etc.).

- ❑ 5. Errors: Write down the exact wording of any error messages received from Copy II Plus.

Appendix I: ProDOS Error Codes

For your convenience, we have included this list of ProDOS error codes that may occur while using Copy II Plus.

Number	Message and Description
$01	**Invalid call number:** A nonexistent command has been sent.
$07	**ProDOS is busy:** The call cannot be made because ProDOS 16 is doing another call.
$10	**Device not found:** There is no device connected with the given name.
$11	**Invalid device request:** The given device name or reference number is not in ProDOS 16's list of connected devices.
$25	**Interrupt vector table full:** The maximum number of user-defined interrupt handlers (16) have been used.
$27	**I/O error:** A hardware failure has prevented correct data transfer to or from the disk. This can cover many conditions.
$28	**No device connected:** There is nothing in the slot and drive specified by the given number.
$2B	**Write-protected:** The specified volume has the write protect notch covered. No writing can be done to this disk.
$2D	**Invalid block address:** An attempt was made to read data from a RAM disk, at an address beyond its limits.
$2E	**Disk switched:** The disk containing the open file has been removed from its drive.
$2F	**Device not on line:** A device specified in a call is not connected to the system.

$30-$3F	**Device specific errors:** These can vary depending on the individual device drivers.
$40	**Invalid pathname or device name syntax**: The specified name contains illegal characters.
$42	**FCB table full:** The table of file control blocks is full. You may not open another file. (Limit is 8)
$43	**Invalid file reference number:** The specified number does not match any currently open file.
$44	**Path not found:** A subdirectory name in the pathname does not exist.
$45	**Volume not found:** The volume name in the specified pathname does not exist.
$46	**File not found:** The last file in the specified pathname does not exist.
$47	**Duplicate pathname:** An attempt has been made to create or rename a file with a name already in use.
$48	**Volume full:** An attempt to allocate blocks on a disk failed due to lack of space.
$49	**Volume directory full:** No more space for entries is left on the volume directory.
$4B	**Unsupported (or incorrect) storage type**: Seen only on GS/OS extended files.
$4C	**End-of-file encountered (out of data):** A read has been attempted, but the current file position is equal to the end of the file and no further data can be read.
$4E	**Access not allowed:** One of the attributes in the specified file's access bytes blocks the attempted operation (writing, reading, etc.)
$50	**File is open:** An attempt has been made to perform a disallowed operation on an open file.

$51	**Directory structure damaged:** The number of entries in the directory header does not match the actual number of directory entries.
$52	**Unsupported volume types:** The specified volume is not recognized by ProDOS.
$54	**Out of memory:** A ProDOS 8 program is too large to fit into the memory space available for ProDOS 8 applications.
$55	**VCB table full:** The maximum number of on line devices (8) has been reached.
$56	**File buffer invalid**
$57	**Duplicate volume:** Two or more on line volumes have identical volume directory names.
$5D	**Operating system/file system not available:** The ProDOS 8 operating system is not on the system disk.

Memory Manager Errors

$80	Memory Manager wasn't closed properly.
$81	Out of memory error.
$82	I/O error.
$83	Memory Manager handle overwritten (GS only.)
$84	No memory in system.
$88	**AppleTalk** error message that appears if you have a network and are trying to access a hard drive.

Appendix J: Other CPS Products

Central Point Software also sells these other disk utility and software backup products:

PC Tools Deluxe is our complete DOS utility package for the IBM PC and nearly all compatible computers. PC Tools Deluxe combines all the popular features of the Norton Utilities, Fastback, XTREE, Mace, Sidekick and Disk Optimizer. When it comes to managing and protecting your data, nothing does it better than PC Tools Deluxe. It includes file undeletion, PC Format, PC-Cache, a disk optimizer, file encryption, PC Shell, and PC Backup. In fact, if you have a Deluxe Option Board installed, PC Backup will automatically utilize it during DMA backups using unformatted disks, thus increasing the backup speed by 20-40%. Also included is a complete memory resident desktop manager with a word processor, outliner, database with autodialer, appointment scheduler with alarms, keyboard macros, and financial, algebraic, and programmers' calculators. **PC Tools Deluxe** works with virtually all IBM compatibles with at least 256K of memory. ($129.00*)

Deluxe Option Board uses the same disk duplication technology used by software duplication firms who put the protection on in the first place. There is virtually no protection method the Deluxe Option Board cannot handle (except those protected by physically altering the disk.) The Deluxe Option Board also makes it easy for PCs to trade data files with Macintoshes. With the Deluxe Option Board installed, your PC's internal 3.5" drive is transformed into a dual purpose Macintosh/IBM compatible drive. ($159)

PC Tools Deluxe for the Macintosh offers a complete utility package for all Macintosh computers. Features include hard disk backup, data recovery, file encryption, track and block editor, fast disk copy, and disk optimizing.

Copy II PC is the most complete copy program available for the IBM Personal Computer. It backs up most protected disks with no parameter changes, and uses all available memory to make reliable copies fast. You can also run popular software such as Lotus 1-2-3 and Symphony from your hard disk without inserting the original floppy disk. Copy II PC includes a disk speed test to help keep your drives in top running order. For IBM PC, XT, AT, 256K jr. ($39.95)

Copy II for the Apple Macintosh is a disk backup and utility package for Macintosh computers. Combining all the most needed functions, Copy II will let you make archival backups of your protected software easily. No parameters are needed.

Copy II Plus

Copy II also includes our powerful utility program MacTools. MacTools can recover some damaged disks and undelete files. It will also display all files on a disk, including invisible files, and will let you make them visible again. You can mark any file as protected, unprotected, locked, or unlocked. Its block editor shows you what is inside any Macintosh file, and allows you to change it. Our Copy II HARD DISK application, also included on the disk, can copy many popular protected programs onto a hard disk. ($39.95)

Copy II 64/128 is the disk backup and utility program for the Commodore 64 and 128 computers. Copy II 64/128 makes reliable backups of nearly all copy-protected Commodore software. It also includes powerful utilities such as copy, recover files, protect and unprotect files, format, disk error checker, block allocation mapping, and validation of disks. ($39.95)

We update our software products regularly to handle new protection methods. Updates are always available to you as a registered owner at a reduced price. Protection methods do change frequently so it is a good idea to double check with us if you need to back up a brand new release of one particular program. For more information on our products, call or write:

Central Point Software Inc.
15220 NW Greenbrier Parkway, #200
Beaverton, Oregon 97006

(503) 690-8090

*Effective May 1, 1989. All prices subject to change without notice.

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COPY II PLUS
VERSION 9

INTRODUCING COPY II® PLUS VERSION 9! The most complete Apple II utility product available. Includes utilities to help you recover accidentally deleted files, compare files, alphabetize and sort your catalog, select and run applications directly from the main menu, format disks, verify drive speeds, and make archival backups of copy protected and unprotected software.

EASY INTERFACE. Copy II Plus's interface makes it a snap to use. Simply choose a "key" letter or scroll the menu with the mouse to select any function. You can also select files with the mouse. Mouse support includes both ProDOS and DOS.

MAKE GETTING WHERE YOU'RE GOING EASIER. Copy II Plus will allow you to select ProDOS applications from within the program and run them. You can also edit the application listing to suit your needs, not someone else's. And when you're finished with the application, you'll automatically return to Copy II Plus as if you just rebooted it.

PROTECT YOUR SOFTWARE INVESTMENT. Make backup copies of protected and unprotected programs. Hundreds of new parameters have been added to the program. They are easy to use; simply select the program you wish to backup, insert the source and target diskettes and you're off!

COMPARE FILES BYTE FOR BYTE. You can see any differences between two files, keep track of the total number of mismatched bytes and get a screen display of that information. Support for comparing DOS 3.3 files or ProDOS files.

MAP YOUR DISKS AND DEVICES. Copy II Plus supports disk mapping of any 5¼" and any ProDOS device.

MAKE YOUR CATALOG SUIT YOUR NEEDS. Now you can alphabetize and sort your catalog and put it in any order that makes sense for you.

EVERYTHING YOU ALWAYS WANTED. Whether you're a novice or an experienced computer user, you'll find Copy II Plus has a utility for you. From sector editing to performing disk and drive diagnostics to undeleting files, the capability is there.

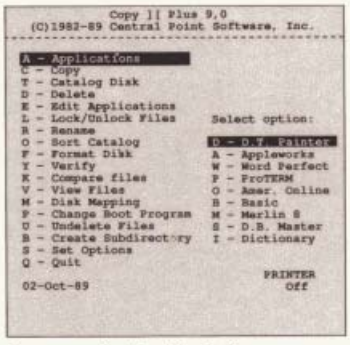
You'll find the Copy II Plus manual and program easy to read, easy to follow and most of all, easy to understand.

REQUIREMENTS: Enhanced Apple IIe, all IIc series, all IIGS series or all Laser 128 series. Must have 80 column card, 128K memory and 1 disk drive. Supports any ProDOS compatible RAM board. 3½" Apple Unidisk drives and Apple IIc+ internal drives do not support bit copy program.

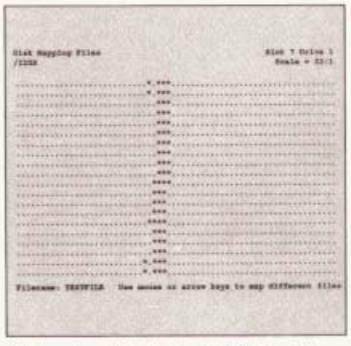
Copy II is a registered trademark of Central Point Software.
Apple IIe, IIc and IIGS are trademarks of Apple Computer, Inc.

Central Point Software INC
(503) 690-8090
15220 N.W. GREENBRIER PKWY. #200, BEAVERTON, OREGON 97006

Sort your catalog any way you like– alphabetically or by file type.



Run an application directly from Copy II Plus.



Find out exactly where your file is using the Copy II Plus disk map.