

Elite Series
User Manual



RanaSystems[™]

ELITE SERIES USER MANUAL

RanaSystems



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0.0 INTRODUCTION

Congratulations! Now that you have bought one of the totally new Elite Series products, you have done more for your Apple than Apple could do.

If you are an Elite Controller card user, you'll find it is designed specifically to solve one of the major problems sophisticated Apple II users have these days: too many cards, not enough slots. The Elite Controller's ability to handle four drives from just one slot provides a perfect solution. And in addition, if you have a library of diskettes which go back to the ancient 13-sector DOS days, the Elite Controller allows you to autoboot these diskettes without any awkward pre-boot diskettes or controller card jumpers.

If you are an Elite Series drive user, the high capacity of your new drive will immediately help you to obtain the maximum efficiency from your existing Apple II hardware and software.

Holding more information is even more valuable when you can get to it faster, so your new drive has engineered into it a head positioning mechanism that positions up to three times faster across the diskette with greater accuracy than Apple's.

We at RANA know that modern business and professional needs have outstripped many of the early Apple designs but our cost effective improvements make the sophisticated Elite Series Products less expensive to run in the comparisons which count: price per kilobyte of drive storage and expandability per controller card purchased.

We are proud of the Elite Series, and we know you will be too.

To achieve the best results and the most enjoyment from your new Elite Product, we suggest you read this manual carefully.

We have tried to avoid including too many technicalities but, if you feel we have gone beyond what you require, please bear with us. Like we said, we are proud of our products too!

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Rana Systems Part Number 13-0010-001

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1. INSTALLATION**1.1. Unpacking**

During unpacking, care should be taken to ensure that all tools are non-magnetic and do not inflict damage to the unit. Carefully unwrap the package and save the material which will be useful in the future for protection during storage or travel.

Before attempting to use an Elite disk drive, check for a protective shipping diskette inside the drive. Elite One drives do not require a protective diskettes, so there may or may not be one in the drive.

NOTE: Before connecting or disconnecting ANY equipment TURN OFF ALL COMPUTER AND PERIPHERAL POWER.

1.2. Connecting Drive Cables

A flat ribbon cable is already connected to your Elite Series or Disk II disk drive(s). The other end of these cables must be connected to your disk controller card. For you first drive, connect the drive to the upper set of pins. Be sure to orient pin one on the connector with pin one on the controller card. Pin one on the connector is marked with a small arrow. Pin one on the controller card is numbered.

If this connection is incorrectly made, considerable damage may be done to the electronics of both the drive and the controller. Be sure to make the connection BEFORE installing the controller card into the Apple motherboard.

If you are installing a second disk drive, you should connect the ribbon cable from the second drive onto the next set of pins down on the controller card marked "DRIVE 2", taking the same precautions as above.

If you are connecting and third (and fourth) drive to an Elite Controller, they would be connected to the third and fourth set of pins from the top down. Once again, be sure to orient pin one correctly.

1.3 Installing Your Controller Card

To install your controller card into the Apple, simply plug the card into any slot (except zero) in the back of the Apple II motherboard as follows:

1. With the power switch OFF, remove the top cover from the Apple II computer by lifting from the rear edge.
2. Choose a slot which would be correct for your application. Most packages which run under Apple DOS (or are protected from

copying) do not care which slot you use for your drives; however the more advanced operating systems (like CP/M and Apple Pascal) require that your first controller card be located in slot six. This has made slot six the "standard" slot for a disk controller card, so you should consider placing your controller in that slot.

3. Insert the gold covered "fingers" into the slot and GENTLY rock the controller card into a firmly seated position.

4. Adjust your ribbon cables so they pass easily out through the back of the computer through the vertical openings in the rear of the case.

5. If you wish to install a second controller card, the same procedure outlined above would be used; except the "standard" slot number for second controllers is slot five. A third controller would normally go in slot four.

6. Replace the lid, remembering to slide the front edge into the case first, then press down on the two rear corners until they pop into place.

7. Your Elite product is now installed and the Apple II can be turned on. Your disk drive(s) can be placed in a convenient location, usually along side or on top of the computer.

See figures 1.1 and 1.2 for correct cable connections to the Elite and Disk][controller cards.

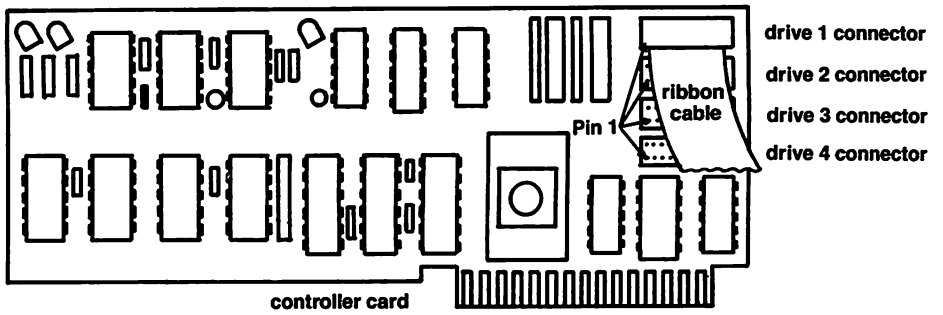


Fig. 1-1: Elite Controller Cable Connections

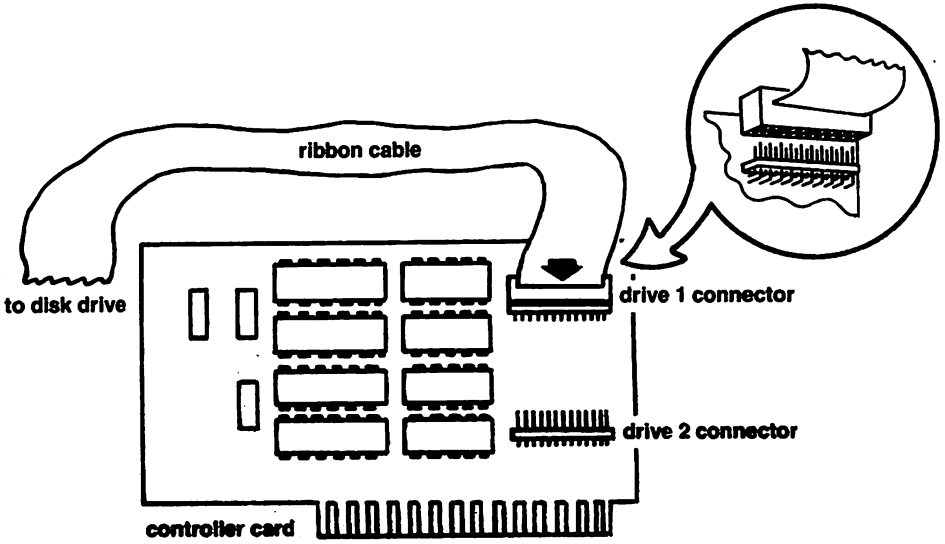


Fig. 1-2: Disk-II Controller Cable Connections

2. OPERATING

If the only Elite product you currently have is the Elite Controller, then this section probably won't be of much interest to you. Since the Elite Controller has no switches (13/16 sector booting is automatic) and we haven't supplied you with a slot in the card in which you could insert a diskette, there is nothing which you could "operate".

If you are a programmer who is interested in how to manipulate the controller card software-wise, such secrets are revealed later in this manual.

2.1. Elite Drives' Write-Protect Switch

Operating the Elite drives is identical to operating a Disk-II drive, except that the Elite drives have an extra write-protect switch which may require a little explaining.

Mounted on the upper front panel of an Elite drive is a touch-switch. By momentarily pressing the stripes labeled PROTECT, the write-protect status of the drive can be toggled on/off. The drive's write protect status is reflected by a small light next to the PROTECT switch.

The switch does not affect the write-protect status of a diskette which has been protected by covering the diskette's notch. Diskettes which are protected in this way are always considered protected regardless of the PROTECT switch.

Located next to the PROTECT switch is a small LED which, when on, indicates that the diskette is currently write-protected. This LED reflects write-protecting due to the switch or a tab on the diskette. An Elite drive will only permit writing on a diskette when this LED is off.

Due to the fact that the Elite Series drives were designed to operate identically to the Disk II drives in every way, the PROTECT LED will flicker whenever the Elite drive is seeking its read/write head from track to track and the drive is not in a write-protected state. This flickering is completely normal, and accurately reflects the write-protect status on both the Elite One and Disk II during head movement.

2.2. Recommended Diskettes

There are any number of diskette manufacturers on the market, each offering the "perfectly engineered" diskette. We do not intend to dispute any individual claim to this title.

However, in the jungle of literature there are certain features

which should be sought out. With the vast amount of technical data involved, it is not easy to locate the vital information.

There are a number of industry-standard tests which manufacturers will refer to with pride (assuming their product passes the tests) and these are useful pointers.

The best diskettes are those which give the most trouble-free recording, storage, and retrieval of information for the longest period of time. Look for those incorporating features which lead to minimum head abrasion and which shield the diskette from environmental hazards (like dust particles) in a strong, durable jacket.

The following table illustrates a number of diskette manufacturers which Rana Systems has found produce consistently high quality media. For advice on diskette care and handling turn to the section later in this manual headed Maintenance.

The following tables of diskettes include both soft and hard sectored diskettes. If you are familiar with diskettes required by non-Apple systems, this may puzzle you. Don't worry, the tables are correct. Apple uses a kind of "no sector" format in which the index hole(s) punched in the diskette (which is the difference between soft and hard sectored diskettes) is completely ignored.

Recommended Diskettes for the Elite One

	Soft Sec.	Hard Sec.	Hard Sec.
	Dbl. Dens.	16 Sec.	10 Sec.
	Sgl. Sided	Dbl. Dens.	Dbl. Dens.
		Sgl. Sided	Sgl. Sided
Dysan			
Part Nbr.	104/1D	107/1D	105/1D
Ord. Nbr.	801187	801014	801188
Maxell			
Part Nbr.	MD1-M	MH1-10M	MH1-16M
Maxell does not use independent order numbers.			
Verbatim			
Part Nbr.	MD525-01	MD525-10	MD525-16
Ord. Nbr.	18158	18167	18176

Recommended Diskettes for the Elite Two

	Soft Sec.	Hard Sec.	Hard Sec.
	Dbl. Dens.	16 Sec.	10 Sec.
	Sgl. Sided	Dbl. Dens.	Dbl. Dens.
		Sgl. Sided	Sgl. Sided
Dysan			
Part Nbr.	104/2D	107/2D	105/2D
Ord. Nbr.	802060	802062	802061
Maxell			
Part Nbr.	MD2-DM	MH2-10DM	MH2-16DM
Maxell does not use independent order numbers.			
Verbatim			
Part Nbr.	MD550-01	MD550-10	MD550-16
Ord. Nbr.	18188	18197	18206

Recommended Diskettes for the Elite Three

	Soft Sec. Dbl. Dens. Sgl. Sided	Hard Sec. 16 Sec. Dbl. Dens. Sgl. Sided	Hard Sec. 10 Sec. Dbl. Dens. Sgl. Sided
Dysan			
Part Nbr.	204/2D	207/2D	205/2D
Ord. Nbr.	802067	800455	802066
Maxell			
Part Nbr.	MD2-DDM	---	---
Maxell does not use independent order numbers.			
Verbatim			
Part Nbr.	MD557-01	MD557-10	MD557-16
Ord. Nbr.	18239	18248	18257

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3. ENHANCING APPLE'S APPLE II DOS 3.3

Rana Systems' Enhancements for Apple's Apple II DOS 3.3 allow automatic accessing of 4 drives from the Rana Elite Controller Card and the additional capacity of the Elite Disk Drives. The Controller Card is capable of addressing any combination of Apple Disk II and Rana Elite Series Drives. The PROFILE program sets up DOS (Disk Operating System) to recognize which drives are Rana Elite Drives and which are Apple Disk II drives. The seek rate can also be increased by the PROFILE program to take advantage of the increased speed of Rana drives.

The enhancements made by the ENHANCE utility only apply to a master DOS diskette. Non-master diskettes (slave diskettes) are what are created when the DOS "INIT" command is used to initialize a new diskette. The copy of DOS which is placed on such a diskette is not ENHANCE-able. Even though a diskette may say it is a "master" when it is booted, it may not actually be one. The program which says the diskette is a master is completely independent of the DOS itself, and can be copied or saved (by an "INIT" command, for instance) onto a slave DOS diskette.

Those DOS 3.3 diskettes supplied directly from Apple are all master DOS diskettes. In addition, any diskette which is a copy of an Apple DOS 3.3 distribution diskette, made using the Apple COPY or COPYA utility will also be a system master diskette. These instructions will assume you are using your original DOS 3.3 distribution diskette from Apple; but if you've made a backup copy of it, the backup copy can also be used.

The Rana DOS Enhancements Diskette does not contain a copy of DOS and will not boot DOS into the computer. However, certain areas of the diskette are initialized in a DOS format, allowing those DOS programs on the Enhancer diskette to be run once the system is booted from a DOS master. The Rana Elite Enhancements Disk will be used to create a new enhanced DOS master diskette. The system tracks from this diskette can then be used to create any number of additional DOS system diskettes that utilize the desired Rana features, but don't have all the DOS utilities and demonstration programs occupying the space the you can put to better use.

The following steps will guide you in creating your enhanced DOS master and demonstrate some of the functions of the Rana enhancement utilities. The additional features of these utilities and a detailed discussion of their operation is contained in a later section of this manual. Since the time required to perform the following enhancement process does not alter much between using multi-drives or just one drive, only a single drive approach to enhancing has been described.

These instructions detail a very specific approach to creating an enhanced DOS for any valid combination of Elite drives, Elite Controllers, Disk II drives, and Disk II controllers which any

user can possibly dream up. This places upon these instructions an almost impossible task, considering the vivid imagination of many users.

These instructions have been written in a step-by-step manner, with some explanation of what is being done at each step. All of these instructions have been tested at Rana to confirm that they are correct. In addition, several "early release" and later users also confirmed the accuracy of these instructions. Therefore, there is no reason for you not having complete success following these instructions. That is, if you follow the instructions completely, step by step. You are encouraged to read these instructions completely, all the way through, before starting the procedure. That way you will have a general understanding of what all is involved before "diving in".

The first thing to do is to "dig up" your DOS 3.3 master diskette which has Apple's MASTER CREATE utility on it. (If you're a CP/M or Pascal user, you'll find your DOS diskettes buried in the bottom left hand corner of the closet, on top of the DOS 3.2.1 diskettes.)

These instructions are going to assume that you have your (first) controller card in slot six, and your (first) drive attached as drive one (you won't get very far having your only drive connected as drive two). If your drive is not connected in this manner, and you are not an old hand at using Apple DOS, then you should probably rearrange your system into this configuration for the duration of the enhancing procedure.

Slot six is the normal location for your first controller, so unless you have something which conflicts, it is suggested that you leave your system in a "slot six" configuration. (The DOS enhancements and associated utilities themselves won't care, but it will make things easier when following these instructions.) Drive one off of slot six will be referred to as your system, or boot drive.

Remove all diskettes from your drives, and then turn on your system. If your Apple is equipped with the autostart feature (most are), your system drive (slot six, drive one) should rattle a little and then sit there quietly spinning. If you do not have the autostart feature, then your Apple will simply display an asterisk ("*") and wait for you to type something. That "something" should be:

6<CTRL-P><RETURN>

Whenever these instructions need to refer to keys (to be typed) which are labelled with more than just a single character (such as: A, B, C, &, \$, etc.), the key label will be enclosed in angle brackets. For example, <RETURN> indicates that the "RETURN" key should be pressed. Some special characters require that one key be held down while another is pressed. For example, <CTRL-P>

means to hold down the <CTRL> key while pressing the "P" key. This is just like holding down the <SHIFT> key in order to type "§".

After the "6<CTRL-P><RETURN>" sequence is typed on a non-auto-start Apple (the <CTRL-P> part won't show on the screen), your system drive should rattle for a moment and then sit there quietly spinning.

In both cases, the drive will end up waiting for you to insert a diskette; so indulge it by inserting your DOS master diskette (not the Enhancer diskette). Once the door is closed, the system will "boot" (if the diskette is okay) and eventually display a "J" or ">" prompt. The first indicates you are in Applesoft BASIC, and the second indicates you are in Integer BASIC. Both are okay for these instructions. When booting an original DOS diskette from Apple, a lot of other stuff will probably happen before you get the BASIC prompt. This just means that the "hello" program has executed (harmless). If you never get the BASIC prompt ("J" or ">"), it may be wise to try another diskette.

Once you get the BASIC prompt, type:

```
CATALOG<RETURN>
```

and DOS will list all the files on your DOS diskette.

Look through the list and locate the file "MASTER CREATE". If CATALOG stops before another BASIC prompt appears, that means there are more files than will fit on the screen. Press:

```
<RETURN>
```

to see more of the list. If MASTER CREATE is not on the diskette, you are not using an original Apple DOS 3.3 distribution diskette (or an exact copy of one). You will need to start over again using another diskette which does have MASTER CREATE on it.

Once you've found MASTER CREATE, skip through the rest of the catalog listing (if there is more), by pressing:

```
<RETURN>
```

until the BASIC prompt shows up again.

Now, you will need two diskettes (one now, one later). If you are using an Elite Two or Elite Three drive as your system drive, you should consult the tables of recommended diskettes provided elsewhere in this manual. If you are planning on making an Elite Three your system (boot) drive, then you will also need two additional diskettes for later. If you plan on using diskettes which already contain some information, remember that all that existing information will be completely lost. (Don't use those diskettes

containing all your accounting records, please!)

Once you've got one of the two/four diskettes in hand, remove the DOS diskette from the system drive (using the other hand) and insert the new diskette. Unless your second drive is the same type as your system drive and you know for sure what you are doing, then don't try to use your second drive right now. Just to be safe, remove any other diskettes from any other drives. With the new diskette in the system drive, type:

```
INIT HELLO<RETURN>
```

and DOS will INITIALize the diskette. The drive will rattle and spin for less than a minute, and then the BASIC prompt should reappear. The last thing INIT did was save a copy of whatever program was in memory during the INIT out onto the diskette. You should get rid of this program by typing:

```
DELETE HELLO<RETURN>
```

If you are using an Elite Three as your system drive, you will need to repeat this process on a second diskette. Insert another one of your four new diskettes into the system drive and type (Elite Three only):

```
INIT HELLO<RETURN>
```

After you get back the BASIC prompt, type (Elite Three only):

```
DELETE HELLO<RETURN>
```

Once the BASIC prompt is redisplayed, remove the new diskette from the drive and reinsert the DOS diskette. Type (all drive types):

```
BRUN MASTER CREATE<RETURN>
```

Once DOS has loaded MASTER CREATE off the diskette, MASTER CREATE will display:

```
DOS 3.3 MASTER-CREATE UTILITY  
COPYRIGHT 1980 BY APPLE COMPUTER INC.  
ALL RIGHTS RESERVED
```

```
(NOW LOADING DOS IMAGE)
```

After MASTER CREATE has loaded a copy of the master DOS into memory from the diskette, it will ask for the "hello" file name:

```
PLEASE INPUT THE GREETING PROGRAM'S  
FILE NAME:
```

Your response should be:

HELLO<RETURN>

MASTER CREATE will come back with:

REMEMBER THAT MASTER DOES NOT CREATE
THE GREETING PROGRAM, OR PLACE IT IN
THE DISK DIRECTORY

THIS IS THE FILE NAME THAT WILL BE
PLACED WITHIN THE IMAGE:

HELLO

PLACE THE DISKETTE TO BE MASTERED IN
THE DISK DRIVE.

PRESS [RETURN] WHEN READY

NOTE: IF YOU WANT A DIFFERENT FILE NAME,
PRESS [ESC]

Since you won't care about having the "hello" program created for you, simply remove the DOS diskette from the drive and insert (one of) the diskette(s) you just INITIALIZED. Type:

<RETURN>

and MASTER CREATE will "master" your new diskette.

When it is finished, it will respond with:

THE DISKETTE HAS BEEN UPDATED, YOU MAY
REMOVE IT AT THIS TIME.

IF YOU WISH TO "MASTER" ANOTHER DISK-
ETTE, PRESS [RETURN].

OTHERWISE PRESS [ESC] TO EXIT "MASTER"

If your system drive is an Elite Three, put the other INITIALIZED diskette in the drive and type (Elite Three only):

<RETURN>

MASTER CREATE will then ask you to enter the greeting program's name again, so you should again type (Elite Three only):

HELLO<RETURN>

After which, MASTER CREATE will ask you to press <RETURN> again to "master" the disk, press (Elite Three only):

<RETURN>

MASTER CREATE will again tell you when its finished.

No need to remove the diskette. Since no more is required of MASTER CREATE, just type (for all drives):

<ESC>

and you will get:

INSERT A SYSTEM DISKETTE AND PRESS
[RETURN] TO REBOOT DOS

So, of couse, type:

<RETURN>

and your new DOS master will be magically booted for you.

Now for a little enhancing. Remove the DOS master from the drive and insert the Rana Systems Enhancer Diskette. When it's in, type:

BRUN ENHANCE<RETURN>

Once loaded, ENHANCE will respond with:

ENHANCE
RANA SYSTEMS' ENHANCER FOR
APPLE'S APPLE][DOS VERSION 3.3
COPYRIGHT (C)(P) 1982 RANA SYSTEMS
ENHANCER VERSION 2.0
ENHANCEMENTS VERSION 2.0

INSERT DOS 3.3 SYSTEM MASTER DISK INTO
SLOT #6, DRIVE #1. PRESS <RETURN> WHEN
READY TO READ DOS IMAGE INTO MEMORY.
PRESS <ESC> TO TERMINATE THIS UTILITY.

(You may have more up to date version numbers.)

Remove the Enhancer diskette and insert your newly created DOS master. Type:

<RETURN>

and ENHANCE will copy the master DOS into memory and apply the necessary enhancements to it. ENHANCE will then display:

INSERT DISK TO RECEIVE ENHANCED DOS 3.3
INTO SLOT #6, DRIVE #1. PRESS <RETURN>
WHEN READY TO WRITE ENHANCED DOS IMAGE.
PRESS <ESC> TO TERMINATE THIS UTILITY.

Since you will be enhancing the newly created DOS master, which is already in the drive, just type:

<RETURN>

and ENHANCE will replace the "stupid" DOS on the diskette with the enhanced "smart" DOS.

After the replacement has been made, ENHANCE will display:

ENHANCEMENTS COMPLETE. REBOOT THE
SYSTEM TO LOAD THE ENHANCED DOS 3.3.

This message will be followed by the BASIC prompt.

The disk which you just enhanced should be labelled "configured enhanced system master" so that it will be distinguishable from the other disk you will need to create.

If your system drive is an Elite Three, you will also need to enhance the other INITIALized diskette. Insert the Enhancer diskette and type (Elite Three only):

BRUN ENHANCE<RETURN>

Once ENHANCE has displayed its message, insert the other INITIALized diskette and press (Elite Three only):

<RETURN>

to tell ENHANCE to go ahead and read a copy of DOS off of that diskette.

ENHANCE will then tell you when it is ready to write the modified DOS back out to the diskette, and wait for you to press <RETURN>. Go ahead and press (Elite Three Only):

<RETURN>

When done, ENHANCE will again return you to the BASIC prompt. This second enhanced diskette should be labelled "unconfigured enhanced system master" (Elite Three only).

Place (or leave) "configured master" in the drive, then type (all drives):

PR#6<RETURN>

To reboot your Apple using the enhanced DOS.

Once again, the drive will rattle and spin for a moment; and then you will get:

FILE NOT FOUND

This message occurred because you deleted the hello file from the diskette earlier during these instructions. That way, these instructions didn't have to deal with any "strange" hello program you may have had on the diskette.

You are now running under an enhanced DOS 3.3 system master. It already will recognize the extra drives on an Elite Controller (if you are using one). However, it is still treating all your drives as Disk II's (the minimum case).

The next step is to create an enhanced system master which has the full storage of the drive you are using as your system drive (slot six, drive one). If all you have are Disk II drives, you should continue following this procedure in order to make a complete enhanced system master (new utilities, etc.).

Remove the "configured master" and insert the Enhancer diskette. Type:

```
BRUN PROFILE<RETURN>
```

PROFILE will respond with:

```
PROFILE V2.1 COPYR.(C)(P)1982 RANA SYS.
```

```
FROM WHICH SLOT AND DRIVE  
IS DOS IMAGE TO BE LOADED?
```

```
ENTER SLOT NUMBER (1-7) :
```

Remove the Enhancer diskette and insert "configured master". Type (without <RETURN>):

```
6
```

and PROFILE will then ask:

```
ENTER DRIVE NUMBER (1-4) :
```

so type (without <RETURN>):

```
1
```

PROFILE will then respond with:

```
INSERT AN ENHANCED DOS 3.3 SYSTEM  
MASTER DISKETTE INTO SLOT #6, DRIVE #1.  
PRESS <RETURN> WHEN READY TO READ DOS  
IMAGE INTO MEMORY. PRESS <ESC> IF LOAD  
NO LONGER DESIRED.
```

Go ahead and type:

<RETURN>

PROFILE will then read the DOS image off of "configured master" and display a table containing each of the 28 different positions at which drives can be placed on the Apple (seven slots with up to four drives per slot using Elite Controllers). The table will contain all "DISK2S" entries. Each entry is made up of two different parts. The first five characters are the drive type:

```
DISK2 = Apple Disk ][
ELIT1 = RANA Elite One
ELIT2 = RANA Elite Two
ELIT3 = RANA Elite Three
```

The last letter is the speed at which the drive is seeking from track to track:

```
S = Slow (Disk ][ standard)
M = Medium (Elite One standard)
F = Fast (Elite Two and Three standard)
```

Below the table, the following menu will be displayed:

```
ENTER SELECTION (0-3) :
  1) LOAD NEW DOS IMAGE FROM DISK
  2) CHANGE CURRENT DOS IMAGE SETTING
  3) SAVE CURRENT DOS IMAGE TO DISK
  0) TERMINATE PROFILE
```

For now, you'll just need to change the setting for drive one off of slot six (your system drive), so type (without <RETURN>):

2

in order to change a setting. PROFILE will then ask:

```
ENTER SLOT NUMBER (1-7) :
```

so type (without <RETURN>):

6

and PROFILE will respond with:

```
ENTER DRIVE NUMBER (1-4) :
```

So type (without <RETURN>):

1

Now that you've told PROFILE which drive's setting to change, it'll need to know what is to be the new setting; so it will display:

```
ENTER DRIVE TYPE (0-3) : 0
0) APPLE DISK-II ( 35 TRACKS)
1) RANA ELITE ONE ( 40 TRACKS)
2) RANA ELITE TWO ( 80 TRACKS)
3) RANA ELITE THREE (160 TRACKS)
```

PROFILE "pre-loads" your answer with the current setting for the drive (0=DISK-II). If you just hit <RETURN> (don't!), PROFILE will not change the setting. But, you want to change the setting (unless you're actually using an Apple Disk II drive!), so type the number for the menu item which matches your system drive (without <RETURN>).

For example, if you have an Elite One, type:

1

or, for an Elite Two, type:

2

or, for an Elite Three, type:

3

or, if you're stuck with a Disk II, type:

0

PROFILE will then ask for the seek speed of the drive:

```
ENTER SEEK SPEED (0-2) : ?
0) SLOW (DISK-II AND ELITE SERIES)
1) MEDIUM (ELITE SERIES ONLY)
2) FAST (ELITE TWO AND THREE)
```

The "?" in the example will be the "pre-loaded" answer (default) for the type of drive you specified on the previous menu. The default will be the maximum possible seek speed for the drive model specified. Now is not a good time to fiddle with seek speeds (you'll just complicate matters), so just type:

<RETURN>

to use the default.

PROFILE will then update the configuration table displayed at the top of the screen. It should now show the correct setting for your system drive. At the bottom of the table, you will again get:

ENTER SELECTION (0-3) :

- 1) LOAD NEW DOS IMAGE FROM DISK
- 2) CHANGE CURRENT DOS IMAGE SETTING
- 3) SAVE CURRENT DOS IMAGE TO DISK
- 0) TERMINATE PROFILE

PROFILE has only made your change to the copy of DOS it is holding in its storage areas. No changes have been made to any diskette copy or the copy which is running in memory. In order to make use of the change, it will have to be written to a diskette. To do this, type (without <RETURN>):

3

and PROFILE will respond with:

ENTER SLOT NUMBER (1-7) :

Since "configured master" should still be in your system drive, type (without <RETURN>):

6

and PROFILE will say:

ENTER DRIVE NUMBER (1-4) :

so type (without <RETURN>):

1

PROFILE will then display:

```
INSERT FORMATTED DISKETTE TO RECIEVE
ENHANCED DOS 3.3 SYSTEM MASTER IMAGE
INTO SLOT #6, DRIVE #1. PRESS <RETURN>
WHEN READY TO WRITE DOS IMAGE FROM
MEMORY. PRESS <ESC> IF SAVE NO LONGER
DESIRED.
```

To update the diskette, type:

<RETURN>

and PROFILE will over-write the old enhanced DOS with the new one.

When it's finished, it will return to the menu:

ENTER SELECTION (0-3) :

- 1) LOAD NEW DOS IMAGE FROM DISK
- 2) CHANGE CURRENT DOS IMAGE SETTING
- 3) SAVE CURRENT DOS IMAGE TO DISK

Ø) TERMINATE PROFILE

Since you are finished with PROFILE for the time being, type (without <RETURN>):

Ø

and PROFILE will terminate after saying:

```
THIS UTILITY DOES NOT APPLY YOUR
CHANGES TO THE CURRENTLY OPERATING DOS
IMAGE, SO YOU WILL NEED TO BOOT THE
DISKETTE TO WHICH YOU SAVED YOUR
CHANGES IN ORDER TO USE THE NEW
CONFIGURATION.
```

This is a reminder that the "in-memory" (current operating) DOS has not been altered. Don't follow PROFILE's instructions! This newly configured diskette probably won't boot correctly. Following the termination message, the BASIC prompt will appear.

The reason why this newly configured DOS probably won't boot correctly is because you've told the DOS image on the diskette that your system drive is some special type of drive (assuming you're not using a Disk II). But the diskette upon which this DOS is written is not formatted for use by the special drive operating at its full capacity. The next step is to create a diskette which is correctly formatted.

Remove "configured master" and insert the Enhancer diskette. Type:

```
BRUN FORMAT<RETURN>
```

FORMAT will respond with:

```
FORMAT
RANA SYSTEMS' 16-SECTOR DOS 3.3
5-INCH DISKETTE INITIALIZING UTILITY.
COPYRIGHT (C) (P) 1982 RANA SYSTEMS
FORMATTER VERSION 2.1
```

```
INSERT AN ENHANCED DOS 3.3 SYSTEM
MASTER DISKETTE INTO SLOT #6, DRIVE #1.
PRESS <RETURN> WHEN READY TO READ DOS
IMAGE INTO MEMORY. PRESS <ESC> TO
TERMINATE THIS UTILITY.
```

Remove the Enhancer diskette and insert "configured master".

Type:

<RETURN>

and FORMAT will read in the DOS image from that diskette.

After the image is in memory, FORMAT will ask:

SLOT NUMBER (1-7)? 6

FORMAT is asking for the slot number of the drive to be used for formatting. Just like PROFILE, FORMAT has "pre-loaded" the message with the default response. Since the default is correct, type:

<RETURN>

And FORMAT will ask:

DRIVE NUMBER (1-4)? 2

This time FORMAT got the wrong default. FORMAT assumes that it was run from a drive containing a system diskette, so it must be the "other" drive which you wish to use for formatting. Since you will want to use the first drive (one), type (without <RETURN>):

1

FORMAT will then need to know:

TYPE OF FORMAT TO PERFORM (0-3)? 0
0) APPLE DISK-II (35 TRACKS)
1) RANA ELITE ONE (40 TRACKS)
2) RANA ELITE TWO (80 TRACKS)
3) RANA ELITE THREE (160 TRACKS)

Since the currently operating copy of DOS has not been updated, it told FORMAT that the drive you specified was set as a Disk II. Therefore, FORMAT will default to a Disk II format. You'll need to override this by typing whichever menu item number is correct for the drive you are using as your system drive (without <RETURN>).

For example, an Elite One would be:

1

an Elite Two would be:

2

an Elite Three would be:

3

and the lowly Disk II would be:

0

Then FORMAT will ask:

VOLUME NUMBER (1-254)? 254

The default FORMAT has provided is the standard Apple default which un-enhanced DOS's INIT command would use. Therefore, simply type:

<RETURN>

Next FORMAT will inquire:

HI FILE? HELLO

FORMAT isn't trying to be cute, it's just that a short prompt like "HI FILE?" allows a full 30 character file name (allowed under DOS) to be typed all on one line. The "hi" file is the "hello" or "greeting" program's name. For now, just type:

<RETURN>

to use the default ("HELLO").

The last thing FORMAT will ask is:

INVOKE HELLO FILE HOW (A-C)? A
A) RUN <HI FILE>
B) BRUN <HI FILE>
C) EXEC <HI FILE>

FORMAT is giving you a little option which standard DOS's INIT does not provide. This is discussed further in a later section which deals with each utility separately.

For now, just type:

<RETURN>

to use the default (RUN <HI FILE>).

That's all the information FORMAT needs, so it will say:

INSERT DISKETTE IN DRIVE. PRESS
<RETURN> TO INITIALIZE, PRESS <ESC>
TO CHANGE PARAMETERS.

Now is the time to remove "configured master" from the drive and insert your second (or third) blank diskette (mentioned earlier).

Remember, this diskette will be completely erased. When it's in, type:

<RETURN>

and then FORMAT will check to see if the diskette has been 16-sector formatted before. If it has, you will get:

DISKETTE CONTAINS DATA.
INITIALIZE ANYWAYS (Y/N)?

If it is okay to erase the diskette, type (without <RETURN>):

Y

and FORMAT will proceed with the initialization.

When finished, FORMAT will display:

DO ANOTHER DISKETTE (Y/N)?

Type (without <RETURN>):

N

and FORMAT will terminate back to the BASIC prompt.

You now have a full capacity diskette for your system drive which will boot correctly, so type:

PR#6<RETURN>

to try it out. A "FILE NOT FOUND" message should be expected.

There is still one last thing which you need to do. You need to transfer all the utility programs supplied on the Enhancer diskette onto your "full capacity enhanced system master". If your system (boot) drive is an Elite Three, then there is a small preliminary step which you will need to perform before the utility files can be transferred. If your system drive isn't an Elite Three, then this following procedure which will use the CLONE utility can be skipped.

If you're an Elite Three user, you should remove your enhanced system master from the boot drive and insert "unconfigured master".

Type (Elite Three only):

PR#6

You should get a "FILE NOT FOUND" message.

Then remove "unconfigured master" and insert the Enhancer disk-

ette. Type (Elite Three only):

BRUN CLONE<RETURN>

Once CLONE is loaded, it will "sign on" with:

CLONE
RANA SYSTEMS' 16-SECTOR DOS 3.3
5-INCH DISKETTE COPY UTILITY.
COPYRIGHT (C) (P) 1982 RANA SYSTEMS
CLONE VERSION 2.1

CLONE will then ask:

CLONE TYPE TO PERFORM: 0
0) WHOLE DISKETTE
1) DOS ONLY

Just type (Elite Three only):

<RETURN>

You will then be asked:

SOURCE:
SLOT NUMBER (1-7)? 6

Just press (Elite Three only):

<RETURN>

Next comes:

DRIVE NUMBER (1-4)? 1

Just press (Elite Three only):

<RETURN>

The next question is:

DISKETTE TYPE (0-0)? 0

Again, simply press (Elite Three only):

<RETURN>

That ends all the source drive/diskette questions. Now for the destination ones:

DESTINATION:
SLOT NUMBER (1-7)? 6

The default is okay, so press (Elite Three only):

<RETURN>

After the slot number question comes:

DRIVE NUMBER (1-4)? 2

But this time you need to type (Elite Three only, without <RETURN>):

1

The last question is:

DISKETTE TYPE (0-3)? 0

And for this question, respond with (Elite Three only, without <RETURN>):

3

After which CLONE will display a notice concerning the use of the Elite Three backup diskette you have indicated you wish to create. In order to tell CLONE that you've seen the message, press (Elite Three only):

<RETURN>

CLONE will then be ready to start the copy process, and it will tell you when it needs you to insert the source diskette or the destination diskette. The source diskette is your DOS 3.3 System Master from Apple. For the destination diskette, you can use "configured master" since it is no longer needed and won't boot correctly on an Elite Three.

After each time you change the diskette in your system drive in response to CLONE's requests, simply press <RETURN> to tell CLONE to continue.

After several diskette change requests, CLONE will finally say:

DO ANOTHER COPY (Y/N)?

In response, type (Elite Three only, no <RETURN>):

Y

and CLONE will once again prompt you to insert your source diskette. This time, the source diskette will be the Elite Enhancer diskette. The destination diskette will be your fourth diskette, which you've not used so far. Swap these diskettes back and forth as CLONE requests them, pressing <RETURN> when you have made the exchange.

When CLONE is finished, it will again return to:

DO ANOTHER COPY (Y/N)?

Since CLONE has done all you require of it for the time being, type (Elite Three only, no <RETURN>):

N

and CLONE will return you to the BASIC prompt.

Insert your "full capacity system master" and then type (Elite Three only):

PR#6<RETURN>

to boot that diskette. "FILE NOT FOUND" should be expected.

At this point, if you are a non-Elite Three system drive user, you should continue with the procedure.

It is now necessary to transfer Apple's utility FID onto your higher capacity diskette, so insert either your DOS 3.3 Master Diskette (if you are not using an Elite Three as your system drive), or the CLONE you made of the DOS 3.3 Master Diskette (if you are using an Elite Three as your system drive).

Type (all system drive types):

BRUN FID<RETURN>

For instructions on how to use FID, refer to Apple's The DOS Manual. For now, just type:

1<RETURN>

in order to begin a file copy.

When FID asks for the source slot number, type:

6<RETURN>

For the source drive number, type:

1<RETURN>

For the destination slot number, type:

6<RETURN>

And for the destination drive number, type:

1<RETURN>

FID will then ask for the name of the file to copy, so type:

FID<RETURN>

After which, FID will give you a chance to either press <ESC> if you made an entry error, or <RETURN> to begin the copy.

Assuming your entries were correct, type:

<RETURN>

FID will then be asking for the source and destination diskettes just like CLONE did. The source diskette is your DOS 3.3 System Master (or the CLONE of it if you are using an Elite Three), and the destination diskette is your "full capacity system master". Once you inserted the diskette FID requested, press:

<RETURN>

to tell FID to continue.

FID will tell you when it has finished the copy, and wait for you to press <RETURN>. So go ahead and press:

<RETURN>

and FID will redisplay its main menu.

The next step is to copy FID ENHANCE onto the "full capacity system master". To do this, type:

1<RETURN>

to tell FID you want to copy another file.

This time FID will only want to know the name of the file to copy, so type:

FID ENHANCE<RETURN>

Once more, FID will give you a chance to press <ESC> if you typed the name wrong, or <RETURN> to proceed with the copy.

Given that you entered the name correctly, press:

<RETURN>

FID will wait for you to insert the source diskette. This time the source diskette will be the Enhancer diskette (or the CLONE of it if you are using an Elite Three). The destination diskette will be the "full capacity system master" onto which you copied FID earlier.

Press:

<RETURN>

whenever you have finished inserting whichever diskette FID requests.

FID will again tell you when it has completed the copy, and wait for you to press <RETURN>. So press:

<RETURN>

and the main menu will be redisplayed.

You are finished using FID, so type:

9<RETURN>

to get back to BASIC.

Now to modify FID so that the rest of the system master and Enhancer files can be copied. Make sure your "full capacity system master" is in the drive, then type:

BRUN FID ENHANCE<RETURN>

FID ENHANCE will go ahead and modify FID without any reponse from you. When finished, the new modified FID will be saved onto the diskette as FIDR. FIDR should always be used with the higher capacity Elite Series drives since FID will make mistakes under certain circumstances (which were taken into account by these instructions).

Once FID ENHANCE has finished, and it has returned to the BASIC prompt, type:

UNLOCK FID<RETURN>

and then:

DELETE FID<RETURN>

to get rid of the old FID. Then type:

LOCK FIDR<RETURN>

to keep the new FIDR safe.

The last step is to transfer the remainder of the system master programs (supplied by Apple) and the Enhancer utilities onto your "full capacity system master".

To do this, type:

BRUN FIDR<RETURN>

FIDR works exactly the same way FID does, as described in Apple's The DOS Manual.

For now, choose the copy files menu item by typing:

1<RETURN>

FIDR will then ask for the source and destination slot and drive numbers.

Answer these questions with:

6<RETURN>

1<RETURN>

6<RETURN>

1<RETURN>

FIDR will then ask for the name of the file to copy. Indicate all files by typing:

=<RETURN>

Because you indicated more than one file, FIDR will want to know if you want "prompting". Prompting allows you to say yes or no to each file before it is copied. In response to the question, type:

Y<RETURN>

to indicate you do want prompting.

FIDR will then give you a chance to type <ESC> if you entered something wrong, or <RETURN> to proceed with the copy.

Assuming your answers were correct, type:

<RETURN>

Then FIDR will ask for the source diskette. The source diskette is the DOS 3.3 System Master (or CLONE of it if using an Elite Three). Press:

<RETURN>

to tell FIDR when you have finished inserting the diskette.

FIDR will then display a file name from the source diskette, and wait for you to type:

Y<RETURN>

or:

N<RETURN>

to specify either "yes" you want the file copied, or "no" you don't want it copied.

You want to say "yes" to only the following files:

HELLO
APPLESOFT
BOOT13
CHAIN
FPBASIC
INTBASIC
MAKE TEXT
RENUMBER
RENUMBER INSTRUCTIONS

The remainder are demonstration files which need not be copied, and which will take up needed room if using a Disk II or Elite One as your system drive.

Whenever you tell FIDR "yes" (go ahead and copy the file), it will ask you to insert the destination diskette. The destination diskette is the "full capacity system master".

Once you've inserted this diskette, type:

<RETURN>

to tell FIDR it can continue.

Eventually, after saying "yes" and "no" to a lot of file names, and swapping the diskettes several times, FIDR will finally tell you it is finished. To tell FIDR to return to the main menu, press:

<RETURN>

Once back to the main menu, type:

1<RETURN>

to begin copying the files from the Enhancer diskette.

FIDR will not ask for the drive information this time, it will use your answers from the last copy. It will, however, ask you for a file name. To this question, answer:

=<RETURN>

just like last time. (Don't worry, there's not as many files on the Enhancer diskette.)

Once again, FIDR will ask if you want prompting. This time, answer:

N<RETURN>

to tell FIDR to copy all the files without asking you.

FIDR will again give you a chance to press <ESC> if you made a mistake, or <RETURN> if everything is okay. Given everything is okay, press:

<RETURN>

FIDR will then begin asking for the source and destination diskettes. The source diskette is the Enhancer (or CLONE of it if using the Elite Three), and the destination is the "full capacity system master". When you have finished inserting the diskette for which FIDR has asked, press:

<RETURN>

to tell FIDR to continue.

FIDR will tell you when it has finished copying all the files, and wait for you to press <RETURN>. Oblige it by pressing:

<RETURN>

to return to the main menu.

Once back at the menu, type:

9<RETURN>

to get back to BASIC.

At this point, your "full capacity system master" is complete as far as your system drive is concerned. You will still need to refer to the instructions concerning the PROFILE utility later in this manual in order to configure your "full capacity system master" to talk to any other drives on your system.

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4. ENHANCING MICROSOFT APPLE II CP/M 2.2

Rana Systems Enhancements for Microsoft's Apple][56K CP/M 2.2 allow automatic accessing of 4 drives from the Rana Elite Controller Card and the additional capacity of the Elite Disk Drives. The Controller Card is capable of addressing any combination of Apple Disk][and Rana Elite Series Drives. The PROFILE program sets up the CP/M operating system to recognize which drives are Rana Elite Drives and which are Apple Disk][drives. The seek rate may also be increased by the PROFILE program to take advantage of the increased speed of Rana drives. If the disk is run on another Apple the enhanced CP/M will automatically recognize which controllers are Rana and which are Disk][and only try to access the correct number of drives for the particular controller type. Changes in drive combinations may require redefining.

Drives may be temporarily reconfigured in memory only to temporarily make a Rana drive act like an Apple Disk][drive and confine the files to the first 35 tracks of the disk. This feature is useful for creating a disk to send to other Apple CP/M Users.

As you have probably noted by now, these instructions keep referring to Microsoft's Apple][CP/M 56K version. The Elite Enhancements for CP/M only apply to the 56K version. Rana does not support enhancements to the 44K version of CP/M since doing so would require "stealing" space from the user's program area in memory. Something which Rana absolutely does not want to do. The 56K version of CP/M can be modified to support the Elite Series products without stealing space from the user's memory area, because Rana used a little "hidden" section of memory in the 16K RAM/Language Card (which is required for 56K CP/M) which Microsoft left available. This small restriction should not prove to be too much of a hardship since serious Apple][CP/M users soon find that 44K is just not enough in which to run some of the more advanced CP/M programs.

The Apple CP/M operating system addresses disk drives by a letter followed by a colon, A: B: etc. up to P:. Apple][CP/M selects drives from the highest slot number first, starting with slot six. There must be a controller card in slot six, and any additional controller cards must be in slot five, etc. Although CP/M as an operating system recognizes drives A: through P:, Microsoft's Apple][version of CP/M has a necessary limitation of only supporting up to six drives (A: through F:). The enhanced version of Apple][CP/M will support up to eight drives (A: through H:). This allows all drives on two four-drive Elite Controllers to be used. (Of course, four two-drive Disk][controllers could also be used; or any combination totalling no more than eight drives.)

On both enhanced and non-enhanced CP/M, drives A: and B: would be drives one and two on whichever type disk controller is in slot six. Drives C: through H: will change on the enhanced CP/M if an Elite Controller card is in the system.

When booted, the enhanced CP/M checks all the controllers in the Apple to determine which are Elite Controllers and which are Disk][controllers, starting from slot six and working backwards. Whenever an Elite Controller card is found, the next four CP/M drive letters will be assigned to the four drives of which the Elite Controller is capable. If a Disk][controller is found, then only the next two CP/M drive letters will be assigned to that card. The system then moves on to the card in the next lower slot. This continues until either all eight drive letters have been assigned to a controller, or there are no more disk controllers in the Apple.

Although the enhanced CP/M will use the drives on any disk controller in any slot (except slot zero), you should stick with the CP/M slot assignment convention given in the Microsoft CP/M manuals; and place your controller cards only in slots six through four.

The Rana CP/M Enhancements Diskette does not have a copy of the CP/M Operating System and will not boot CP/M into the computer. However, certain areas of the diskette are initialized in a CP/M format, allowing those CP/M programs on the Enhancer diskette to be run once the system is booted from a CP/M master. The Rana Elite Enhancements Disk will be used to create a new enhanced CP/M master diskette. The system tracks from this diskette can then be used to create any number of additional CP/M system diskettes that utilize the desired Rana features, but don't have all the CP/M utilities occupying the space the user needs to put to better use.

The following steps will guide you in creating your enhanced CP/M master and demonstrate some of the functions of the Rana enhancement utilities. The additional features of these utilities and a detailed discussion of their operation is contained in a later section of this manual. The instructions for enhancing CP/M have been duplicated into two sub-sections. The first is for users with more than one drive, for which there are easier approaches to some things. The second is for single drive users, for which Rana has supplied a special utility to make life slightly easier.

4.1. Using Multiple Drives

These instructions detail a very specific approach to creating an enhanced CP/M for any valid combination of Elite drives, Elite Controllers, Disk][drives, and Disk][controllers which any user can possibly dream up. This places upon these instructions an almost impossible task, considering the vivid imagination of many users. Since the use of only a single drive complicates the instructions by a considerable amount, the single drive instructions have been given their own section following these multi-drive instructions.

These instructions have been written in a step-by-step manner, with some explanation of what is being done at each step. All of these instructions have been tested at Rana to confirm that they are correct. In addition, several "early release" and later users also confirmed the accuracy of these instructions. Therefore, there is no reason for you not having complete success following these instructions. That is, if you follow the instructions completely, step by step. You are encouraged to read these instructions completely, all the way through, before starting the procedure. That way you will have a general understanding of what all is involved before "diving in".

The length of these instructions is due to the fact that this will be your initial creation of an enhanced CP/M. Once this initial diskette is created, life becomes alot easier. Even though the instructions are lengthy, they are not terribly complex to follow.

If you intend to make use of either an Elite Two or Three drive as your system drive (A:), it may be necessary to temporarily configure your system in a different configuration than what will be your final configuration. A temporary problem arises if you do not have a second Elite Two or Three to match the one you will be using as drive A:. This is because you do not, as of yet, have a copy of CP/M which can deal with various combinations of drives. Since these multi-drive enhancement instructions only rely on you having two drives, you will only need to rearrange your A: and B: drives. Regardless of the type of drive you will be using as A: in your final configuration, you should temporarily reconfigure your system according to the following table:

Final Configuration		Temporary Config.	
Drive A:	Drive B:	Drive A:	Drive B:
Disk ][	Disk ][	Disk ][	Disk][
Disk ][	Elite One	Elite One	Disk][
Disk ][	Elite Two	Elite Two	Disk][
Disk ][	Elite Three	Elite Three	Disk][
Elite One	Disk ][	Disk ][	Elite One
Elite One	Elite One	Elite One	Elite One
Elite One	Elite Two	Elite Two	Elite One
Elite One	Elite Three	Elite Three	Elite One
Elite Two	Disk ][	Disk ][	Elite Two
Elite Two	Elite One	Elite One	Elite Two
Elite Two	Elite Two	Elite Two	Elite Two
Elite Two	Elite Three	Elite Three	Elite Two
Elite Three	Disk ][	Disk ][	Elite Three
Elite Three	Elite One	Elite One	Elite Three
Elite Three	Elite Two	Elite Two	Elite Three
Elite Three	Elite Three	Elite Three	Elite Three

Any additional drives you may have (C:, D:, etc) can be arranged in whatever final configuration you like since these instructions will, for the most part, ignore them.

Once you have your system into the temporary configuration, it's time to get started. Turn on the computer with no disks in the drives. If you have the Autostart feature, CP/M's drive A: should rattle for a bit and then sit there quietly spinning waiting for a diskette. If you have an old Apple, you may not have the Autostart feature, so you will need to tell your Apple to start-up the drive.

A Non-Autostart Apple will "beep" then display an asterisk ("*") prompt right away. When this prompt appears, simply type:

```
6<CTRL-P><RETURN>
```

When indicating those keys on the Apple][keyboard which are not just a single character (i.e. RETURN, CTRL, ESC, etc.) these instructions will show the key enclosed in angle brackets (<RETURN>) to indicate that the single key with that label is to be pressed, and not that the key sequence "R", "E", "T", "U", "R", and "N" should be typed. Combined key sequences such as <CTRL-P> indicate that the <CTRL> key should be held down while the "P" key is pressed.

The "6<CTRL-P><RETURN>" command assumes that your disk controller card (Elite or Disk][) is located in slot number six. If it isn't, it should be moved to slot six (with power off, please) since CP/M will expect it to be there.

Should either Integer or Applesoft BASIC's prompt (">" or "]") appear on the screen, then your Autostart Apple could not find

any disk controller cards. (Disk controllers won't work in slot zero, and CP/M will want the controller in slot six.) If your controller is in slot six, then there may be something wrong with the controller. (This section of the manual cannot cope with problems, check the Table of Contents for the section which can.)

When all goes well, one of your drives' "busy" light will be on and the drive should be quietly spinning waiting for a diskette. Simply oblige it by inserting your CP/M master diskette from Microsoft. (Label should be up and the last thing to go in the door.) Then close the drive door slowly. The door may require a slight amount of force, but there should be no solid resistance against its closing. If there is solid resistance, you probably haven't inserted the diskette all the way.

Your Apple will respond by displaying the CP/M "sign on" message including Microsoft's copyright notice. This indicates that you have just successfully "booted" CP/M (congratulations). Part of the "sign on" message will indicate that you have just booted a 44K CP/M system. This is correct, you will create a 56K system as part of these enhancement procedures. The last thing your Apple should say is "A>". This is your prompt to enter a command. A real quick one to try for your first time CP/M users is:

```
DIR<RETURN>
```

CP/M will indulge you by displaying the files which Microsoft so nicely included with the CP/M operating system.

Enough playing, time to get back down to business. Insert the Rana Enhancer Diskette in drive B: (slot six, drive two), then type:

```
DIR B:<RETURN>
```

Once again CP/M will indulge you by displaying those files which Rana so nicely supplied you. (What a pair of nice companies, right?) (If you are an Elite Three user, keep in mind that your drive will read standard Apple diskettes.) This little exercise shows that the enhancer diskette should be okay.

The next step is to format a blank diskette. For now, you'll need to use the FORMAT utility Microsoft supplied on the CP/M master until you've created an enhanced CP/M. To get FORMAT running, simply type:

```
FORMAT<RETURN>
```

(Tough, right?) After CP/M loads the utility into memory, FORMAT will "sign on" by saying something like:

```
Apple ][ CP/M
16 Sector Disk Formatter
(C) 1980 Microsoft
```

Format disk in which drive?

If any part of your "sign on" message is different, you may have a newer version. In such a case, it would be wise to look up **FORMAT** in your CP/M manuals to make sure Microsoft didn't change something for which these instructions have yet to be updated.

Now you will need a diskette you can format (you'll also need a second one later). If you want to format a used disk remember that all the files as well as the system tracks will be erased. **Format** will normally detect an already formatted 16 sector disk and ask you to verify that you want the disk erased. This includes any DOS 3.3 or Apple Pascal diskettes you may have had lying around. If you plan on formatting an Elite Two or Three diskette (higher capacity) you should check the Recommended Diskettes section of this manual.

If you're an Elite Three only user, you may have noticed that you are about to do a standard Apple Disk][format (which means doing some writing) on an Elite Three which is only supposed to be read compatible. This is true. However, since this procedure will not expect a non-Elite Three to read this diskette, it will all come out okay in the end.

IMPORTANT! A safe idea before continuing is to remove the enhanced CP/M master and Enhancements diskettes (and any other already recorded diskettes) from the drives, but remember to reinsert them once the formatting has finished.

Once you have a diskette, take out the CP/M master from drive A: and put in the blank diskette. Then type:

```
A:<RETURN>
```

FORMAT will respond with:

```
Insert disk to be formatted in drive A:
Press RETURN to begin
```

You should then oblige it by typing:

```
<RETURN>
```

FORMAT will respond with:

```
Formatting...
```

Drive A: will then rattle for about a minute, and **FORMAT** will come back with:

```
FORMAT Complete
```

```
Format disk in which drive?
```

Since format has done all you require of it, simply type:

<RETURN>

FORMAT will then respond with:

Insert CP/M System disk in drive A:
Press RETURN

This smart little utility remembered you had taken the CP/M master diskette out of drive A: so you could insert the blank disk to be formatted. Follow its direction and remove the blank diskette from A: and re-insert the CP/M master diskette. When you have it in, type:

<RETURN>

The CP/M system prompt ("A>") should then appear.

The CP/M Operating System and all the utility programs on the Apple CP/M master now need to be copied onto your newly formatted disk. The original Microsoft COPY utility supplied on your Apple CP/M Master will do the job nicely. To get it started, type:

COPY<RETURN>

After COPY is loaded into memory, it will "sign on" by saying:

APPLE][CP/M
16 Sector Disk Copy Utility
(C) 1980 Microsoft

*

The asterisk ("*") prompt indicates COPY is ready to go.

Remove the Apple CP/M master in drive A:, and place the newly formatted empty disk in instead. Place the CP/M master in drive B:. It won't matter what type of drive is where, it'll all come out okay if one of the temporary configurations given in the earlier table is in use.

Following the asterisk ("*") prompt type:

A:=B:<RETURN>

The utility will respond with:

Insert MASTER disk into drive B:
Insert SLAVE disk into drive A:

Press RETURN to begin

Type:

<RETURN>

COPY will then respond with:

Copying...

COPY will then proceed to read a little from drive B:, and then write it to drive A:; repeating this process until the entire diskette is copied. Once COPY has finished, it will display:

COPY Complete

Do you wish to make another copy?

Your newly formatted diskette (in drive A:) will now contain all the utilities and the operating system from the Apple CP/M master. The CP/M operating system on this disk is the one which you will eventually enhance.

Take your Apple CP/M Master Diskette from B: and put it away in a safe place. You should no longer need it except in an emergency. Then type:

N

to end the COPY utility. (Note: no <RETURN> is necessary.) COPY, like FORMAT, will remember that you have removed the CP/M master from drive A:, so it will say:

Insert CP/M System disk into drive A:
Hit RETURN

Since the diskette in drive A: (the one which was the blank disk) now contains an exact copy of the CP/M master, go ahead and type:

<RETURN>

Once CP/M responds with its "A>", you can check up on the COPY utility by typing

DIR<RETURN>

and seeing the directory of programs on the new CP/M master disk.

The CPM56 utility from Microsoft must now be run to create a 56K operating system on your new master diskette. To get CPM56 to upgrade your 44K system diskette to a 56K system diskette, type:

CPM56 A:<RETURN>

CP/M will load the CPM56 utility into memory, then the utility

will display:

```
Apple ][ CP/M
56K CP/M Disk Update Program
(C) 1980 Microsoft
```

```
Insert 16 sector disk into drive A:
Hit RETURN to begin
```

Since the system disk you want to update to 56K is the one you already have in drive A:, simply press:

<RETURN>

CPM56 will write out the 56K CP/M system image onto the diskette and then display:

```
Disk has been updated to 56K
```

```
Hit RETURN to re-boot system
```

You will want to work with this 56K system, so type:

<RETURN>

Drive A: will rattle again and then CP/M will "sign back on" with the Microsoft copyright message. But, this time the message will say "56K" where it said "44K" last time you booted the system. The Rana Enhancement utility will now change the CP/M operating system to utilize the features of the Rana Controller and Drives, and permanently place the Enhanced CP/M on the disk's system tracks.

The new copy of the CP/M Master disk should be in drive A: and the "A>" prompt should be on the screen. Place the Rana Elite Enhancements Disk in drive B: and type:

```
B:ENHANCE<RETURN>
```

Once CP/M gets the ENHANCE utility loaded, the utility will display:

```
ENHANCE
RANA Systems' Enhancer for
Microsoft's Apple ][ 56K CP/M BIOS
Copyright (C)(P) 1982 RANA Systems
Version 1.1
```

```
BIOS Image
Primary Copyright 1981 Microsoft
Portions Copyright 1982 RANA Systems
```

```
Insert a *COPY* of your Microsoft 56K
CP/M 2.2 distribution diskette into
```

drive A:.. Please do *NOT* insert your original diskette from Microsoft.

Press <RETURN> when diskette inserted and ready to be enhanced. Press any other key to terminate this program without enhancing the diskette.

Once that mouthful has finished displaying, type:

<RETURN>

ENHANCE will go out and replace those sections of the original Microsoft 56K CP/M with that information which is necessary to use the advanced features of the Rana Elite products. Once ENHANCE is finished, it will display:

Enhancing completed. Press <RETURN>
to reboot system from slot #6.

Since you will want to start playing with the enhanced CP/M right away, press:

<RETURN>

and ENHANCE will re-boot the enhanced CP/M system.

The first enhancement you will notice on the enhanced CP/M is the additional Rana Systems copyright notice right below Microsoft's. This is an easy way to make sure you have booted an enhanced CP/M. Elite Controller users with more than two drives attached to the controller will find that CP/M now recognizes the (those) extra drive(s). If you are one such user, and your Elite Controller is the one in slot six, place the Elite Enhancer Diskette in the third drive on the controller (drive C:) and type:

DIR C:<RETURN>

CP/M will now give you a directory off that drive. (Wasn't that fun!)

In order to complete the enhanced CP/M master diskette, you will need to move the enhanced utilities onto the master diskette from the Enhancements diskette. The standard CP/M PIP utility is designed for this little task. (PIP stands for "Peripheral Interchange Program.") In order to make room for the new utilities on the master diskette, it will be necessary to remove the old ones first. Type the following two CP/M commands. After each command, CP/M will simply respond with "A>".

ERA FORMAT.COM<RETURN>
ERA COPY.COM<RETURN>

These two commands ERASed the old FORMAT and COPY utilities.

Now, to copy the new utilities onto the enhanced CP/M master, insert the Enhancements diskette into drive B:. Then type the following CP/M commands. After each command, CP/M will respond with "A>" when it has finished copying the file.

```
PIP A:=B:FORMAT.COM[V]<RETURN>
PIP A:=B:COPY.COM[V]<RETURN>
PIP A:=B:PROFILE.COM[V]<RETURN>
```

Each command tells the PIP utility to copy the specified file from drive B: to drive A:. The "[V]" part tells PIP to verify that each file was copied correctly. If you're a first time Apple CP/M user, the "[" character is produced by typing <CTRL-K>, and the "]" character is produced by typing <SHIFT-M>. The Apple keyboard is not marked with (at least one of) these characters. If you are using a special keyboard modification or 80-column board, you will probably need to consult the manual for that product concerning special keyboard characters under CP/M.

The next step is to create a system diskette which gives you the full storage capability of the drive you will be using as drive A:. If you will be using a Disk][as drive A:, then you can simply read through all the steps up to the rebooting of the system. Continue following the instructions right after the point where the system is rebooted.

The first step in creating a system diskette for your higher capacity Elite drive is to format a diskette for the drive to use when it starts operating in a higher capacity way. Since you now have an enhanced CP/M, you can now run the new FORMAT utility in order to create these higher capacity diskettes. To get the new FORMAT started, type:

```
FORMAT<RETURN>
```

Once CP/M loads it in, FORMAT will respond with:

```
APPLE ][ CP/M
16 Sector Disk Formatter
Primary Copyright 1980 Microsoft
Portions Copyright 1982 RANA Systems
RANA Systems Version 1.1
```

Format disk in which drive?

In order to create a higher capacity diskette, you will need to choose, from the following table, whatever type of format would be suitable for the drive you currently have as drive B:.

```
0 - Apple Disk ][      ( 35 tracks)
1 - RANA Elite One     ( 40 tracks)
2 - RANA Elite Two     ( 80 tracks)
```


3 - RANA Elite Three (160 tracks)

Once you have the drive type number from the table, type (without <RETURN>):

B:

followed by the drive type number. For example, if you have an Elite Two as drive B:, you would type:

B:2

If you are stuck with just Apple Disk][drives, then you would type:

B:0

You should be careful to specify the correct drive type for the drive being used as drive B:. FORMAT cannot always catch that the drive was unable to handle the type of format you requested. The disk will appear to be correctly formatted but will cause a CP/M Disk I/O error or BDOS error at some later stage, or your new CP/M may not boot.

Once you've specified the formatting information, type:

<RETURN>

FORMAT will respond with:

Insert disk to be formatted in drive B:
Press RETURN to begin

Insert that second blank diskette which was mentioned earlier into drive B:, then type:

<RETURN>

FORMAT will respond with:

Formatting...

The drive will chatter and spin for almost a minute, (or two if formatting an Elite Two or Three diskette), then the screen will display:

FORMAT Complete

Format disk in which drive?

To end the FORMAT utility, press:

<RETURN>

without specifying any drive information. CP/M will eventually respond with "A>".

Before you can copy the system onto the diskette in drive B: in the correct format, you will need to inform the enhanced CP/M of drive B:'s type. This is accomplished using the PROFILE utility. Just like the other utilities, get it started by typing:

```
PROFILE<RETURN>
```

its "sign on" is:

```
APPLE ][ CP/M
Drive Configuration Utility
Copyright (C)(P) 1982 RANA Systems
Version 1.1
```

*

There is alot more to this utility than what you will make use of right now. For now, type (without <RETURN>):

```
B:
```

followed by the drive type number you used earlier during FORMAT.

For example, if drive B: is an Elite Two you would type:

```
B:2
```

Once you've typed the drive type number, press:

```
<RETURN>
```

and PROFILE will respond with:

```
Was B: Apple Disk-][ Slow seek.
```

and:

```
Now B: RANA Elite One, Medium seek.
```

or:

```
Now B: RANA Elite Two, Fast seek.
```

or:

```
Now B: RANA Elite Three, Fast seek.
```

followed by:

```
Ready to update in-memory system.
<RETURN> to continue/retry;
```

<ESC> or <CTRL-C> to abort.

Since you, no doubt, entered the command correctly and received the response which would be correct for whichever type of drive you have as drive B:, simply press:

<RETURN>

and PROFILE will update the current operating CP/M so that it recognizes drive B: as whatever drive B: should be.

After PROFILE updates the CP/M system, it will return to the asterisk ("*") prompt. To get out of PROFILE, type (without <RETURN>):

<CTRL-C>

CP/M will respond with "A>".

Unlike Apple DOS's "INIT" command, CP/M's FORMAT does not place a copy of the operating system (in this case, CP/M) onto the newly formatted diskette. This task is left up to the COPY utility, which will place a copy of CP/M onto an existing diskette without altering any other information on the diskette. Since that is what you will want to do now, type:

COPY<RETURN>

to get the new COPY utility running.

Once it's loaded, it will respond with:

```
APPLE ][ CP/M
16 Sector Disk Copy Utility
Primary Copyright 1980 Microsoft
Portions Copyright 1982 RANA Systems
RANA Systems Version 1.1
```

*

Once again, the "*" signals that COPY is ready for a command. This time, however, the command will be slightly different. Type:

B:=A:/S<RETURN>

Just like with the first time you used Microsoft's COPY, this command tells COPY to copy information from drive A: to drive B:; but the added "/S" tells COPY to copy just the system from one drive to the other and to not disturb the other information on the diskette in drive B:. Copy will respond with:

Insert SOURCE disk into drive A:

Insert TARGET disk into drive B:

Press RETURN to begin

Since the two diskettes are already inserted, type:

<RETURN>

and copy will respond with:

Copying...

This time COPY will make one read on drive A:, and then one write on drive B:.. The new COPY utility will place the CP/M system onto the diskette in drive B: in the proper format so that the diskette will later boot correctly using that drive (or another drive of the same type). When COPY is finished it will display:

COPY Complete

Do you wish to make another copy?

Once again, simply type (without <RETURN>):

N

Since drive A: was used as one of the drives during the copy, COPY will remind you to reinsert the CP/M master diskette back into drive A: by saying:

Insert CP/M System disk into drive A:
Hit RETURN

The enhanced CP/M master was never removed, so just type:

<RETURN>

and the CP/M "A>" prompt will appear.

At this point in the procedures you have created a diskette which will boot correctly (up to a point) on the type of drive you will eventually be using as drive A:, but the CP/M system which is on the diskette for that drive still thinks that drive A: is a Disk][. This is because the system you copied (the one on the enhanced master diskette) was still treating drive A: as a Disk][. In fact, that copy of CP/M thinks that all drives on your system are Disk][drives right now. To remedy this problem for just drive A: for now, get back into PROFILE by typing:

PROFILE<RETURN>

Again, the utility will "sign on" with:

```
Apple ][ CP/M
Drive Configuration Utility
Copyright (c) (p) 1982 RANA Systems
Version 1.1
```

*

Now let's take a look at why the enhanced CP/M is treating all your drives just like Disk][drives. Type:

```
B:=*

```

This tells PROFILE to go look at the drive configuration table contained within the enhanced CP/M system sitting on the diskette in drive B:, and tell you which drive letter (A: through P:) is set to which drive type. PROFILE will first ask for the diskette to be inserted into drive B: by saying:

```
Insert a system disk in B:.
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.
```

Since you are interested in the diskette already in B:, simply press:

```
<RETURN>
```

and PROFILE will go read in the configuration table from that diskette.

Once the table is "read-in", PROFILE will tell you the system configuration for which it is set up:

```
A: Apple Disk-][,      Slow seek.
.
.
.
P:+                    Slow seek.
```

*

The three vertical dots are supposed to indicate that the other drives (B: through O:) will also be listed. After the drives are listed, PROFILE will display the asterisk (***) prompt again and wait for your next command. On your display, drives A: through H: will all be listed as Disk-][. This is why the enhanced CP/M is treating all your drives like Disk-]['s. We'll fix that little problem in a bit.

The reason why I: through P: do not show a drive type is because the Apple][CP/M does not support those drives through the CP/M operating system. The reason why I: through P: are listed at all

is explained in a later section which goes further into the enhanced CP/M system and its utilities. The plus sign "+" will appear after each drive letter which cannot be currently accessed on the system because there is no controller card for it.

The last part of each line is the seek speed at which the drive is defined to seek. All Disk][drives can only seek at the slow (standard Apple) rate, so that is all that should be listed for now.

To change the setting for drive A: within that system sitting out on the diskette in drive B:, type (without <RETURN>):

```
B:=A:
```

What you've told PROFILE so far is that you are interested in updating the CP/M system in drive B: ("B:="), and the change you wish to make is to drive A: ("A:"). However, you've yet to specify the change to be made. Remember that drive type number you used back in FORMAT and PROFILE? It's time to type that again.

Example: If drive A: is going to be (in your finished system) an Elite Two (in which case drive B: should be an Elite Two right now), you would want to type:

```
B:=A:2
```

If drive A: is going to be an Elite One, type:

```
B:=A:1
```

and last, but certainly not least (by about 500,000 bytes of storage), the Elite Three would be:

```
B:=A:3
```

Once you've entered the drive type number, press:

```
<RETURN>
```

and PROFILE will respond with (again):

```
Insert a system disk in B:  
<RETURN> to continue/retry;  
<ESC> or <CTRL-C> to abort.
```

Given that you entered the command correctly (of course you did!), press:

```
<RETURN>
```

and PROFILE should mutter something like:

Was A: Apple Disk-][, Slow seek.

and then:

Now A: RANA Elite One, Medium seek.

or:

Now A: RANA Elite Two, Fast seek.

or:

Now A: RANA Elite Three, Fast seek.

and always:

Ready to update B:
 <RETURN> to continue/retry;
 <ESC> or <CTRL-C> to abort.

The "Now" message you get will match the drive type you specified. To update the CP/M system on drive B:, type:

<RETURN>

and PROFILE will write out the new configuration.

Now you can turn your Apple off (don't worry about still being in PROFILE) and rearrange the drives into your final configuration. When you have everything set, reboot the system (just like you did at the beginning of this whole process) using the diskette which is currently in drive B:.

Once you have the system rebooted, the last thing you will need to do in completing your higher capacity system diskette (the one you just booted). To do this, you'll need to copy the CP/M distribution files (from Microsoft and Rana) onto the higher capacity diskette. To do this, insert the first enhanced CP/M master diskette you made into drive B: and type:

B:PIP A:=B:*. *[V]<RETURN>

This command first tells CP/M where to find PIP ("B:PIP"), and then tells PIP to copy all files on drive B: ("B:*. *") to drive A: ("A:=") and verify that they made it correctly ("[V]"). Since PIP will be doing a whole bunch of files, it will display the name of each file as it is copied. PIP must be used to copy each file one at a time since the diskette in drive A: and the diskette in drive B: are of a different type and the files must be written to the diskette according to the diskette's type. COPY will not rearrange files into different arrangements according to the diskette's type. When PIP is finished, it will return to the CP/M "A>" prompt.

All the hard work is over. There is just one last little task which must be completed. Defining the remainder of your drives within the CP/M system so that they are treated as they should be. Since this falls under PROFILE's domain, bring it back up by typing:

```
PROFILE<RETURN>
```

It will "sign-on" with its usual:

```
APPLE ][ CP/M
Drive Configuration Utility
Copyright (C) (P) 1982 RANA Systems
Version 1.1
```

*

The easiest way to define within enhanced CP/M which type of drive is where is by specifying one long string of change commands, preceded by:

```
A:=
```

For example, if you have an Elite Two as drive B:, a Disk][as drive C:, an Elite One as drive D:, and another Disk][as drive E:, you would type:

```
A:=B:2,C:0,D:1,E:0<RETURN>
```

Note that there is no need to respecify drive A: since it is already defined correctly. The drive type numbers come from that same table in which you found the number for FORMAT and PROFILE earlier. The "A:=" in front tells PROFILE you want to make these changes to the "system image" sitting on the diskette in drive A:. Once you press <RETURN>, PROFILE will respond with:

```
Insert a system disk in A:.
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.
```

If you entered the command correctly, go ahead at press:

```
<RETURN>
```

If you just realized you made a mistake, press:

```
<ESC>
```

If you press <RETURN>, PROFILE will list all the "Was" and "Now" changes that it made (under your direction), and then display:

```
Ready to update A:.
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.
```


Once again, PROFILE gives you a chance to back-out. If all the changes PROFILE listed were suitable to you, press:

<RETURN>

and PROFILE will update the "system image" on the diskette. If a change was not to your liking, press:

<ESC>

and PROFILE will not make any changes. In either case, PROFILE will return to the asterisk ("**") prompt.

When you've finished making all the changes you desire, type:

<CTRL-C>

after the asterisk ("**") prompt, and PROFILE will "terminate" back to the CP/M "A>" prompt.

All the hard work is over. It's time to enjoy!! If you want to see the difference between a Disk]['s capacity and your new Elite drive's capacity (if you're an Elite Two or Three user, this will make your day), look up the:

STAT DSK:<RETURN>

command in your Microsoft CP/M manuals. For a Disk][drive, STAT will respond with the following:

```
A: Drive Characteristics
1024: 128 Byte Record Capacity
128: Kilobyte Drive Capacity
48: 32 Byte Directory Entries
48: Checked Directory Entries
128: Records/ Extent
8: Records/ Block
32: Sectors/ Track
3: Reserved Tracks
```

The drive capacity in records and kilobytes is what will primarily interest you. Also, a quick explanation: the 32 sectors per track is correct. When Apple talks about 16 sectors/track, they are referring to a "sector" which contains 256 bytes. When CP/M refers to a "sector", it is referring to a "sector" of 128 bytes. Microsoft (and thus Rana) handles this small difference in interpretation of a "sector" by packing two CP/M sectors into every Apple sector (2 times 128 equals 256). Therefore Microsoft gets twice as many (smaller) CP/M sectors on every track (32) as Apple does (16). The actual way "sectors" are read and written from/to a diskette is identical between Microsoft CP/M, Apple DOS 3.3, and Apple Pascal 1.1. This means that all three systems can read and write the remaining two systems' diskettes, but they

generally do not understand the information which the other two systems' place within the "sectors".

Remember, when it comes to the new Rana version of the FORMAT and COPY utilities, the instructions in this manual are intended to replace those instructions given in the very informative Microsoft CP/M manuals.

4.2. Using a Single Drive

These instructions detail a very specific approach to creating an enhanced CP/M for any valid combination of Elite drives, Elite Controllers, Disk][drives, and Disk][controllers which any user can possibly dream up. This places upon these instructions an almost impossible task, considering the vivid imagination of many users. Since there are many steps in the instructions which can be simplified for multi-drive users, the single drive and multi-drive user instructions have been split into their own sections. If you are a multi-drive user, you will want to use the instructions in the preceding section.

These instructions have been written in a step-by-step manner, with some explanation of what is being done at each step. All of these instructions have been tested at Rana to confirm that they are correct. In addition, several "early release" and later users also confirmed the accuracy of these instructions. Therefore, there is no reason for you not having complete success following these instructions. That is, if you follow the instructions completely, step by step. You are encouraged to read these instructions completely, all the way through, before starting the procedure. That way you will have a general understanding of what all is involved before "diving in".

The length of these instructions is due to the fact that this will be your initial creation of an enhanced CP/M. Once this initial diskette is created, life becomes alot easier. Even though the instructions are lengthy, they are not terribly complex to follow.

In order to use Microsoft Apple][CP/M, you must have your disk controller card (Elite or Disk][) in slot six. Your disk drive (Elite or Disk][) must be attached to the first drive's connector on the controller card (drive one).

Turn on the computer without a disk in the drive. If you have the Autostart feature, your drive should rattle for a bit and then sit there quietly spinning waiting for a diskette. If you have an old Apple, you may not have the Autostart feature, so you will need to tell your Apple to start-up the drive.

A Non-Autostart Apple will "beep" then display an asterisk ("*") prompt right away. When this prompt appears, simply type:

```
6<CTRL-P><RETURN>
```

When indicating those keys on the Apple][keyboard which are not just a single character (i.e. RETURN, CTRL, ESC, etc.) these instructions will show the key enclosed in angle brackets (<RETURN>) to indicate that the single key with that label is to be pressed, and not that the key sequence "R", "E", "T", "U", "R", and "N" should be typed. Combined key sequences such as <CTRL-P> indicate that the <CTRL> key should be held down while

the "P" key is pressed.

The "6<CTRL-P><RETURN>" command assumes that your disk controller card (Elite or Disk][) is located in slot number six. If it isn't, it should be moved to slot six (with power off, please) since CP/M will expect it to be there.

Should either Integer or Applesoft BASIC's prompt (">" or "]") appear on the screen, then your Autostart Apple could not find your disk controller card. (Disk controllers won't work in slot zero, and CP/M will want the controller in slot six.) If your controller is in slot six, then there may be something wrong with the controller. (This section of the manual cannot cope with problems, check the Table of Contents for the section which can.)

When all goes well, your drive's "busy" light will be on and it will be quietly spinning waiting for a diskette. Simply oblige it by inserting your CP/M master diskette from Microsoft. (Label should be up and the last thing to go in the door.) Then close the drive door slowly. The door may require a slight amount of force, but there should be no solid resistance against its closing. If there is solid resistance, you probably haven't inserted the diskette all the way.

Your Apple will respond by displaying the CP/M "sign on" message including Microsoft's copyright notice. This indicates that you have just successfully "booted" CP/M (congratulations). Part of the "sign on" message will indicate that you have just booted a 44K CP/M system. This is correct, you will create a 56K system as part of these enhancement procedures. The last thing your Apple should say is "A>". This is your prompt to enter a command. A real quick one to try for you first time CP/M users is:

```
DIR<RETURN>
```

CP/M will indulge you by displaying the files which Microsoft so nicely included with the CP/M operating system.

Enough playing, time to get back down to business. Remove the CP/M master diskette and insert the Rana Enhancer Diskette, and again type:

```
DIR<RETURN>
```

Once again CP/M will indulge you by displaying those files which Rana so nicely supplied you. (What a pair of nice companies, right?) (If you're an Elite Three user, keep in mind that your drive will read standard Apple diskettes.) This little exercise shows that the enhancer diskette should be okay.

The next step is to format a blank diskette. For now, you'll need to use the FORMAT utility Microsoft supplied on the CP/M master until you've created an enhanced CP/M. To get FORMAT running, insert the CP/M master and type:

FORMAT<RETURN>

(Tough, right?) After CP/M loads the utility into memory, FORMAT will "sign on" by saying something like:

```
Apple ][ CP/M
16 Sector Disk Formatter
(C) 1980 Microsoft
```

Format disk in which drive?

If any part of your "sign on" message is different, you may have a newer version. In such a case, it would be wise to look up FORMAT in your CP/M manuals to make sure Microsoft didn't change something for which these instructions have yet to be updated.

Now you will need a diskette you can format (you'll also need a second one later). If you want to format a used disk remember that all the files as well as the system tracks will be erased. Format will normally detect an already formatted 16 sector disk and ask you to verify that you want the disk erased. This includes any DOS 3.3 or Apple Pascal diskettes you may have had lying around. If you plan on formatting an Elite Two or Three diskette (higher capacity) you should check the Recommended Diskettes section of this manual.

If you're an Elite Three user, you may have noticed that you are about to do a standard Apple Disk][format (which means doing some writing) on an Elite Three which is only suppose to be read compatible. This is true. However, since this procedure will not expect a non-Elite Three to read this diskette, it will all come out okay in the end.

Once you have a diskette, take out the CP/M master and put in the blank diskette. Then type:

A:<RETURN>

FORMAT will respond with:

```
Insert disk to be formatted in drive A:
Press RETURN to begin
```

You should then oblige it by typing:

<RETURN>

FORMAT will respond with:

```
Formatting...
```

Your drive will rattle for about a minute, and FORMAT will come back with:

FORMAT Complete

Format disk in which drive?

Since format has done all you require of it, simply type:

<RETURN>

FORMAT will then respond with:

Insert CP/M System disk in drive A:
Press RETURN

This smart little utility remembered you had taken the CP/M master diskette out of the drive so you could insert the blank disk to be formatted. Follow its direction and remove the blank diskette and re-insert the CP/M master diskette. When you have it in, type:

<RETURN>

The CP/M system prompt ("A>") should then appear.

The CP/M Operating System and all the utility programs on the Apple CP/M master now need to be copied onto your newly formatted disk. The original Microsoft COPY utility supplied on your Apple CP/M Master will do the job nicely. To get it started, type:

COPY<RETURN>

After COPY is loaded into memory, it will "sign on" by saying:

```
APPLE ][ CP/M
16 Sector Disk Copy Utility
(C) 1980 Microsoft
```

*

The asterisk ("*") prompt indicates COPY is ready to go.

Following the prompt type:

A:=A:

The utility will respond with:

Insert MASTER disk and press RETURN

Type:

<RETURN>

COPY will then read as much of the CP/M master diskette as it can into memory. Then it will say:

Insert SLAVE disk and press RETURN

You should then insert the newly formatted diskette, and tell COPY to continue by typing:

<RETURN>

Then COPY will write out what it has in memory to the new diskette. After it's all written, COPY will again ask for the CP/M master diskette by saying:

Insert MASTER disk and press RETURN

In response to this message you should insert the CP/M master and then type:

<RETURN>

COPY will proceed like this until the copy is completed. It will take about eight diskette exchanges (four inserts of each diskette) to complete the copy. Once COPY has finished, it will display:

COPY Complete

Do you wish to make another copy?

Your newly formatted diskette (still in the drive) will now contain all the utilities and the operating system from the Apple CP/M master. The CP/M operating system on this disk is the one which you will eventually enhance.

Take your Apple CP/M Master Diskette (the one not in the drive) and put it away in a safe place. You should no longer need it except in an emergency. Then type (without <RETURN>):

N

to end the COPY utility. COPY, like FORMAT, will remember that you have removed the CP/M master from the drive, so it will say:

Insert CP/M System disk into drive A:
Hit RETURN

Since the diskette in the drive (the one which was the blank disk) now contains an exact copy of the CP/M master, go ahead and type:

<RETURN>

Once CP/M responds with its "A>", you can check up on the COPY

utility by typing

```
DIR<RETURN>
```

and seeing the directory of programs on the new CP/M master disk.

The CPM56 utility from Microsoft must now be run to create a 56K operating system on your new master diskette. To get CPM56 to upgrade your 44K system diskette to a 56K system diskette, type:

```
CPM56 A:<RETURN>
```

CP/M will load the CPM56 utility into memory, then the utility will display:

```
Apple ][ CP/M
56K CP/M Disk Update Program
(C) 1980 Microsoft
```

```
Insert 16 sector disk into drive A:
Hit RETURN to begin
```

Since the system disk you want to update to 56K is the one you already have in drive A:, simply press:

```
<RETURN>
```

CPM56 will write out the 56K CP/M system image onto the diskette and then display:

```
Disk has been updated to 56K
```

```
Hit RETURN to re-boot system
```

You will want to work with this 56K system, so type:

```
<RETURN>
```

Your drive will rattle again and then CP/M will "sign back on" with the Microsoft copyright message. But, this time the message will say "56K" where it said "44K" last time you booted the system. The Rana Enhancement utility will now change the CP/M operating system to utilize the features of the Rana controller and drives, and permanently place the Enhanced CP/M on the disk's system tracks.

Remove the copy of the CP/M master diskette from the drive and insert the Elite Enhancements Diskette. Type:

```
ENHANCE<RETURN>
```


Once CP/M gets the ENHANCE utility loaded, the utility will display:

```
ENHANCE
RANA Systems' Enhancer for
Microsoft's Apple ][ 56K CP/M BIOS
Copyright (C)(P) 1982 RANA Systems
Version 1.1
```

```
BIOS Image
Primary Copyright 1981 Microsoft
Portions Copyright 1982 RANA Systems
```

Insert a *COPY* of your Microsoft 56K CP/M 2.2 distribution diskette into drive A:.. Please do *NOT* insert your original diskette from Microsoft.

Press <RETURN> when diskette inserted and ready to be enhanced. Press any other key to terminate this program without enhancing the diskette.

After that mouthful has finished displaying, reinsert the copy of the CP/M master diskette into the drive and type:

```
<RETURN>
```

ENHANCE will go out and replace those sections of the original Microsoft 56K CP/M with that information which is necessary to use the advanced features of the Rana Elite products.

Once ENHANCE is finished, it will display:

```
Enhancing completed. Press <RETURN>
to reboot system from slot #6.
```

Since you will want to start playing with the enhanced CP/M right away, press:

```
<RETURN>
```

and ENHANCE will re-boot the enhanced CP/M system.

The first enhancement you will notice on the enhanced CP/M is the additional Rana Systems copyright notice right below Microsoft's. This is an easy way to make sure you have booted an enhanced CP/M.

In order to complete the enhanced CP/M master diskette, you will need to move the enhanced utilities onto the master diskette from the Enhancements diskette. The standard CP/M PIP utility is designed for this little task. (PIP stands for "Peripheral Interchange Program".) However, PIP does not understand a single

drive copy. Therefore, your Enhancer diskette includes a special utility which will assist PIP in that area. But first, in order to make room for the new utilities on the master diskette, it will be necessary to remove the old ones first.

Type the following three CP/M commands. After each command, CP/M will simply respond with "A>".

```
ERA FORMAT.COM<RETURN>
ERA COPY.COM<RETURN>
ERA RW13.COM<RETURN>
```

These three commands ERAsed the old FORMAT and COPY utilities, along with the little used (but still useful) utility RW13. RW13 was erased to make room for the SGLDRIVE utility on the already packed Disk][capacity CP/M master diskette.

Now, to copy the new utilities onto the enhanced CP/M master, insert the Enhancements diskette into the drive, and then type:

```
SGLDRIVE<RETURN>
```

SGLDRIVE is PIP's assist utility which makes CP/M (and therefore PIP) think that your one drive is actually two drives. SGLDRIVE will respond with:

```
Enhanced Apple ][ CP/M
Dual to Single Drive Mapping Utility
Copyright (C) 1982 RANA Systems
Revision 1.1
```

```
B: now mapped to A:
```

```
Mount A:, Press <ESC>
```

The final "mount" message comes from the section of SGLDRIVE which is left in memory as part of the operating system (CP/M) after the bulk of SGLDRIVE goes away. This extra little "resident" section of SGLDRIVE does not consume any of the user's memory. It is loaded into that section of the operating system which is only required if you have more than one drive. And, since you don't have more than one drive (otherwise you wouldn't be running SGLDRIVE), this section of the operating system can be used for other purposes.

Once this "resident" portion of SGLDRIVE is loaded, CP/M as an operating system will begin recognizing two different drives (A: and B:), even though you only have the one physical drive attached to your Apple. SGLDRIVE "fools" CP/M into seeing another drive by constantly watching which drive CP/M (and standard programs running under CP/M, such as PIP) is trying to talk to at any particular time. Whenever CP/M changes from trying to talk to drive A: to trying to talk to drive B:, SGLDRIVE displays the message:

Mount B:, Press <ESC>

This gives you a chance to remove the diskette which CP/M thinks is the one in drive A:, and insert the diskette which CP/M thinks is in drive B:. Once you press:

<ESC>

SGLDRIVE converts CP/M's request to read or write on drive B: into a request to do the same read or write on drive A: (which now has the "phoney" drive B:'s diskette in it). Along the same lines, whenever CP/M changes from talking to drive B: back to talking to drive A:, SGLDRIVE displays the message:

Mount A:, Press <ESC>

This give you a chance to remove the "phoney" drive B: diskette and reinsert drive A.'s diskette. Once you've changed the diskettes, press:

<ESC>

and CP/M will be allowed to continue. If you are already starting to envision grand and glorious things for SGLDRIVE to do for you, it is suggested that you check the section later in this manual which deals strictly with SGLDRIVE itself. It explains some of the drawbacks and problems which can arise when using SGLDRIVE with certain types of programs. For now, SGLDRIVE is going to help you with the problem of PIP not being able to copy files between two different diskettes using one drive.

SGLDRIVE will still be sitting there waiting for you to insert the diskette for drive A:, so insert the enhanced CP/M master diskette and type:

<ESC>

CP/M will respond with it's "A>". Now issue the following four commands. After each command has completed, CP/M will respond with it's "A>" prompt. Whenever SGLDRIVE asks you to "mount B:", you should insert the Enhancer diskette and then press <ESC>. When SGLDRIVE asks you to "mount A:", you should insert the enhanced CP/M master diskette and then press <ESC>.

PIP A:=B:FORMAT.COM[V]<RETURN>

PIP A:=B:COPY.COM[V]<RETURN>

PIP A:=B:PROFILE.COM[V]<RETURN>

PIP A:=B:SGLDRIVE.COM[V]<RETURN>

If you are a first time Apple CP/M user, the "[" character is produced by typing <CTRL-K>, and the "]" character is produced by typing <SHIFT-M>. The Apple keyboard is not marked with (at least one of) these characters. If you are using a special

keyboard modification or 80-column board, you will probably need to consult the manual for that product concerning special keyboard characters under CP/M.

These commands told the PIP utility to copy the specified files from drive B: to drive A: and to verify that the files made it there correctly ("[V]").

The next step is to create a system diskette which gives you the full storage capability of your drive. If the only Elite product you have is the Elite Controller, then you are finished. The rest of these instructions deal with the configuring of the enhanced CP/M to make use of the extra storage of an Elite Series drive.

The first step in creating a system diskette for your higher capacity Elite drive is to format a diskette for the drive to use when it starts operating in a higher capacity way. Since you now have an enhanced CP/M, you can now run the new FORMAT utility in order to create these higher capacity diskettes. To get the new FORMAT started, type:

```
FORMAT<RETURN>
```

Once CP/M loads it in, FORMAT will respond with:

```
APPLE ][ CP/M
16 Sector Disk Formatter
Primary Copyright 1980 Microsoft
Portions Copyright 1982 RANA Systems
RANA Systems Version 1.1
```

```
Format disk in which drive?
```

In order to create a higher capacity diskette, you will need to choose, from the following table, whatever type of format would be suitable for your drive:

```
0 - Apple Disk ][      ( 35 tracks)
1 - RANA Elite One     ( 40 tracks)
2 - RANA Elite Two     ( 80 tracks)
3 - RANA Elite Three   (160 tracks)
```

Once you have the drive type number from the table, type (without <RETURN>):

```
A:
```

followed by the drive type number. For example, if you have an Elite Two, you would type:

```
A:2
```

If you have an Elite One, you would type:

A:1

And, if you have an Elite Three, you would type:

A:3

You should be careful to specify the correct drive type for your drive. FORMAT cannot always catch that the drive was unable to handle the type of format you requested. The disk will appear to be correctly formatted but will cause a CP/M Disk I/O error or BDOS error at some later stage, or your new CP/M may not boot.

Once you've specified the formatting information, type:

<RETURN>

FORMAT will respond with:

Insert disk to be formatted in drive A:
Press RETURN to begin

Insert that second blank diskette which was mentioned earlier, then type:

<RETURN>

FORMAT will respond with:

Formatting...

The drive will chatter and spin for almost a minute, (or two if formatting an Elite Two or Three diskette), then the screen will display:

FORMAT Complete

Format disk in which drive?

To end the FORMAT utility, press:

<RETURN>

without specifying any drive information. Once again FORMAT will remember that you had to remove the enhanced CP/M master diskette in order to insert the blank diskette to be formatted, so it will say:

Insert CP/M System disk in drive A:
Press RETURN

Remove the just formatted diskette and reinsert the enhanced CP/M master diskette. Then press:

<RETURN>

CP/M will eventually respond with "A>".

Before you can copy the system onto the new diskette in the correct format, you will need to define for the enhanced CP/M a drive which can read and write in the higher capacity format. This is accomplished using the PROFILE utility. Just like the other utilities, get it started by typing:

PROFILE<RETURN>

its "sign on" is:

```
APPLE ][ CP/M
Drive Configuration Utility
Copyright (C)(P) 1982 RANA Systems
Version 1.1
```

*

There is alot more to this utility than what you will make use of right now. For now, type (without <RETURN>):

B:

followed by the drive type number you used earlier during FORMAT. For example, if your drive is an Elite Two you would type:

B:2

Once you've typed the drive type number, press:

<RETURN>

and PROFILE will respond with:

```
Was B: Apple Disk-][      Slow seek.
```

and:

```
Now B: RANA  Elite One,   Medium seek.
```

or:

```
Now B: RANA  Elite Two,   Fast seek.
```

or:

```
Now B: RANA  Elite Three, Fast seek.
```

followed by:

Ready to update in-memory system.
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.

Since you, no doubt, entered the command correctly and received the response which would be correct for whichever type of drive you have, simply press:

<RETURN>

and PROFILE will update the currently operating CP/M so that it recognizes the phoney drive B: as whatever your drive should be. This gets a little confusing since drive B:, when using SGLDRIVE, will actually be drive A: (the only drive you have). However, its actually not all that complicated. Whenever CP/M goes to talk to drive B:, it will think it is talking to a higher capacity Elite Drive. SGLDRIVE will take care of the fact that drive B: is actually drive A: (with a different diskette inside). When CP/M goes to talk to drive A:, it will think of it as a Disk][. The only thing you need to worry about is that when SGLDRIVE asks you to mount the diskette for drive B:, you must put in the diskette which was formatted for the higher capacity. When SGLDRIVE requests the diskette for drive A:, you must put in the enhanced CP/M system master diskette. Let the system worry about all the complicated details of dealing with two different types of diskettes.

After PROFILE updates the CP/M system, it will return to the asterisk ("*") prompt. The next thing that needs doing is a small assist for SGLDRIVE. Due to the way SGLDRIVE functions, you will also need to redefine drive D: (another drive you don't actually have) the same way you redefined drive B:. So, if you're an Elite One user, type:

D:1<RETURN>

If you're an Elite Two user, type:

D:2<RETURN>

and of course, if you're an Elite Three user, type:

D:3<RETURN>

PROFILE will then go through all the same steps it did when you redefined drive B:, except this time it will apply to drive D:. Once you get back to the asterisk ("*") prompt, type (without <RETURN>):

<CTRL-C>

to get out of PROFILE. CP/M will respond with "A>".

Unlike Apple DOS's "INIT" command, CP/M's FORMAT does not place a copy of the operating system (in this case, CP/M) onto the newly formatted diskette. This task is left up to the COPY utility, which will place a copy of CP/M onto an existing diskette without altering any other information on the diskette. Since that is what you will want to do now, type:

```
COPY<RETURN>
```

to get the new COPY utility running.

Once it's loaded, it will respond with:

```
APPLE ][ CP/M
16 Sector Disk Copy Utility
Primary Copyright 1980 Microsoft
Portions Copyright 1982 RANA Systems
RANA Systems Version 1.1
```

*

Once again, the "*" signals that COPY is ready for a command. This time, however, the command will be slightly different. Type:

```
B:=A:/S<RETURN>
```

This command tells COPY to copy the CP/M system which is on the diskette in drive A: to the diskette in drive B: without altering any other information on the diskette in drive B:. Of course, there is no drive B:, but SGLDRIVE will take care of the problem for you. Right away, SGLDRIVE will catch COPY requesting information from drive B:, so it will allow you to change diskettes by saying:

```
Mount B:, Press <ESC>
```

Once you've changed the diskette in the drive from the enhanced CP/M master to the higher capacity formatted diskette, press:

```
<ESC>
```

Since COPY knows nothing of this little diskette change that occurred, it will respond with:

```
Insert SOURCE disk into drive A:
Insert TARGET disk into drive B:
```

```
Press RETURN to begin
```

With SGLDRIVE running, this message is basically redundant, so

just press:

<RETURN>

SGLDRIVE will then request:

Mount A:, Press <ESC>

Change the diskette in the drive back to the enhanced CP/M master and press:

<ESC>

SGLDRIVE will then allow COPY to proceed with reading the CP/M system off of the enhanced CP/M master diskette. When COPY changes to trying to write the enhanced CP/M to the higher capacity diskette, SGLDRIVE will request:

Mount B:, Press <ESC>

Insert the higher capacity diskette into the drive and press:

<ESC>

COPY will then continue by writing the enhanced CP/M to the higher capacity diskette.

Once COPY is finished, it will inform you of that fact by saying:

COPY Complete

Do you wish to make another copy?

Just like last time, simply type (no <RETURN> is necessary):

N

Since drive A: was used as one of the drives during the copy, COPY will remind you to reinsert the CP/M master diskette back into drive A: by saying:

Insert CP/M System disk into drive A:
Hit RETURN

Go ahead and remove the higher capacity diskette, then insert the enhanced CP/M master. Once its in the drive, press:

<RETURN>

Since the last diskette SGLDRIVE requested you place in the drive was the diskette for drive B:, it will request that you mount the drive A: diskette once CP/M goes to use it:

Mount A:, Press <ESC>

The enhanced CP/M master is already in the drive in response to COPY's request for it, so just hit:

<ESC>

CP/M will finally respond with its "A>".

At this point in the procedure you have created a diskette which will boot correctly (up to a point) on your higher capacity drive in a higher capacity way, but the CP/M system which is on the diskette for that drive still thinks that your drive is a Disk][. This is because the system you copied (the one on the enhanced master diskette) was still treating drive A: as a Disk][. To remedy this problem, get back into PROFILE by typing:

PROFILE<RETURN>

Again, the utility will "sign on" with:

```
Apple ][ CP/M
Drive Configuration Utility
Copyright (c) (p) 1982 RANA Systems
Version 1.1
```

*

To change the setting for drive A: within that system sitting on your higher capacity diskette, type (without <RETURN>):

B:=A:

What you've told PROFILE so far is that you are interested in updating the CP/M system in drive B: ("B:=") (with the help of SGLDRIVE), and the change you wish to make is to drive A: ("A:"). However, you've yet to specify the change to be made. Remember that drive type number you used back in FORMAT and PROFILE? It's time to type that again.

Example: If your drive is an Elite Two (in which case phoney drive B: would be defined as an Elite Two right now), you would want to type:

B:=A:2

If your drive is an Elite One, type:

B:=A:1

and last, but certainly not least (by about 500,000 bytes of storage), an Elite Three would be:

B:=A:3

Once you've entered the drive type number, press:

<RETURN>

and PROFILE will respond with (again):

Insert a system disk in B:
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.

Given that you entered the command correctly (of course you did!), insert your higher capacity diskette in the drive and press:

<RETURN>

Since PROFILE will then make an attempt to read the information off of phoney drive B:, SGLDRIVE will come back with:

Mount B:, Press <ESC>

SGLDRIVE is just doing it's job, even though the higher capacity diskette is already in the drive. Just hit:

<ESC>

and PROFILE will read the configuration information off of the higher capacity diskette and then mutter something like:

Was A: Apple Disk-][, Slow seek.

then PROFILE will change to referencing some drive A: information, so SGLDRIVE will request:

Mount A:, Press <ESC>

Once you've inserted the enhanced CP/M master, press:

<ESC>

and PROFILE will continue with:

Now A: RANA Elite One, Medium seek.

or:

Now A: RANA Elite Two, Fast seek.

or:

Now A: RANA Elite Three, Fast seek.

and always:

Ready to update B:.
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.

The "Now" message you get will match the drive type you specified. To update the CP/M system on your higher capacity diskette, insert the higher capacity diskette and type:

<RETURN>

PROFILE will then attempt to write the new configuration to the higher capacity diskette, which SGLDRIVE does not know you've put in the diskette, so you'll get:

Mount A:, Press <ESC>

Since the diskette is already inserted, press:

<ESC>

and PROFILE will continue by writing out the new configuration.

When its finished, it will return to the asterisk ("*") prompt.

To get out of PROFILE, insert the enhanced CP/M master into the drive and type:

<CTRL-C>

SGLDRIVE will catch the change in drives and do its little:

Mount A:, Press <ESC>

The enhanced CP/M master is already inserted, so just type:

<ESC>

CP/M will then respond with its "A>" prompt. To complete your higher capacity system diskette, you'll need to copy the CP/M distribution files (from Microsoft and Rana) onto the higher capacity diskette from the enhanced CP/M master. You should read ahead at this point (if you're not already doing so) up to the point where PIP finishes what it is about to do. This next step is a little involved (but not complicated), so you'll want to know what's coming up.

Once you're done reading, type:

PIP B:=A:*. *[V]<RETURN>

This command first tells PIP to copy all files on drive A: ("A:*.**") to drive B: ("B:=") and verify that they made it correctly ("[V]"). Since PIP will be doing a whole bunch of files, it will display the name of each file as it is copied. PIP must be used to copy each file one at a time since the two diskettes are of a different type and the files must be written to the diskette according to the diskette's type. COPY will not rearrange files into different arrangements according to the diskette's type. PIP will require alot of diskette changes, which SGLDRIVE will catch and request:

Mount A:, Press <ESC>

or:

Mount B:, Press <ESC>

Whenever SGLDRIVE requests diskette A:, insert the enhanced CP/M master. When diskette B: is requested, insert the higher capacity diskette. To be safe, you should place a write protect tab over the enhanced CP/M master's write protect notch so that that diskette cannot be written upon. This will insure that the diskette will not be "destroyed" should you accidentally forget to exchange the diskettes.

Amidst all of these very abundant "mount" requests from SGLDRIVE, PIP will report the name of each file as it begins copying the file. There are alot of files on the CP/M distribution diskette (and thus on the enhanced CP/M master), so there will be alot of diskette changes; but without SGLDRIVE, this little single drive file-by-file copy would be impossible. And, without this copy, creating a higher capacity system master would be impossible. Don't fear though! Once this higher capacity system master is created, COPY can be used to duplicate it alot faster, and with alot fewer diskette changes.

When PIP is finished, it will return to the CP/M "A:" prompt.

Now you can turn your Apple off, and reboot the system (just like you did at the beginning of this whole process) using the higher capacity diskette.

All the hard work is over. It's time to enjoy!! If you want to see the difference between a Disk]['s capacity and your new Elite drive's capacity (if you're an Elite Two or Three user, this will make your day), look up the:

STAT DSK:<RETURN>

command in your Microsoft CP/M manuals.

For a Disk][drive, STAT will respond with the following:

```
A: Drive Characteristics
1024: 128 Byte Record Capacity
128: Kilobyte Drive Capacity
48: 32 Byte Directory Entries
48: Checked Directory Entries
128: Records/ Extent
8: Records/ Block
32: Sectors/ Track
3: Reserved Tracks
```

The drive capacity in records and kilobytes is what will primarily interest you. Also, a quick explanation: the 32 sectors per track is correct. When Apple talks about 16 sectors/track, they are referring to a "sector" which contains 256 bytes. When CP/M refers to a "sector", it is referring to a "sector" of 128 bytes. Microsoft (and thus Rana) handles this small difference in interpretation of a "sector" by packing two CP/M sectors into every Apple sector (2 times 128 equals 256). Therefore Microsoft gets twice as many (smaller) CP/M sectors on every track (32) as Apple does (16). The actual way "sectors" are read and written from/to a diskette is identical between Microsoft CP/M, Apple DOS 3.3, and Apple Pascal 1.1. This means that all three systems can read and write the remaining two systems' diskettes, but they generally do not understand the information which the other two systems' place within the "sectors".

Remember, when it comes to the new Rana version of the FORMAT and COPY utilities, the instructions in this manual are intended to replace those instructions given in the very informative Microsoft CP/M manuals.

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5. Section 5

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6. SPECIFICATIONS**6.1. Introduction**

This section of the manual provides specifications for the entire Elite Series of products. Most of the information is of a highly technical nature, so it may or may not be of interest to you.

At this stage, the general user should know that familiarity with the technical information to follow is not required to obtain the best performance from any Elite Series product.

Capacity	163K Bytes
Track to Track Access Time	15ms
Maximum Access Time	450ms
Average Access Time	150ms
Number of Heads	1
Number of Cylinders	40
Number of Tracks	40
Number of Sectors/Track	16
Track Density	48 TPI
Rotational Speed	295 RPM
Recording Frequency	250 KHZ
Recording Density	
Inside Track Maximums	5536 FCI
	4429 BPI
Weight	5 lbs 4 oz
Reliability	
MTBF	9200 Hours
MTTR	.5 Hours
Design Life	5 Years
Soft Error Rate	1 in 10^{+09} Bits
Hard Error Rate	1 in 10^{+12} Bits
Seek Error Rate	1 in 10^{+06} Steps
Media	ANSI Std. 5.25" Disk
Interface	Disk II Compatible
Average Latency	100ms
Motor Start Time	0.5s

Fig. 6-1: Elite One Characteristics

Power Requirements	
+5 VDC Standby	35mA
+5 VDC Active	50mA
+12 VDC Standby	40mA
+12 VDC Active	300mA
+12 VDC Surge	450mA
Operating Temp.	40F - 115F
Nonoperating Temp.	-40F - 160F
Operating Humidity	20% - 80% (noncond.)
Nonoperating Humidity	5% - 95% (noncond.)
Max Wet Bulb	85F

Fig. 6-2: Elite One Characteristics (cont.)

Specifications are approximations based on industry standard testing. They are not based on an Elite One operating under the standard Apple II operating systems and hardware, and are also not best/worst case.

Capacity	326K Bytes
Track to Track Access Time	5ms
Maximum Access Time	210ms
Average Access Time	84ms
Number of Heads	2
Number of Cylinders	40
Number of Tracks	80
Number of Sectors/Track	16
Track Density	48 TPI
Rotational Speed	295 RPM
Recording Frequency	250 KHZ
Recording Density	
Inside Track Maximums	5876 FCI
	4700 BPI
Weight	5 lbs 4 oz
Reliability	
MTBF	9200 Hours
MTTR	.5 Hours
Design Life	5 Years
Soft Error Rate	1 in 10e+09 Bits
Hard Error Rate	1 in 10e+12 Bits
Seek Error Rate	1 in 10e+06 Steps
Media	ANSI Std. 5.25" Disk
Interface	Disk II Compatible
Average Latency	100ms
Motor Start Time	0.5s

Fig. 6-3: Elite Two Characteristics

Power Requirements	
+5 VDC Standby	35mA
+5 VDC Active	50mA
+12 VDC Standby	40mA
+12 VDC Active	300mA
+12 VDC Surge	450mA
Operating Temp.	40F - 115F
Nonoperating Temp.	-40F - 160F
Operating Humidity	20% - 80% (noncond.)
Nonoperating Humidity	5% - 95% (noncond.)
Max Wet Bulb	85F

Fig. 6-4: Elite Two Characteristics (cont.)

Specifications are approximations based on industry standard testing. They are not based on an Elite Two operating under the standard Apple II operating systems and hardware, and are also not best/worst case.

Capacity	652K Bytes
Track to Track Access Time	5ms
Maximum Access Time	420ms
Average Access Time	150ms
Number of Heads	2
Number of Cylinders	80
Number of Tracks	160
Number of Sectors/Track	16
Track Density	96 TPI
Rotational Speed	295 RPM
Recording Frequency	250 KHZ
Recording Density	
Inside Track Maximums	5922 FCI
	4737 BPI
Weight	5 lbs 4 oz
Reliability	
MTBF	9200 Hours
MTTR	.5 Hours
Design Life	5 Years
Soft Error Rate	1 in 10e+09 Bits
Hard Error Rate	1 in 10e+12 Bits
Seek Error Rate	1 in 10e+06 Steps
Media	ANSI Std. 5.25" Disk
Interface	Disk II Compatible
Average Latency	100ms
Motor Start Time	0.5s

Fig. 6-5: Elite Three Characteristics

Power Requirements	
+5 VDC Standby	35mA
+5 VDC Active	50mA
+12 VDC Standby	40mA
+12 VDC Active	300mA
+12 VDC Surge	450mA
Operating Temp.	40F - 115F
Nonoperating Temp.	-40F - 160F
Operating Humidity	20% - 80% (noncond.)
Nonoperating Humidity	5% - 95% (noncond.)
Max Wet Bulb	85F

Fig. 6-6: Elite Three Characteristics (cont.)

Specifications are approximations based on industry standard testing. They are not based on an Elite Three operating under the standard Apple II operating systems and hardware, and are also not best/worst case.

Interfacing Capability	4 Drives
PROM Sizes	
6502 Boot Logic	2K Bytes
State Machine	256/512 Bytes
GCR Data Frequency	250 KHZ
Weight	1 lb
Reliability	
MTBF	35,000 Hours
MTTR	.25 Hours
Design Life	10 Years
Interface	
System	Apple II Bus
Drives	Disk II Compatible
Power Req. (excluding drives)	
+5 VDC Standby	140mA
+5 VDC Active	340mA
Operating Temp.	40F - 115F
Nonoperating Temp.	-40F - 160F
Operating Humidity	20% - 80% (noncond.)
Nonoperating Humidity	5% - 95% (noncond.)
Max Wet Bulb	85F

Fig. 6-7: Elite Controller Characteristics

Specifications are approximations based on industry standard testing. They are not based on an Elite Controller operating under the standard Apple II operating systems and hardware, and are also not best/worst case.

6.2. Mechanical Dimensions

The following two figures give the physical dimensions of the Elite Series drives and the Elite Controller.

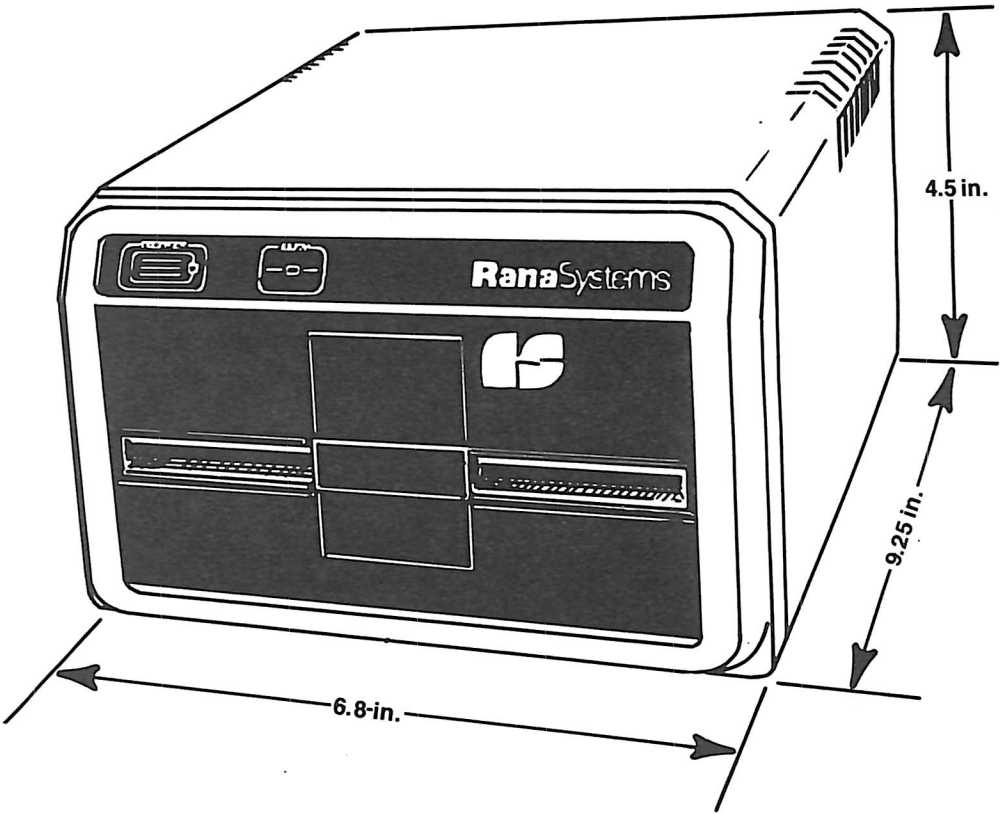


Fig. 6-8: Physical Dimensions of Elite Drives

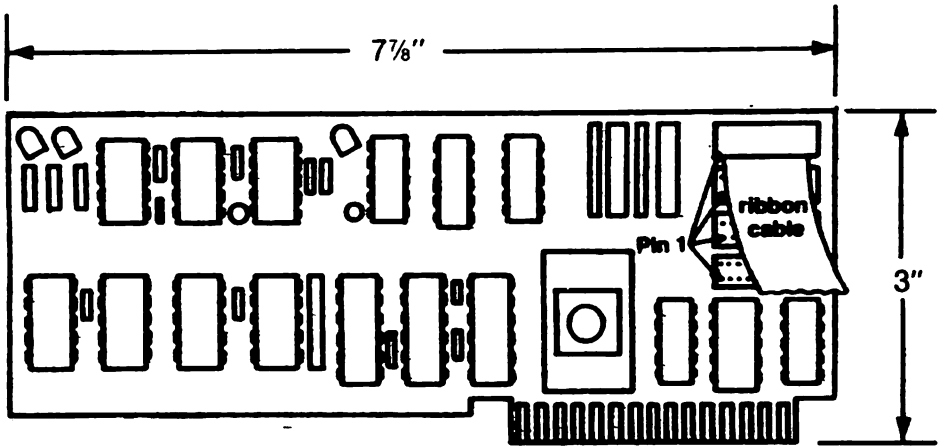


Fig. 6-9: Elite Controller Physical Dimensions

6.3. Controller to Drive Interface

Pin Number	Signal (originates)
1	Ground
2	+ Stepper Motor Phase A (ctrl)
3	Ground
4	+ Stepper Motor Phase B (ctrl)
5	Ground
6	+ Stepper Motor Phase C (ctrl)
7	Ground
8	+ Stepper Motor Phase D (ctrl)
9	Not Connected
10	- Activate Writing (ctrl)
11	+5V
12	+5V
13	+12V
14	- Select Drive (ctrl)
15	+12V
16	+/- Read Data (drive)
17	+12V
18	+/- Write Date (ctrl)
19	+12V
20	+ Write Protect (drive)

Fig. 6-10: Controller to Drive Interface Signals

The Elite drives/controller interface can be divided into two categories:

1. Signal.
2. Power.

The following sections provide the electrical definition for each line.

Refer to the preceeding figure for all interface connections. Timing diagrams for the signals are provided in the Elite Series Service Manual.

6.4. Signal Interface

The signal interface consists of two categories:

1. Control.
2. Data transfer.

All lines in the signal interface are digital and originate in either the drive (to controller) or on the controller (to drive) via the interface cable.

6.4.1. Control Signals

All control signals originate at the controller, and are of two types: those intended to be multiplexed in a multiple drive system, and one which will perform the multiplexing.

Drive Select

The input signal intended to do the multiplexing is the drive selection signal. Although standard Apple II-type minifloppy drives are not daisy-chained on a cable like most other systems, the majority of the input/output signals passing between the drives and the controller are wire-ORed together on the controller card inside the Apple making multiplexing of signals necessary.

The drive select signal is the only signal which is not shared between all drives attached to the same controller card. The controller has a separate drive select line for each drive for which is it capable of controlling.

The Drive Select line provides a means of selecting and dese-

lecting the individual disk drives. When this signal is low, that portion of the disk drive electronics which are normally powered down (Elite drives) are activated. The spindle drive motor is turned on, the busy light is illuminated, and the drive is conditioned to respond to step or read/write commands.

When this signal is high, the drive motor and the busy light are turned off, the input control and the output status lines are disabled, and unused sections of the drive's electronics (Elite series) are powered down.

There is an intentional delay incorporated on both the Elite and Disk II controller cards which keeps a drive selected for a little over one second after the software gives the command to deselect the drive. This allows the software to "reselect" the drive within that period without having to wait for the motor to return to operational speed.

This delay must be taken into account when the software goes to select a drive on a different controller card so that only one drive is powered-up at any one time (an Apple II power supply consideration). (The same consideration is necessary when another device, such as Apple's Silentyper printer, which draws power from the Apple II power supply is to be selected.) No pause is required when selecting an alternate drive on the same controller since both the Elite and Disk II controllers will immediately deselect the previous drive when the new drive is selected.

The select line must remain low throughout the execution of a step or read/write command. After the drive is selected, there must be a 500ms delay before a write operation is initiated. This 500ms delay allows the drive motor to come up to speed. This delay is handled by the Apple II operating systems.

Although a newly selected drive will not return valid data until the motor comes up to speed, the software need not incorporate any timing delays before attempting a read provided the motor-on time is taken into account in any retry logic. Since a 500ms motor-on time is a maximum, the system software can usually shorten the delay by sampling the drive's returned data until valid data begins to appear.

Stepper Motor Phase Selection

In order to move the read/write head, each of the four phases of the stepper motor (A-D) must be turned on then off again in a certain sequence. Each phase is activated/deactivated in direct response to the stepper motor phase control interface signals being set logically high/low respectively. If the stepper motor phases are activated then deactivated in ascending order (A, B, C, D, A, etc), the arm is moved inward. In descending order (A,

D, C, B, A, etc), the arm is moved outward. The timing between activation and deactivation of these signals is critical.

Activate Writing

The active state of this signal, or logical low, enables the write data to be written on the diskette. The inactive state, or logical high, completely disables the write logic and enables the read data logic and stepper logic.

6.4.2. Data Signals

Read Data

This interface line returns to the controller card the magnetic polarity of the section of the diskette (side) which is currently passing under the (selected) read/write head. When a section of media with a particular magnetic polarity is passing under the (selected) read/write head, this interface line will be a logical low. When a section of the media with an opposite polarity is passing under the (selected) read/write head, this line will be a logical high. The controller cards are not as interested in the actual logical level of this line as they are in a change from one level to the other. Such a transition signifies that a "1" bit was recorded at that media location, lack of a transition indicates a "0" bit.

Write Data

This interface line directly controls the current flowing through the (selected) read/write head. A logical high level on this line will cause the (selected) read/write head to magnetize the disk (side) with a particular polarity. A logical low level will cause the (selected) read/write head to magnetize the disk (side) using the opposite polarity. This line is only enabled when the Activate Writing signal is enabled. Write Data is inactive during a read operation. A Write Data clamp is provided within the drive logic to hold the Write Data line at a logical zero whenever Activate Writing is inactive.

Write Protect

This interface signal is provided by the drive to give the Apple an indication when the installed diskette is write protected.

The signal is a logical low level when it is protected. The drive will inhibit writing with a protected diskette installed in addition to notifying the controller card.

Write protection can be in the form of either a diskette with a label covering the write protect notch (physical write protection), or the front panel write protect switch being set on the Elite Series drives (logical write protection).

6.5. Power Interface

Both the Elite Series and Disk II drives require only DC power for operation, which is drawn from the Apple II computer through the controller card. The two DC voltages, their specifications and their interface pin designators are given in various tables earlier in this section.

7. OPERATIONAL THEORY OF ELITE PRODUCTS**7.1. Elite Drives****7.1.1. General Operation**

The Elite Series drives consist of read/write, control, and drive motor electronics; drive mechanism; read/write head; and an advanced track positioning mechanism. These components perform the following functions:

1. Interpret and generate control signals.
2. Move the read/write head to the desired track.
3. Read and write data.
4. Control drive motor speed.
5. Select between two heads (Elite Two and Three).

The interface signals and their relationship to the internal functions are shown in the following figure.

Fig. 7-1: Interface Signal Relationships

7.1.2. Read/Write/Control Logic

The electronics are packaged on one PCB which contains:

1. Read/write head positioning drivers.
2. Write current drivers.
3. Read amplifier and transition detectors.
4. Write protect detectors and latches
 - a. Diskette
 - b. Panel switch
5. Drive select circuits.
6. Drive motor control circuits.
7. Head selection detection and latch circuits (Elite Two and Three).

7.1.3. Drive Mechanism

The drive motor operates on 12VDC and rotates the spindle at 300 RPM through a belt-drive system. The motor speed is controlled by a feed-back from a tachometer inside the motor. A registration hub clamp that moves in conjunction with the door closure mechanism centers and clamps the diskette onto the spindle hub.

7.1.4. Head Positioning Mechanisms

An electrical stepping motor and an advanced head positioning mechanism position the read/write head. Clockwise and counter-clockwise rotations of the stepper motor are translated into linear head movement via one of two mechanisms discussed below. The Apple system software increments the stepper motor to the desired track by directly signalling the drive electronics which stepper motor phases to power on and off.

The stepper motor stator coils are organized in four phases: A, B, C, and D. As each phase is activated in turn, the motor rotates to align with that coil, forcing the carriage to move one "half-track" (full track for Elite Three) position. If the phases are activated in the order A, B, C, D, A ... the head will step in. The order D, C, B, A, D ... will cause the head to step out.

Band Pulley Positioning

In the Elite Two, Three, and some Elite Ones, the stepper motor acts on a pulley to which is attached a flexible, ultra thin band. One half of this band has a slot through which the other half passes after looping around the pulley.

The two band ends are secured to the main head carriage at the inner and outer edges. Slackness in the band or the motion of the mechanism is highly unlikely as the system is pre-tensioned (reducing angular and linear inertia) to allow greatly improved track to track access times.

Lead Screw Positioning

In some Elite One designs, the stepper motor rotates a lead screw. The four-start lead screw is threaded through a type of "nut" which is part of the read/write head carriage assembly. As the stepper motor rotates, the linearly stationary lead screw forces the "nut" to move, taking the read/write head carriage along with it.

7.1.5. Read/Write Head

The Elite Series read/write heads are single element, glass bonded ferrite/ceramic heads with tunnel erase elements to provide erased areas between data tracks. Thus, normal interchange tolerances between media and drives will not degrade the signal to noise ratio and insures diskette interchangeability.

The read/write head is mounted on a carriage assembly which moves on rails and is positioned by one of the two mechanisms mentioned above. The diskette is held in a plane perpendicular to the read/write head by a platen located on the base casting.

This precision registration insures perfect compliance with the read/write head. The diskette is loaded against the head when the drive door is closed. The read/write head is in direct contact with the diskette, so the head surface has been designed to obtain maximum signal transfer to and from the magnetic surface of the diskette with minimum friction and wear.

The Elite One contains a single head which is positioned below the diskette, facing upward, thus allowing it to read and write upon the lower surface (surface opposite the diskette's label). A felt pressure pad is mounted on a precision tensioned swing arm located opposite the read/write head. This pad insures constant contact of the diskette against the head. The pad swings up and back when the door is opened to permit insertion/removal of the diskette. Although this pad is engineered for minimum diskette wear, the pad is not designed to ride on a diskette surface

containing valid data. Therefore, diskettes containing valid data on both surfaces should not be used in single headed drives such as the Elite One or Disk II.

The Elite Two and Elite Three drives contain two heads which are oriented essentially opposite each other on opposing sides of the diskette. The lower head (head zero) is oriented identical to the Elite One's single head. The upper head (head one) is mounted on a precision tensioned swing arm, which is raised up and back when the drive's door is opened; thus allowing the diskette to be inserted/removed.

7.2. Elite Controller

7.2.1. Introduction

The four disk drives allowed with each Elite Controller card are grouped into two pairs with drives 1 and 2 (Bank 0) selected when power is first applied.

They may be addressed using the standard "D1" and "D2" used by most Apple software. With a special command to the controller to select Bank 1, drives 3 and 4 will respond as if they were drives 1 and 2. An LED indicates when the second bank (drives 3 and 4) is selected.

An EPROM, containing the Rana boot code, is located on the controller card. The Rana boot accommodates both the standard Apple 13 and 16 sector formats. The controller card is also compatible with the special "copy protected" 16-sector boot formats since, in a general sense, only the initial boot sector must be read by the boot PROM. Following this, the user software (or DOS) handles any special formats.

The EPROM is switched into and out of the peripheral expansion space (\$C800-CFFF) using the protocol recommended by Apple. An LED, located on the Controller Card, indicates when the Rana boot EPROM is switched into the expansion space.

7.2.2. Booting

The Rana boot code automatically detects the format, whether 13 or 16 sector, and loads the initial boot sector (track 0, sector 0).

On 13 sector booting, control is immediately transferred to the second stage boot code (loaded at \$300-\$3FF) via a jump to \$301.

On 16 sector booting, the boot sector is loaded at \$800-\$8FF. Following the load, byte \$800 is checked to find which other sectors are to be loaded prior to transferring control to the second stage. Any additional sectors will be loaded in successive memory pages (\$900, \$A00, etc).

The standard DOS 3.3 second stage boot does not require any additional sectors to be loaded under the exclusive control of the boot PROM.

Once all the required sectors have been loaded, the PROM transfers control to the second stage boot code via a jump to \$801.

Both the DOS 3.2.1 and DOS 3.3 second stage boot routines re-enter the boot PROM in order to use the sector reading code it contains.

DOS 3.2.1 re-enters the PROM at \$Cn5D using a 6502 JSR which requires the PROM to perform an RTS when completed.

DOS 3.3 re-enters at \$Cn5C using a 6502 JMP. When the PROM is finished, the second stage expects it to transfer control back, via a JMP, to \$801.

DOS 3.2.1 does not expect the boot PROM to try to decode the data read on the later calls (the boot sector is a special encoding scheme which differs from the rest of a 13 sector disk).

However, DOS 3.3 does require the boot PROM to decode on these later sectors.

NOTE: The Rana boot code adheres to all the above standard Apple DOS booting protocols, and to several extensions to this protocol in order to support existing software packages.

7.2.3. Hardware

The Elite Controller Card has full data buffering, using a bi-directional bus driver, which provides more drive than other controllers yet requires very little drive from the bus. Extensive power switching reduces the power consumption of the data buffer and other circuits.

7.2.4. EPROM Logic

The EPROM is split into two sections (\$000-\$6FF and \$700-\$7FF). Both sections are mapped into \$C800-\$CFFF; however only the \$000-\$6FF section, which maps into \$C800-\$CEFF, is intended to be used at this location. The second section is mapped into the slot-dependent location in the Apple memory as illustrated in the table below.

Slot	Memory Address for EPROM (\$700-\$7FF)
0	(not allowed)
1	\$C100-\$C1FF
2	\$C200-\$C2FF
3	\$C300-\$C3FF
4	\$C400-\$C4FF
5	\$C500-\$C5FF
6	\$C600-\$C6FF
7	\$C700-\$C7FF

Fig. 7-2: Slot Dependent PROM Address Ranges

This slot dependent portion of the EPROM is always there. The mapped-in section, at \$C800-\$CFFF, is only there after an access to the slot dependent area. However, before accessing the expansion area a command must be given to turn off all the other ROMs that might be on the bus (an access at \$CFFF) which also turns off the Rana EPROM. When the expansion ROM area is mapped out from within the slot dependent ROM code, the following instruction fetch made by the 6502 will cause the Elite Controller's ROM to be mapped back in. This allows the slot dependent code to map out all other controllers' ROMs without affecting itself.

This mapping of the 2K peripheral ROM space (\$C800-\$CFFF) is a convention maintained by nearly all of the hardware and software developers.

The partitioning of the EPROM is performed by U16 (74LS257) and selection of the expansion portion is done by U7 (74LS74) and U16 (74LS257). Decoding of the off instruction is performed by U15 (74LS30). A synchronous approach was taken to selection design because of noise spikes on many of the bus interface lines.

7.2.5. State Machine

This consists of a program counter latch, a control latch, and a condition matrix contained in a 256/512 byte PROM. The present program counter address (which is completely independent from the 6502 central processor's program counter) and the condition lines are the inputs to the condition matrix PROM.

Separate state diagrams exist for every kind of activity allowed by the controller. These states are selected by two of the condition lines.

7.2.6. Addressable Latch

The addressable latch is used to store the operating mode of the controller including the selected disk drive, the phase of the stepper motor, the motor enable state, and the function currently being performed.

7.2.7. Alternate Pair Select Logic

Selection of the second pair of disk drives is accomplished by detecting a write to the peripheral expansion area which normally contains ROM.

The controller will only recognize the write if its own EPROM is mapped in. This is to avoid recognition of the pair select command for a second controller card installed in the same computer.

The select information is contained in address line 0, thus (if this controller's EPROM is switched into \$C800-\$CFFF) a write to \$C800 will select Bank 0 (drives 1 and 2). A write to \$C801 will select Bank 1 (drives 3 and 4) a condition which will be indicated by an LED.

7.2.8. Data Buffer/Internal Data Bus

The data buffer U13 (8304) is powered-on whenever a data transfer to or from the controller card occurs. The internal data bus connects the data buffer with the EPROM and the serial to parallel converter U12 (74LS323). The outputs of the EPROM and the serial to parallel converter are controlled to insure that no contention ever occurs on the bus.

7.2.9. Controller Command Structure

The Elite Controller Card responds to three types of commands. The first type is the device command, characterized by bringing the DEV line low as shown in the following table. (See the Apple II Reference Manual for an explanation of the DEV line.)

Slot	Memory Address for DEV
0	(not allowed)
1	\$C090-\$C09F
2	\$C0A0-\$C0AF
3	\$C0B0-\$C0BF
4	\$C0C0-\$C0CF
5	\$C0D0-\$C0DF
6	\$C0E0-\$C0EF
7	\$C0F0-\$C0FF

Fig. 7-3: DEV Line Address Ranges

Each block of sixteen addresses permits eight commands (on and off for each). These are:

Command	OFF	ON
Stepper Phase A	\$C0n0	\$C0n1
B	\$C0n2	\$C0n3
C	\$C0n4	\$C0n5
D	\$C0n6	\$C0n7
Drive Motor Enable	\$C0n8	\$C0n9
Drive 1/2 Select	\$C0nA	\$C0nB
Function Select Bit 0	\$C0nC	\$C0nD
Function Select Bit 1	\$C0nE	\$C0nF

where n is a number from \$9 to \$F (slot +8) as determined by the slot location of the card:

Slot	Value of "n" in Command
0	(not allowed)
1	9
2	A
3	B
4	C
5	D
6	E
7	F

Fig. 7-4: Controller Command Addresses

Function bits 0 and 1 determine the mode of the controller:

Controller Mode	Function	
	Bit 1	Bit 0
Read From Disk	0	0
Sense Write Protect	0	1
Write To Disk	1	0
Load Data Byte (Write)	1	1

Fig. 7-5: Controller Functions

The second type of command is the bank select command, characterized by a write by the Apple CPU to the address space occupied by the controller's EPROM. The bank select commands are only enabled when the controller's EPROM is switched into the peripheral expansion space. An LED indicates when drives 3 and 4 (Bank 1) are selected.

Drives Selected	Address to Write (data ignored)
1 and 2	\$C800
3 and 4	\$C801

(Writes to other addresses between \$C800 and \$CFF7 are also possible but may not be supported in later card revisions).

Fig. 7-6: Controller Bank Select Addresses

The third type of command is the EPROM switches. These control whether the EPROM is enabled for the \$C800-CFFF peripheral expansion space. An LED indicates when the EPROM is switched on.

EPROM Switch	Address to Access
Turn on at \$C800-CFFF	\$Cn00-CnFF (n = slot #)
Turn off EPROM	\$CFF8-CFFF

Fig. 7-7: Controller EPROM Map-In/out Addresses

7.2.10. Power-On Reset

Unlike early Apple II computers, a power-on reset circuit has been included to insure the controller assumes the correct quiescent mode when power is first applied. This is implemented with a timer circuit that pulls the reset line down in a "wire-or" fashion. After approximately 0.2 seconds, the reset line is released. This circuit does not interfere with the normal operation of the reset line.

7.2.11. Power Supply Decoupling

All power supplies to the controller are bypassed to ground on board, whether or not they are used. This technique provides the best grounding scheme for Apple II equipment and also reduces noise on other bus lines.

7.2.12. Direct Use of Disk Drives

It is often necessary to access the drives directly from assembly language, without the use of DOS. This is done using a section of 16 addresses that are latched toggles, interfacing directly to the hardware. There are eight two byte toggles that essentially represent pulling a TTL line high or low. Applications which could use direct access range from a user written operating system to DOS-independent utility programs. The device address assignments are illustrated in the figure below.

The addresses are slot-dependent and the offsets are computed by multiplying the slot number by 16. This works well in hexadecimal where \$n0 (with n as the slot number) can be added to the base address. To engage drive 1 in slot #6, add \$60 to \$C08A (device address assignment for engaging drive 1) for a result of \$C0EA. However, for code that is not slot dependent use \$C08A,X (where the X register contains the value \$n0).

In general, the addresses in the figure below need only be accessed with any valid 6502 command. When reading and writing bytes, ensure the data is in the appropriate register. All the following engage Drive 1 (assume slot #6).

```
LDA $C0EA
BIT $C08A,X (where X-reg contains $60)
CMP $C08A,X (where X-reg contains $60)
```

ADDRESS	LABEL	DESCRIPTION
\$C080	PHS00F	Stepper Phase 0 Off
\$C081	PHS00N	Stepper Phase 0 On
\$C082	PHS10F	Stepper Phase 1 Off
\$C083	PHS10N	Stepper Phase 1 On
\$C084	PHS20F	Stepper Phase 2 Off
\$C084	PHS20N	Stepper Phase 2 On
\$C085	PHS30F	Stepper Phase 3 Off
\$C086	PHS30N	Stepper Phase 3 On
\$C086	PHS40F	Stepper Phase 4 Off
\$C087	PHS40N	Stepper Phase 4 On
\$C088	MTROFF	Turn Motor Off
\$C089	MTRON	Turn Motor On
\$C08A	DRV0EN	Engage Drive 1
\$C08B	DRV1EN	Engage Drive 2
\$C08C	Q6L	Strobe Latch for I/O
\$C08D	Q6H	Load Data Latch
\$C08C	Q7L	Prepare Latch/Input
\$C08D	Q7R	Prepare Latch/Output

- Q7L after Q6L = Read
- Q7L after Q6H = Sense Write Protect
- Q7H after Q6L = Write
- Q7H after Q6H = Load Write Latch

The following are typical examples of the use of device address assignments (slot #6 is assumed and the X-reg contains \$60).

Stepper Phase Off/On

Each of the four phases (0-3) must be turned on and off again. In ascending order, the arm is moved inward, in descending order the arm is moved outward. The timing between accesses to these locations is critical and the SEEK command in RWTS should be used to move the arm.

The following example assumes the drive is already selected, motor on, not in write mode, and has two stepper motor phases per track (standard for the Elite One, Elite Two, and Disk II), and it will move the head from the source track SRCTRK to destination track DSTTRK. The seek speed is controlled by the routine DELAY which should loop for approximately 15 milliseconds (for the purposes of the example) prior to returning.


```

        LDA    #DSTTRK
        ASL    A
        STA    TEMP1
        LDA    #SRCTRK
        ASL    A
LOOP:   CMP    TEMP1
        BEQ    DONE
        BCS    MOVOUT
        ADC    #1
        BCC    MOVE
MOVOUT: SBC    #1
MOVE:   PHA
        AND    #$03
        ASL
        STA    TEMP2
        TXA
        ORA    TEMP2
        TAY
        LDA    $C080,Y
        JSR    DELAY
        PLA
        TAY
        LDA    $C080,Y
        JSR    DELAY
        PLA
        JMP    LOOP
DONE:   <SEEK FINISHED>
```

Motor Off/On

LDA \$C088,X Turn Motor Off

LDA \$C089,X Turn Motor On

NOTE: A delay should be provided to allow the motor to come up to speed. DOS will keep this delay to a minimum by watching the read latch until data starts to change. Motor-on timing characteristics for the Elite Series drives can be found elsewhere in this manual.

Engage Drive within Bank

LDA \$C08A,X Engage Drive 1:

LDA \$C08B,X Engage Drive 2:

Select Bank

TXA	Build \$Cn00 address
LSR	to access controller
LSR	slot dependent PROM.
LSR	
LSR	
ORA #C0	
STA ZPAGE+1	
LDY #00	
STY ZPAGE	
LDA \$CFFF	Map out other boards
LDA (ZPAGE),Y	Map in Elite Controller
LDY #BANK	Select Bank 0/1
STA \$C800,Y	
LDA \$CFFF	Map out Elite Controller

Read a Byte

```

READ LDA $C08C,X
      BPL READ

```

NOTE: \$C08E,X must already have been accessed to assure Read mode. The loop is necessary to assure that the accumulator will contain valid data. If the data latch does not yet contain valid data, the high bit will be zero.

Sense Write Protect

```
LDA $C08D,X
LDA $C08E,X      Sense write protect
BMI ERROR PROTECTED High bit set, protected.
```

Write Load/Write a Byte

```
LDA DATA
STA $C08D,X      Write Load
ORA $C08C,X      Write byte
```

NOTE: \$C08F,X must already have been accessed to insure Write mode and a 100 microsecond delay should be invoked before writing.

Because of hardware constraints, data bytes must be written in 32 processor (6502) cycle loops. The following example illustrates an immediate load of the accumulator followed by a write.

Because timing is critical, different routines may be necessary depending upon how the data is to be accessed and code cannot cross memory page boundaries without an adjustment. See the following sample write program.

```
        LDA #$D5      (3 cycles)
        JSR WRITE9    (6)
        LDA #$AA      (3)
        JSR WRITE9    (6)

WRITE9  CLC           (2)
WRITE7  PHA           (3)
        PLA           (4)
WRITE   STA $C08D,X   (5)
        ORA $C08C,X   (4)
        RTS           (6)
```

NOTE: Software that uses only the commands of the Apple controller will work with the Elite Controller Card.

8. USER LEVEL MAINTENANCE

The Elite Controller card has no moving or electrically adjustable parts, so there is no regular maintenance required. On the other hand, the Elite Series drives, like other disk drives, are very mechanical products and should have an annual "check-up". Since read/write head alignment and other very precision settings can "drift" over an extended period of time (varying with usage), data reliability can also "drift" unless the adjustments are checked.

In addition to mechanical adjustment drifts, the read/write head can become dirty from a year's worth of diskettes gliding past its surface. The common user remedy for this dirt build-up is to use one of the many head cleaning diskettes available on the market today. However, these diskettes can be very abrasive to the delicate read/write head(s).

The safest and most ideal approach to cleaning any drive's read/write head falls beyond the scope of what Rana Systems supports at the user level. However, Rana Systems has found the Perfect Data Systems Series 2024 5-1/4" head cleaning diskette/kit (part number 101912-21) to be of satisfactory quality for use on the Elite One disk drives. If you find it absolutely necessary to clean the read/write head of an Elite One by yourself, this particular diskette is the only one which should be used.

As of yet, no cleaning diskette can be authorized for use on the Elite Two and Three drives. This is due to the difference in the structural design of the second read/write head on these drives from the structure of the primary head shared among all the Elite drives.

If you decide to make use of the Perfect Data Systems diskette on an Elite One (or Disk II), make absolutely sure that the second (upper) surface of the cleaning diskette is covered. The Elite One (and Disk II) have felt pads which are designed to glide on the upper surface of single sided diskettes, and these pads will very quickly wear away if "scrubbed" by a cleaning diskette. Also, make absolutely sure that none of the supplied cleaning solution is on the covering for the upper diskette surface (Elite One and Disk II). Should the covering become damp you will end up contaminating the felt pad in the drive.

Regardless of what cleaning diskette is used, there is absolutely no reason for any disk drive's read/write head to require cleaning more often than once a year (regardless of what your head cleaning diskette instructions say). One of the worst things you can possibly do to your drive (apart from drop kicking it) is to over clean the read/write heads. The abrasive nature of the head cleaning diskettes place excessive wear on the head surface.

Head cleaning on the Elite Two and Three drives, and any other

form of maintenance on any Elite drive should be left to your dealer provided the dealer is authorized as a Rana service center. If your dealer is not an authorized Rana service center, then give Rana a call directly for information on the regional service depot nearest you. Correct maintenance insures greater data reliability and a longer drive life span.

8.1. Handling

The Elite Series drives, unlike the Apple computer, are mechanical devices with motors and moving parts. They are perhaps even more delicate than the computer and must be treated gently.

Avoid rough handling such as dropping the drives or letting things drop onto them.

Disk drives in general should not be positioned beside or on a television set, since some television sets emit strong magnetic fields which can damage the magnetic properties of disk drives. A general rule is to position a disk drive at least two feet away from any television set.

8.2. Diskette Care and Handling

To get the best performance from your diskettes and to protect the information you need, the following rules are suggested by the diskette manufacturers:

1. Whenever handling diskettes do not touch the recording surface. Touch them only on the plastic jacket.

2. After you have finished using a diskette do replace it in its protective envelope immediately. If you leave a diskette exposed; dust, debris, cigarette smoke and other atmospheric pollutants can quickly cause damage to the recorded data.

3. When writing an ID label for the diskette do not use a hard pen, such as a ball point. Use a soft felt tip if the label is already on the cover. If you are replacing an ID label, write it out first, then attach it to the diskette jacket. Heavy pressure can mark the surface of a diskette causing malfunction.

4. Diskettes work best at temperatures between 50 and 120 degrees fahrenheit. Outside these limits, their performance may well deteriorate. Avoid extremes of temperature.

5. Avoid all magnets and magnetic fields (like a television set). Always be aware of where you are storing your diskettes, and what equipment is immediately adjacent to their storage area.

6. Do not fold or bend diskettes. Handle them carefully so they will always keep their shape and make firm contact with the read/write head.
7. Do not use erasers on the ID label. Debris can easily attach itself to the diskette surface causing loss of data.
8. Always load the diskette gently into the disk drive so it doesn't bend or center improperly. That causes the diskette to rotate elliptically, missing data.
9. Always place the ID label in the rear right or left corner of the jacket. It will act as a guide to handling and inserting the diskette into the drive.
10. Do not expose disks to strong sunlight. Diskettes are essentially plastic and can easily warp in extreme temperatures.

Many users are concerned about whether or not their diskettes should have reinforced centers (strengthening rings around the inner diskette hole). This reinforcement ring has no effect at all on the disk drive's performance itself. The primary effect of reinforcement rings is to extend the life time of a diskette.

The edges of the center hole on a diskette can become worn with excessive inserting and removal of the diskette. The reinforcement ring comes close to completely eliminating this wear and thus extends the life of the diskette. The choice of whether or not to buy diskettes with these reinforcement rings is completely up to you as a user. Your decision should be based on how often you change diskettes in your drives, and how much protection you wish to give to the data on your diskettes.

8.3. Back-up Diskettes

If you are ever in the position where you have information you cannot afford to lose, make a back-up copy (or even two copies) of the diskette and store the copies in a safe place, using the write protect feature described below.

8.4. Write Protect

All standard end-user blank 5-1/4" diskettes incorporate a write protect feature so your system cannot accidentally write over or destroy valuable information contained on your diskette when the write protect feature is activated.

A write protect notch is located on the diskette jacket. When the notch is open, writing to the diskette is allowed.

To use the write protect feature, simply cover the notch with an adhesive tab. To write on the diskette, uncover the notch. See the figure below.

Note: The write protect feature of the diskette overrides the write protect panel switch feature of the Elite Series drives. If either the diskette itself is write protected or the drive is set for write protect, the diskette will be protected.

A write protected diskette will always be treated as write protected. A write enabled diskette can be write protected without removing it from an Elite Series drive by pressing the special PROTECT switch on the front panel of the drive.

Note: If you are familiar with using eight-inch diskettes and five-inch diskettes are new to you, then the five-inch approach to covering and uncovering the write protect notch will seem a little backwards. However, these instructions are correct. Five-inch drives (in general) detect write protection exactly opposite to the way in which eight-inch drives detect write protection.

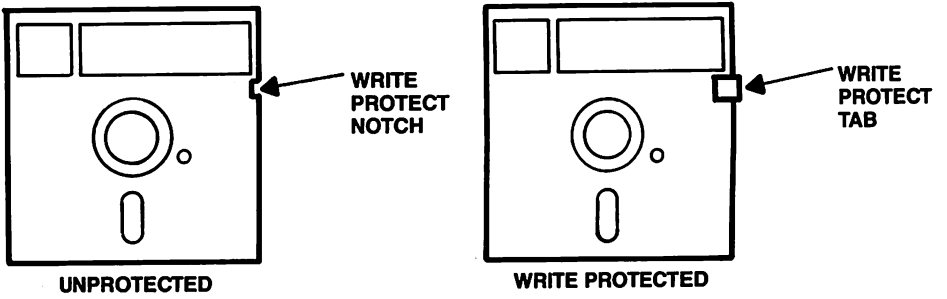


Fig. 8-1: Write Protecting Diskettes

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9. ENHANCED DOS UTILITIES

This section deals with the use of each of the enhanced DOS 3.3 utilities individually, in order to provide you with the information you need to use the utilities for more than just enhancing your DOS. If you do not use DOS, then this section will prove to be of little interest to you.

The Rana Systems enhancements to Apple's DOS 3.3 consist of five system utilities: FORMAT, CLONE, PROFILE, ENHANCE, and FID ENHANCE. The first is a more versatile replacement for the DOS "INIT" command, which was removed in the enhanced DOS. The second is a more versatile replacement for the DOS COPY and COPYA utilities supplied on original DOS distribution diskettes from Apple.

FORMAT is used for initializing new diskettes for use under DOS. It can also be used to reinitialize old diskettes (completely erasing any old data on the diskette). The enhanced version of FORMAT supplies you with the capability of formatting diskettes ranging from 143K Disk II diskettes all the way up to a full 652K Elite Three diskette.

CLONE is used to make exact one-for-one copies of a diskette onto another diskette. CLONE reads every sector on the original (source) diskette, sector-by-sector, and then writes the information, sector-by-sector, onto the duplicate (destination) diskette. The enhanced CLONE provides the capability of duplicating all the various different size diskettes used on the various Elite drives and the Disk II drive. In addition to full diskette copies, CLONE will copy just the (enhanced) DOS system from one diskette to another so that old diskettes can be updated; and new bootable Elite capacity diskettes can be created.

PROFILE gives you the flexibility to redefine the arrangement of the drives on your system to suit your needs. Since the enhanced DOS needs to know what type of drive you have where, PROFILE is used to tell DOS of any rearranging you wish to do.

Both ENHANCE and FID ENHANCE are one-time-only type of utilities. They contains all the various modifications that need to be made to Apple's standard Apple II DOS 3.3 and associated FID utility in order for the system and utility to use the extra features of the Elite Series products.

9.1. FORMAT Utility.

The enhanced FORMAT utility is designed to replace the INIT command which is part of the original DOS. The new utility is capable of formatting a diskette just like INIT did, but the new one can also format the higher capacity diskettes used by the Elite Series drives.

To get into the FORMAT utility, boot up your enhanced DOS diskette containing FORMAT and type:

```
BRUN FORMAT<RETURN>
```

This will work under both Integer BASIC and Applesoft BASIC.

Once DOS has loaded FORMAT, the utility will sign on with:

```
FORMAT
RANA SYSTEMS' 16-SECTOR DOS 3.3
5-INCH DISKETTE INITIALIZING UTILITY.
COPYRIGHT (C) (P) 1982 RANA SYSTEMS
FORMATTER VERSION 2.1

INSERT AN ENHANCED DOS 3.3 SYSTEM
MASTER DISKETTE INTO SLOT #<s>, DRIVE #<d>.
PRESS <RETURN> WHEN READY TO READ DOS
IMAGE INTO MEMORY. PRESS <ESC> TO
TERMINATE THIS UTILITY.
```

The <s> and <d> part of the above message will be the slot and drive number from which you ran FORMAT.

FORMAT assume that it was run from an enhanced DOS master diskette, and therefore assumes it can read a copy of the operating system off the same diskette. If FORMAT was not run from an enhanced system master, you will need to insert a system master into the indicated drive before pressing <RETURN>.

FORMAT must read a copy of the DOS system into memory at this point so that it can place it onto any diskettes you will be formatting; just like the INIT command used to do.

You have the option of pressing <ESC> in response to this prompt, which will cause FORMAT to terminate. Of course, this would only make sense if you didn't really want to run FORMAT in the first place.

After you have pressed <RETURN>, and FORMAT has read into memory a copy of the DOS, FORMAT will ask:

```
SLOT NUMBER (1-7)? <s>
```

FORMAT is asking for the slot number of the drive which you wish to use for formatting. The <s> will be the same slot from which

you ran FORMAT. If <s> is correct, just hit <RETURN>; otherwise press the slot number which you desire without pressing <RETURN> following it.

FORMAT provides you with several ways in which to correct typing errors or incorrect answers. If you need to "back up" to a previous question which you either answered wrong or for which you have changed your mind, simply press <ESC> for each question you need to "back up" past. You don't need to type <ESC> once you reach the input you wish to change, simply type the new response.

Most of FORMAT's questions have single key responses, and once you answer the question FORMAT moves on to the next question without your having to press <RETURN>. However, some of FORMAT's questions require more than just a single character response. In such a case the return key must always be pressed after your answer to let FORMAT know you have finished typing.

On the multi-character response, if you type <ESC> anytime during your response FORMAT will "back up" to the previous question. If you type <CTRL-X>, FORMAT will erase anything you've typed in response to that particular question and redisplay the default answer. You can then just hit <RETURN> to enter the default answer, or type a new answer. The backspace key (left pointer arrow key) can also be used to back up letter by letter to correct typing errors.

After you've entered the slot number, FORMAT will ask:

DRIVE NUMBER (1-4)? <d>

This time FORMAT is asking for the number of the drive which you wish to use for formatting. The <d> will not be the same as the drive from which you ran FORMAT. Instead it will be the "other" drive depending upon the drive from which FORMAT was ran.

For instance, if FORMAT was run from drive 1, <d> would be 2. If FORMAT was run from drive 2, <d> would be 1. If FORMAT was run from drive 3 (Elite Controller), <d> would be 4. And last but not least, if FORMAT was run from drive 4, <d> would be 3.

The reason which FORMAT shuffles the drive number is because it assumes your system diskette is the one from which FORMAT was run, and therefore the obvious default would be the "other" drive.

If the drive number displayed is correct, simply type <RETURN>. If you wish to use a different drive, simply type the drive number without any <RETURN> following it.

After you've entered a drive number, FORMAT will ask:

```
TYPE OF FORMAT TO PERFORM (0-3)? <t>
0) APPLE DISK-II ( 35 TRACKS)
1) RANA ELITE ONE ( 40 TRACKS)
2) RANA ELITE TWO ( 80 TRACKS)
3) RANA ELITE THREE (160 TRACKS)
```

The <t> is the type for which the drive is defined under the currently in use DOS.

FORMAT is requesting the type of format which you wish it to perform. The format type can be completely independent of how the drive is defined (see PROFILE) under the enhanced DOS, however it is not completely independent of the actual drive being used to do the formatting.

The following table lists which drives can perform which format types:

Format Type	Drive Type	Possible?
Disk II	Disk II	Yes
Disk II	Elite One	Yes
Disk II	Elite Two	Yes
Disk II	Elite Three	Special
Elite One	Disk II	No
Elite One	Elite One	Yes
Elite One	Elite Two	Yes
Elite One	Elite Three	Special
Elite Two	Disk II	No
Elite Two	Elite One	No
Elite Two	Elite Two	Yes
Elite Two	Elite Three	Special
Elite Three	Disk II	No
Elite Three	Elite One	No
Elite Three	Elite Two	No
Elite Three	Elite Three	Yes

The above table shows that, with the exception of the Elite Three, the higher capacity drives can all format lower capacity diskettes. However, lower capacity drives cannot format higher capacity diskettes.

The Elite Three is capable of performing any of the format types, but the resulting diskette is not interchangeable with a non-Elite Three drive. For instance, an Elite Two diskette formatted using an Elite Three cannot be used by an Elite Two drive. In addition, the "special" diskette cannot even be used by an Elite Three drive unless the drive is redefined using PROFILE to be of the same type as the formatted diskette.

Once a diskette has been formatted in a particular way, it can be used in any drive which also has "yes" in the above table for the particular type diskette. Once again, this means that, with the exception of the Elite Three, lower capacity diskettes can be used in higher capacity drives.

Although this is true regardless of the way the drive is defined under the currently in use DOS (excluding the Elite Three), it is bad practice to use one type of diskette in a drive which has been defined differently. Programs may or may not rely upon the drive definitions within the DOS to determine the way in which the drive, and in turn the diskette, should be treated.

If the format type is to be the same as the one displayed by FORMAT (the same as the way the drive is defined), just press <RETURN>. If you wish a different format type (taking into account the above table), press the format type number listed in the menu without following it with a <RETURN>.

After you've specified the format type, you will be asked:

VOLUME NUMBER (1-254)? 254

On this question, the default is always 254, which is the standard default used by the original INIT command. If you wish a different volume number, just type it in followed by <RETURN>. If the default number is okay, just type <RETURN> without anything else.

After you specify the volume number, FORMAT will want to know the hello file name. However, it asks it in a slightly funny way:

HI FILE? HELLO

Asking for the "hi" file is not FORMAT's way of being cute, instead it permits a full 30 character file name (permitted under DOS) to be specified on the 40 column Apple screen.

Although the INIT command required a hello file name (it would not default), the default has always been accepted as being "HELLO". The hello file is the program which DOS automatically executes when that diskette is booted.

You have the option of typing a new file name (if you don't like HELLO) followed by <RETURN>, or simply pressing <RETURN> without typing anything else to accept the default name.

Unlike the INIT command, FORMAT will not save the hello file onto the diskette once the diskette is formatted. This is because FORMAT is also a program, and only one program can fit into memory at one time. This means that the only program FORMAT would have around to save as the hello file is FORMAT itself, and it's unlikely that is the hello program you will want.

Once `FORMAT` is finished, you can go back and save the hello program onto the diskettes you formatted. The enhanced `FID` utility can be used to copy binary and text files. Refer to your `DOS` manual and also the `FID ENHANCE` utility later in this section.

Once you've specified the `HELLO` file name, `FORMAT` allows you specify a little something extra which `INIT` does not permit:

```
INVOKE HELLO FILE HOW (A-C)? A
  A) RUN <HI FILE>
  B) BRUN <HI FILE>
  C) EXEC <HI FILE>
```

The default (`RUN <HI FILE>`) is the only choice you get with `INIT` and is therefore the default. If you specify the `RUN` option, then your hello file must be an Integer BASIC or Applesoft program. If you specify the `BRUN` option, then your hello file must be a binary (machine language) program. And, if you specify the `EXEC` option, your file must be a text file containing `DOS` commands. For more explanation, refer to your `DOS` manual under each of these commands.

You can either type one of the menu item letters without following it with `<RETURN>` if you don't want the default (A), or you can simply press `<RETURN>` to accept the default. If this selection confuses you, simply press `<RETURN>` and `FORMAT` will default to exactly what the `INIT` command did.

Since that is the last piece of information `FORMAT` needs to know, it will display:

```
INSERT DISKETTE IN DRIVE. PRESS
<RETURN> TO INITIALIZE, PRESS <ESC>
TO CHANGE PARAMETERS.
```

This means that `FORMAT` is ready to proceed with the formatting and is giving you one last chance to "bail out". If you press `<RETURN>`, `FORMAT` will proceed with the diskette format. If you press `<ESC>`, `FORMAT` will return to the "invoke how?" prompt.

Once `FORMAT` is allowed to proceed with the formatting, it will first check to see if the diskette is already formatted for 16-sectors (this includes `CP/M` and `Pascal` diskettes). Whether or not `FORMAT` is successful in detecting an already formatted diskette is highly dependent upon how the drive being used is defined in the current in use `DOS`, and also how the already formatted diskette was formatted originally. Therefore, this test should not be relied upon.

If `FORMAT` does find an already formatted diskette, it will ask:

```
DISKETTE CONTAINS DATA.
```

INITIALIZE ANYWAYS (Y/N)?

If it is okay to format the diskette, simply type <Y> without any <RETURN>. If you didn't expect the diskette to be already formatted, type <N> and FORMAT will not format the diskette.

Once FORMAT has finished with the formatting, or if you specify <N> to the "initialize anyways?" question, FORMAT will ask:

DO ANOTHER DISKETTE (Y/N)?

Once again you can response <Y> or <N>. If you specify <N>, FORMAT will return you to BASIC. If you specify <Y>, FORMAT will return to the point where you can specify <RETURN> to start formatting another diskette, or <ESC> to change parameters. If you wish to format another diskette the same way in the same drive, the you can change diskettes and just type <RETURN>.

If you wish to change some of your previous responses, use <ESC> to back up to the entry you wish to change.

9.2. CLONE Utility

The CLONE utility is very similar to the COPY and COPYA utility supplied by Apple on their Apple DOS 3.3 Master Diskette. In fact, CLONE is the enhanced DOS's replacement for the two Apple utilities.

To get into the CLONE utility, boot up your enhanced DOS diskette containing CLONE and type:

```
BRUN CLONE<RETURN>
```

This will work under both Integer BASIC and Applesoft BASIC.

Once CLONE has been loaded into memory by DOS, the utility will sign-on by saying:

```
CLONE
RANA SYSTEMS' 16-SECTOR DOS 3.3
5-INCH DISKETTE COPY UTILITY.
COPYRIGHT (C) (P) 1982 RANA SYSTEMS
CLONE VERSION 2.1
```

```
CLONE TYPE TO PERFORM: 0
0) WHOLE DISKETTE
1) DOS ONLY
```

Unlike COPY and COPYA, CLONE allows you to copy on the DOS image (boot tracks) from one diskette to another without disturbing the other information of the destination diskette. This allows you to update existing DOS diskettes with the enhanced DOS.

Since CLONE will also copy an entire diskette (just like COPY and COPYA), the first question it will ask is which type of copy you wish CLONE to perform (as shown above). The default is "whole diskette" copy, which means you can simply press <RETURN> to specify that copy type. Pressing <0> will also tell CLONE to copy the entire diskette. Pressing <1> will indicate to CLONE that you wish only the DOS to be copied.

No matter which type of copy you specify, CLONE will then ask:

```
SOURCE:
SLOT NUMBER (1-7)? <ss>
```

where <ss> is the slot number from which you ran CLONE.

A special feature of CLONE is that it allows you to back-up to previously answered questions so that you can change your answer. To do this, simply type <ESC> in response to any question and you will be returned to the previous question. You can then press <ESC> again to back-up another question.

With the above question, CLONE is asking for the slot number of the drive in which you will be inserting the source (original) diskette. If <ss> is correct, you can simply press <RETURN>. If <ss> is wrong, press the number of the slot which is correct.

Once the slot number is specified, CLONE will ask:

```
DRIVE NUMBER (1-4)? <sd>
```

where <sd> is the drive number from which you ran CLONE.

The also refers to the drive in which you will be inserting the source diskette. You can simply press <RETURN> if <sd> is correct. If you wish to specify a different drive number, press the new number.

After the source drive number, CLONE asks:

```
DISKETTE TYPE (0-3)? <st>
```

where <st> is the drive type which you have specified (using PROFILE) for the source drive you selected, as follows:

```
0 = Disk II  
1 = Elite One  
2 = Elite Two  
3 = Elite Three
```

Although CLONE determines the default answer to this question by looking to see how you have the source drive defined under the currently booted DOS, this question is referring to the source diskette itself and not the drive.

CLONE places restrictions on both the source diskette and the destination diskette according to how the drive is defined under the booted DOS. CLONE will not permit you to specify a diskette type which has a larger capacity than the capacity for which the drive is defined. Given that restriction, CLONE will treat either diskette the way you specify in response to this question (for the source) and a later question (for the destination). But you are still restricted by what the drives being used are physically capable of doing.

The following tables relates whether or not each diskette type can be copied from/to each of the various drive types:

DISKETTE	DRIVE	SOURCE?
Disk II	Disk II	Yes
Disk II	Elite One	Yes
Disk II	Elite Two	Yes
Disk II	Elite Three	Special
Elite One	Disk II	No
Elite One	Elite One	Yes
Elite One	Elite Two	Yes
Elite One	Elite Three	Special
Elite Two	Disk II	No
Elite Two	Elite One	No
Elite Two	Elite Two	Yes
Elite Two	Elite Three	Special
Elite Three	Disk II	No
Elite Three	Elite One	No
Elite Three	Elite Two	No
Elite Three	Elite Three	Yes

Several special circumstances arise when the Elite Three is used in the copy process when not performing a straight Elite Three to Elite Three copy.

It is possible to use the Elite Three as the source drive for all types of diskette copies. This goes right along with the standard Elite Three usage rule that it can read any of the lesser storage capacity diskettes.

When the Elite Three is used as the destination drive, a very special point needs to be remembered. The resultant destination (duplicate) diskette will not be compatible with its associated drive type, unless the diskette and drive type is Elite Three. Once again, this comes from the fact that the Elite Three is not write compatible with non-Elite Three drives.

This is not to say that the Elite Three can't be used as the destination drive in a non-Elite Three copy. This simply means that the resultant diskette will only be readable by an Elite Three drive.

After all the source drive and diskette questions have been answered, CLONE will move on to the destination (duplicate) drive and diskette information:

```
DESTINATION:
SLOT NUMBER (1-7)? <ds>
```

<ds> is the default answer you will be specifying if you just

press <RETURN>. If <ds> is not the slot number you want for the destination drive, simply press the correct number.

CLONE will allow you to specify the same drive as both the source and destination drive. In this case, CLONE will give you a change to change diskettes during the copying process.

After the destination slot number question comes:

DRIVE NUMBER (1-4)? <dd>

where <dd> is the default destination drive number. Once again, <dd> will be used if you just press <RETURN>. If <dd> is not correct, press the correct number.

The last question is:

DISKETTE TYPE (0-3)? <dt>

where <dt> is the drive type you have defined in the booted DOS for the destination drive you specified. This drive type number is just like the table of numbers listed previously for the source diskette type.

Just like with the source diskette type, CLONE is asking what type of diskette the destination diskette is to be and not what type of drive is going to be used.

CLONE will not permit you to specify a destination diskette type which has a smaller capacity than the source diskette type. Also, since CLONE will not restructure the diskette's directory or associated information when copying from a lesser capacity diskette to a higher capacity diskette, there is only one real reason to specify a diskette type different from that specified for the source diskette: copying non-Elite Three diskette files to Elite Three diskette files when you have only one drive and its an Elite Three. The FIDR utility can be used to copy files between different capacity diskettes. See FID ENHANCE in this manual, and the instructions for FID in Apple's The DOS Manual.

FIDR will permit you to transfer individual files between two diskettes using only a single drive, however FIDR assumes that both the source and destination diskette will be of the same type as defined using PROFILE in the booted DOS. Due to the way DOS works (which is outside the scope of this manual), this does not present a problem when transferring between two non-Elite Three diskettes of different types; even though the single drive is defined for a particular diskette type.

However, this capability does not extend to Elite Three drives. Therefore, on single drive Elite Three systems, there is a special approach to transferring non-Elite Three diskette files to Elite Three diskettes.

The first step is to use CLONE's whole diskette copy to copy the non-Elite Three diskette (source) to an Elite Three type diskette (destination type of 3). This will convert the diskette data into a structure which is compatible with the Elite Three, but which will not have the full storage capacity of the Elite Three. Then FIDR can be used to copy the individual files from the restructured diskette onto a full capacity Elite Three diskette.

Back to CLONE itself. Once the destination drive and diskette questions have been answered, CLONE will say:

```
PLEASE INSERT BOTH DISKETTES AND  
PRESS <RETURN>
```

if you specified different source and destination drives, or:

```
PLEASE INSERT THE SOURCE DISKETTE  
AND PRESS <RETURN> TO CONTINUE.
```

if you specified the same drive for both source and destination.

This is your indication that CLONE is ready to begin the copying process. You should insert either just the source diskette (single drive copy) or both diskettes (two drive copy), and then press <RETURN> to begin the copy process.

If you specified that only the DOS is to be copied, then CLONE will give you a reminder to:

```
INSERT AN ENHANCED DOS 3.3 SYSTEM  
MASTER DISKETTE INTO SLOT #<s>, DRIVE #<d>.  
PRESS <RETURN> WHEN READY TO READ DOS  
IMAGE INTO MEMORY. PRESS <ESC> TO  
TERMINATE THIS UTILITY.
```

After you allow CLONE to proceed (whole diskette or DOS only), it will read as much information from the source diskette as it can fit into memory, and then write the information to the destination diskette. If you specified a single drive copy, then CLONE will first request:

```
PLEASE INSERT THE DESTINATION DISKETTE  
AND PRESS <RETURN> TO CONTINUE.
```

This means that CLONE is waiting for you to remove the source diskette and insert the destination diskette. Once you've changed the diskette, press <RETURN> and CLONE will continue with the copy.

When CLONE has written out all the information it has in memory, it will change back to reading the source diskette to get more. If you're doing a single drive copy then CLONE will request that you insert the source diskette just like it did at the start of the copy process.

Two drive copies proceed all the way through without your having to play with either diskette.

Once CLONE has finished with the copy, it will say:

DO ANOTHER COPY (Y/N)?

If you press <N>, CLONE will dump you back into BASIC. If you press <Y>, CLONE will return to the "insert source/both diskettes" prompt.

You can change the copy type (whole or DOS only), the drives, and/or the diskette types, before making another copy by pressing <ESC> for the "insert diskettes" prompt.

Special note concerning DOS-only copies:

During a DOS only copy (and not during a whole diskette copy) the DOS copy which is placed on the destination diskette will be restructured (if necessary) to conform to the way the DOS should boot off of the destination drive/diskette type you specified.

The way in which DOS is structured for booting off of an Elite One is identical to the way it is structured for the Disk II, but changes are made when dealing with full capacity diskettes for the Elite Two and Elite Three.

There are two conditions which must be met for a copy of the enhanced DOS to boot correctly (at all) from a diskette. The first is that the DOS must be placed on the diskette in a way which is compatible with the booting process for that particular type of diskette/drive (this is done by CLONE). The second is that the configuration table within the DOS must reflect the correct setting for the way the DOS has been placed on the diskette (see PROFILE).

In order to assure these two conditions, the configuration table on the source diskette must be set (using PROFILE) correctly for the boot slot and drive prior to copying the DOS to the destination diskette. The other option is to use PROFILE to change the table setting on the destination diskette after the copy has been made, but PROFILE will require that the drive containing the DOS to be changed be defined (in the currently booted DOS) to match the way the DOS is structured on the diskette.

CLONE will allow you (under certain conditions) to copy a DOS image onto a diskette using a structure specified by you which does not necessarily match the way in which the diskette was originally formatted. You should never do this. This will either immediately destroy one or more of the files on the destination diskette, or the diskette will stop booting as soon as a new file manager to overwrite the DOS on the diskette.

9.3. PROFILE Utility

The PROFILE utility is the heart of the enhanced DOS system. It is this utility which allows you to tell DOS where various drive models are located on your system, and also allows you to declare the drive as a different model (an Elite Two as a Disk II, for example) to allow you to read and create diskettes to be interchanged with other Apple II DOS systems.

PROFILE has absolutely no effect on the Elite Controller card since the enhanced DOS functions with it completely automatically. Enhanced DOS does not need to be told to use all four drives on the Elite Controller, and to only use two drives on the Disk II controller; it's all automatic.

To get PROFILE running, type:

```
BRUN PROFILE
```

and the utility will respond with:

```
PROFILE V2.1 COPYR.(C)(P)1982 RANA SYS.
```

```
FROM WHICH SLOT AND DRIVE  
IS DOS IMAGE TO BE LOADED?
```

```
ENTER SLOT NUMBER (1-7) :
```

Since PROFILE will only make definition changes to on-disk copies of the enhanced DOS (the in use in-memory copy of DOS cannot be modified), the first thing PROFILE needs to know is where the DOS to be modified is located.

If you type <ESC>, PROFILE will return you to BASIC.

PROFILE is very dependent upon how you have your drives defined under the currently in use DOS. Whenever you specify to PROFILE that it is to read a copy of DOS off of a particular diskette, PROFILE assumes that the DOS will be arranged on the diskette according to the way the drive is defined.

This means that an Elite One system diskette cannot be read by a drive defined under the currently in use DOS as an Elite Two.

Keeping this in mind, you would answer PROFILE by typing the number of the slot from which PROFILE is to read a copy of the enhanced DOS without following the number with a <RETURN>.

After you've told PROFILE the slot number, it will ask:

```
ENTER DRIVE NUMBER (1-4) :
```

Just like with the slot number, you would type the number of the drive from which PROFILE is to read the copy DOS. If you type

<ESC>, PROFILE will return to the slot number question.

After you have entered the two numbers, PROFILE will prompt you with:

```
INSERT AN ENHANCED DOS 3.3 SYSTEM
MASTER DISKETTE INTO SLOT #<s>, DRIVE #<d>.
PRESS <RETURN> WHEN READY TO READ DOS
IMAGE INTO MEMORY. PRESS <ESC> IF LOAD
NO LONGER DESIRED.
```

<s> and <d> are the slot and drive numbers you specified.

If you've changed your mind and no longer wish to change any drive definitions, you can type <ESC> and PROFILE will return you to BASIC. Otherwise, insert an enhanced DOS master diskette which is compatible with the way the drive is defined; and then press <RETURN>.

PROFILE will read in the copy of the DOS, and then display half a screen full of drive settings.

These settings will be arranged by slot number in the up and down direction, and by drive number in the across direction. Each setting displayed is made of two separate parts. The first part consists of five characters as follows:

```
DISK2 = Apple Disk ][
ELIT1 = RANA Elite One
ELIT2 = RANA Elite Two
ELIT3 = RANA Elite Three
```

The second part is a single character immediately after the first five characters as follows:

```
S = Slow (Disk ][ standard)
M = Medium (Elite One standard)
F = Fast (Elite Two and Three standard)
```

This displayed table shows how each drive position which is possible on the Apple II is currently defined. Including drive positions for which there are no controllers or drives at the present time.

Following the table, PROFILE will display a menu of choices:

```
ENTER SELECTION (0-3) :
 1) LOAD NEW DOS IMAGE FROM DISK
 2) CHANGE CURRENT DOS IMAGE SETTING
 3) SAVE CURRENT DOS IMAGE TO DISK
 0) TERMINATE PROFILE
```

You can choose an item by pressing its menu number without pressing <RETURN>.

The first item allows you to read into memory a different copy of DOS to be altered. (Note: reading a DOS copy into memory does not mean replacing the currently operating DOS copy.)

The second item allows you to make changes to the copy of DOS you already have in memory. The third item allows you to save the DOS copy you have in memory (changes and all) back out to a diskette. And the last item gets you out of PROFILE back to BASIC.

If you select any of the first three items, PROFILE will ask you the slot and drive number questions which it asked you when you first ran PROFILE. However, the drive PROFILE is asking for varies with the menu item you selected.

For item 1 (load new DOS image), PROFILE will be asking for the drive from which you wish to load the new copy of DOS.

For item 2 (change current DOS image setting), PROFILE will be asking for the drive who's definition (setting) you wish to change in the copy of DOS you already have read into memory.

For item 3 (save DOS image), PROFILE will be asking for the drive to which you wish to save the DOS image (and any changes) you have in memory. This need not be the same drive or diskette from which you loaded the DOS image, but the image will be placed onto the diskette in a format which is compatible with the way the drive is defined under the in use DOS.

Item 1 will cause PROFILE to proceed exactly like it did when you first ran PROFILE, except that pressing <ESC> for the final <ESC>/<RETURN> prompt will return you to the selection menu instead of dumping you back into BASIC.

After specifying the drive to be redefined under item 2, PROFILE will ask:

```
ENTER DRIVE TYPE (0-3) : <t>
  0) APPLE DISK-II ( 35 TRACKS)
  1) RANA ELITE ONE ( 40 TRACKS)
  2) RANA ELITE TWO ( 80 TRACKS)
  3) RANA ELITE THREE (160 TRACKS)
```

<t> will be the current setting for the drive as reflected in the table at the top of the screen. If you simply press <RETURN>, the definition will be left unchanged. If you wish to change the definition for the drive, simply type the new definition menu item number without any <RETURN>.

<ESC> can also be typed to return to the drive number question.

After you have answered the drive type question, PROFILE will ask:

```
ENTER SEEK SPEED (0-2) : <s>
  0) SLOW (DISK-II AND ELITE SERIES)
  1) MEDIUM (ELITE SERIES ONLY)
  2) FAST (ELITE TWO AND THREE)
```

<s> will be the correct seek speed for the drive type you selected (or defaulted to). If you just type <RETURN>, <s> will be used. Otherwise, you can type one of the menu item numbers without press <RETURN>.

After you make your selection, PROFILE will display the change you made at the top of the screen, and then return to the main menu. The change which was made still needs to be saved to a diskette, otherwise the redefined system cannot be booted.

Main menu item 3 (save DOS image) is used to save the redefined DOS. After PROFILE requests the slot and drive numbers for item 3, it will say:

```
INSERT FORMATTED DISKETTE TO RECIEVE
ENHANCED DOS 3.3 SYSTEM MASTER IMAGE
INTO SLOT #<s>, DRIVE #<d>. PRESS <RETURN>
WHEN READY TO WRITE DOS IMAGE FROM
MEMORY. PRESS <ESC> IF SAVE NO LONGER
DESIRED.
```

<s> and <d> are the slot and drive numbers you specified.

At this point you can type <ESC> and PROFILE will return to the main menu. Otherwise, insert the diskette to receive to redefined DOS and press <RETURN>. The diskette must be formatted correctly for the way the drive is defined under the in use DOS. PROFILE will write the DOS to the diskette in that format.

Once PROFILE has finished writing the copy of DOS to the diskette, it will return to the main menu.

The last menu item (0) is self explanatory, and probably only requires a little practice.

9.4. ENHANCE Utility

The ENHANCE utility is intended as a one-time-only utility. Once you've performed the DOS enhancements outlined earlier in this manual, ENHANCE is no longer needed. The FORMAT and CLONE utilities are used to make new enhanced DOS system master diskettes. It is not necessary the use ENHANCE to keep enhancing every new DOS system diskette you create. The earlier DOS enhancing instructions are essentially the instructions for using ENHANCE.

9.5. FID ENHANCE Utility

The FID ENHANCE utility does for Apple's FID utility what ENHANCE did for Apple's DOS. It makes it more intelligent. FID, as it exists in its original form from Apple (supplied by Apple on the DOS master diskette) does not exactly follow all of the conventions which Apple has defined for reading and writing to diskettes. If it did, it would work with every Elite Series drive except the Elite Three (special case).

FID, as it comes from Apple, will work correctly on the Elite One drive without any modification. In fact, FID will even function correctly with the Elite Two drive except it will refuse to copy files to all of the Elite Two diskette. Unmodified FID should never be used on a Elite Three since it has a tendency to "butcher" directory entries. In addition, FID only allows you to specify a drive number of 1 or 2 because that's all Apple gave you on their Disk II controller card.

But never fear! Rana has come to the rescue. FID can be saved from its own stupidity!

FID ENHANCE is a very straight forward, down to business utility which will teach FID all those little things it should have known to begin with. The catch is that FID ENHANCE must be on the same diskettes as FID, which means using the "dumb" FID to put it on the diskette.

Since "dumb" FID will work with Disk II and Elite One diskettes correctly, you need to create a Disk II or Elite One diskette containing FID on it. The run FID and specify menu item 1 (copy files) in order to copy FID ENHANCE onto the same diskette as "dumb" FID. For more information on using FID, refer to your DOS manual.

Once FID and FID ENHANCE are on the same diskette, simply type:

```
BRUN FID ENHANCE
```

to begin the modifications.

FID ENHANCE does not ask you anything. The first things it does is issue a "BLOAD FID" command to DOS in order to load FID into memory (FID must be on the diskette, or DOS will inform you of the error).

Once DOS has loaded FID into memory, FID ENHANCE will perform the necessary "teaching" and then issue a "BSAVE FIDR" to DOS to save the new "smart" FID under the name of FIDR. The "R" on the end indicates it is the Rana modified copy of FID.

FIDR can then be used exactly like the original FID, except FIDR is completely compatible with the entire Elite Series drive line and also the four drives of the Elite Controller.

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10. ENHANCED CP/M UTILITIES

This section deals with the use of each of the new CP/M utilities individually, in order to provide you with the information you need in order to use the utilities for more than just enhancing your CP/M. If you do not use CP/M, then this section will prove to be of little interest to you.

The Rana Systems enhancements to Microsoft Apple II 16-Sector 56K CP/M 2.2 consist of five system utilities: FORMAT, COPY, PROFILE, SGLDRIVE, and ENHANCE. The first two are replacements for utility programs provided by Microsoft on their original CP/M distribution diskette.

FORMAT is used for initializing new diskettes for use under CP/M. It can also be used to reformat old diskettes (completely erasing any old data on the diskette). The enhanced version of FORMAT supplies you with the capability of formatting diskettes ranging from 143K Disk II diskettes all the way up to a full 652K Elite Three diskette.

COPY is used to make exact one-for-one copies of a diskette onto another diskette. Unlike the standard CP/M utility PIP, COPY does not copy the diskette file-by-file. Instead, COPY reads every sector on the original (source) diskette, sector-by-sector, and then writes the information, sector-by-sector, onto the duplicate (target) diskette. The enhanced COPY provides the capability of duplicating all the various different size diskettes used on the various Elite drives and the Disk II drive.

PROFILE gives you the flexibility to redefine the arrangement of the drives on your system to suit your needs. Since CP/M needs to know what type of drive you have where, PROFILE is used to tell CP/M of any rearranging (temporary or permanent) you wish to do.

SGLDRIVE is a special utility primarily intended to help those users who have only a single disk drive. Several of the CP/M utilities (PIP in particular) were not written for use on single drive systems. SGLDRIVE can be used to "fool" these utilities (and CP/M itself) into thinking that a single drive is actually two drives.

ENHANCE is a one-time-only type of utility. It contains all the various modifications that need to be made to the standard Apple II CP/M distributed by Microsoft in order for the system to use the extra features of the Elite Series products.

10.1. Notation

Since almost all of the various different commands which you can give to the enhanced CP/M utilities contain choices and options, it is necessary to define a syntax notation. This notation permits the extensive amount of material covered by this section to be reduced to as small an amount of verbiage as possible.

[] Square brackets surround those items which are optional. The items can be used as part of the command sentence, or completely left out.

< > Angle brackets are used to surround lower case letters or words which are meant to describe only one item. The letters or words enclosed infer the type of "thing" that is supposed to be "plugged in" at that location in the command, and not the exact letters which should be typed. (<filename>)

Angle brackets are also used to surround upper case letters or words. In this case, the letter or word is an actual key on the keyboard which is to be typed. (<RETURN>)

{ } Braces enclose lists of items from which you must choose one (and only one). If the items in the list are also enclosed the square brackets, then it is permissible to select none.

! The exclamation point is used to separate the different choices enclosed in braces.

... Ellipses are used to indicate that you may repeat the entry as many times as you need or desire.

CAPS Capital letters are used for those portions of the command which you must type exactly as show. In addition, other symbols not listed above must be typed as shown. If any of the above symbols must be typed, they will be enclosed in angle brackets. (<!>)

10.2. FORMAT Utility

The enhanced FORMAT utility is designed to replace the original FORMAT utility supplied by Microsoft. The new utility is capable of formatting a diskette just like the old one did, but the new one can also format the higher capacity diskettes used by the Elite Series drives.

In order to get FORMAT running, you need to be in CP/M command level. This is indicated by:

A>

being displayed by CP/M. The "A" would be which ever drive is your current logged (default) drive.

FORMAT is executed by typing:

```
<d>:FORMAT<RETURN>
```

with a diskette containing the new FORMAT utility inserted into drive <d>.

FORMAT will sign-on by saying:

```
APPLE ][ CP/M
16 Sector Disk Formatter
Primary Copyright 1980 Microsoft
Portions Copyright 1982 RANA Systems
RANA Systems Version 1.1
```

Format disk in which drive?

This is all very similar to the way the original (old) FORMAT signed-on. In fact the first part of the answer to FORMAT's "which drive?" question is just like the response you would give to the original FORMAT, but there is more which has been added to the command.

The complete syntax of the answer is:

```
<d>:<type><RETURN>
```

<d> is the drive letter which will be used to format the diskette. The colon (:) is typed as shown. <type> is a single digit number (0-3) which tells FORMAT which type of formatting to perform, as follows:

```
0 = Apple Disk ][ ( 35 tracks)
1 = RANA Elite One ( 40 tracks)
2 = RANA Elite Two ( 80 tracks)
3 = RANA Elite Three (160 tracks)
```

FORMAT is capable of performing any one of these format types on the specified drive regardless of how the drive is specified under CP/M (see PROFILE). However, it cannot format a diskette using a particular type of format on a drive which is incapable of handling that type of format.

This is really just common sense when you consider that if the Disk II could handle 652K bytes of storage just like the Elite Three can, then Apple would be saying the Disk II can do 652K bytes instead of 143K.

The following table shows which drive models can and can not be used to format the various different types of diskettes:

Diskette Type	Drive Model	Can/Can't
Disk II	Disk II	Can
Disk II	Elite One	Can
Disk II	Elite Two	Can
Disk II	Elite Three	Can't
Elite One	Disk II	Can't
Elite One	Elite One	Can
Elite One	Elite Two	Can
Elite One	Elite Three	Can't
Elite Two	Disk II	Can't
Elite Two	Elite One	Can't
Elite Two	Elite Two	Can
Elite Two	Elite Three	Can't
Elite Three	Disk II	Can't
Elite Three	Elite One	Can't
Elite Three	Elite Two	Can't
Elite Three	Elite Three	Can

The basic rule of thumb which this table points out is that smaller capacity drives can not format diskettes for the higher capacity drives, but the higher capacity drives can format diskettes for the smaller capacity drives. The exception which makes this rule true is the Elite Three.

Since the Elite Three achieves its 652K of storage by writing half width tracks in half track increments, the tracks (and any other data at other times) which the Elite Three writes while formatting a diskette are too small for the lower capacity drives to read.

Once you press <RETURN> following your command, FORMAT will say:

```
Insert disk to be formatted in drive <d>:
Press RETURN to begin
```

The <d> here is the drive letter you specified in your command. Before proceeding, you will need to make sure that the diskette

you wish to format is the one which is in the specified drive.

If you are formatting a diskette on which you already have programs or data, remember that when FORMAT finishes with the diskette all those data or program files will be completely gone. (No hope of recovering them.)

Another "peace of mind" thing to do is to open the doors on any other drives you have which are not being used for the format. This makes sure nothing unexpected happens to any other diskettes you may have in those other drives.

Once you hit <RETURN> to allow FORMAT to begin, the first thing it will do is try to read the diskette to be formatted to see if it already has any information on it. This little check is very dependent upon how you have the drive defined under CP/M and what type of already formatted diskette you have in the drive.

Normally FORMAT will detect an already formatted 16-sector diskette (including DOS 3.3 and Apple Pascal diskettes), but given certain circumstances it may not. Therefore, you should not rely upon this check. If FORMAT does find the diskette to be already formatted, it will say:

```
Disk in drive <d>: will be ERASED.  
Continue (Y/N)?
```

If you reply <Y><RETURN>, FORMAT will go ahead and format the diskette (erasing everything that was on the diskette, for ever and ever). If you reply <N><RETURN>, FORMAT will return to the "which disk?" question without formatting the diskette.

Once you let FORMAT go ahead and do its job, it will say:

```
Formatting...
```

The time it takes to format a diskette varies directly with the type of format FORMAT has to perform. Disk II formats are done in about 30 seconds (because there's not much to do). A full Elite Three format can take well over a full minute (there is four times the storage to be formatted than what is necessary for a Disk II).

Eventually, you will get:

```
FORMAT Complete
```

```
Format disk in which drive?
```

You are free to issue another command to do another format at this point. When you have no more formatting to do, make sure your CP/M system diskette is back in drive A: and then just answer the question with <RETURN>.

If you used drive A: anytime during your formatting, FORMAT will remember this and request:

Insert CP/M System disk in drive A:
Press RETURN

When you've got your system diskette back into drive A:, type <RETURN>.

Important Note: Unlike the INIT command under Apple's DOS, FORMAT does not place a copy of any operating system onto the newly formatted diskette. This means that the diskette will not boot at all. You Apple will "hang" if you attempt to boot the diskette or leave it in drive A: when a transient command or program finishes and returns control to CP/M (see Transient Commands in your CP/M manuals). Refer to the COPY utility instructions for information on how to place CP/M onto the new diskette.

10.3. COPY Utility

The COPY utility provides a means for you to make backup copies of your diskettes. The enhancements made to the new COPY utility are primarily just in the area of support for the higher capacity Elite Series drives.

A lot of extra logic has been added to the COPY utility to permit it to make backup copies of lower capacity diskettes using higher capacity drives. In addition, the way in which the Elite Two and Elite Three drives boot CP/M (when operating in their full capacity mode) is slightly different than for the Elite One and Disk II. The new COPY takes this into account when performing a system-only copy.

In order for COPY to be executed, CP/M must be in command level and a diskette containing the new COPY utility must be inserted in one of your drives. The command to issue is:

```
<d>:COPY<RETURN>
```

where <d> is the drive in which the diskette containing COPY is inserted.

COPY signs-on by saying:

```
APPLE ][ CP/M
16 Sector Disk Copy Utility
Primary Copyright 1980 Microsoft
Portions Copyright 1982 RANA Systems
RANA Systems Version 1.1
```

*

You may find the "*" prompt to be just a little lacking in clues to the correct responses, but such a prompt is a tradition in CP/M, starting back with the standard CP/M utility PIP.

The new COPY (just like the new FORMAT) is very similar to its predecessor from Microsoft. The command syntax which you can type following the "*" prompt is:

```
<target>:=<source>:[/S]<RETURN>
```

If you are already used to working with the original COPY utility, then you will quickly notice Rana has changed two terms on you. What would be a "master" diskette to the original COPY is referred to as a "source" diskette by the new COPY. And the original COPY's "slave" diskette is called the "target" diskette by the new COPY. This change probably won't throw you for too big a loop.

<source> is the drive letter in which you plan on placing (or already have placed) the original diskette you wish to be copied. <target> is the drive letter in which you plan on placing the already formatted diskette which is to receive the information from the original diskette. <source> and <target> can be the same drive.

If you specify the "/S" option at the end of the command, the you will be telling COPY to only copy the CP/M operating system from the source diskette to the target diskette without altering any other information on the target diskette. If you do not specify the "/S" option, then the entire source diskette will be copied to the target diskette.

The full diskette copy will completely replace any previous information you had on the target diskette. Just like with FORMAT, this previous information will never be seen again.

Once again, the possibility of having various different drive models intermixed on the same system leads to certain restrictions as to their use. COPY is very reliant upon how you have the source and target drives defined under the CP/M system. COPY asks CP/M for this information so that it knows the type of drives with which it will be dealing.

When performing a full diskette copy, three variables influence the type of diskettes which can be copied, what type of drives can be used for the copy, and what type of target diskette will result. These various combinations are given in the following four tables:

Source Diskette is Disk II Format

Source Drive	Target Drive	Target Disk
Disk II	Disk II	Disk II
Disk II	Elite One	Disk II
Disk II	Elite Two	Disk II
Disk II	Elite Three	Explained (1)
Elite One	Disk II	Disk II
Elite One	Elite One	Not allowed
Elite One	Elite Two	Not allowed
Elite One	Elite Three	Not allowed
Elite Two	Disk II	Disk II
Elite Two	Elite One	Not allowed
Elite Two	Elite Two	Not allowed
Elite Two	Elite Three	Not allowed
Elite Three	Disk II	Explained (2)
Elite Three	Elite One	Not allowed
Elite Three	Elite Two	Not allowed
Elite Three	Elite Three	Not allowed

Source Diskette is Elite One Format

Source Drive	Target Drive	Target Disk
Disk II	Disk II	Impossible
Disk II	Elite One	Impossible
Disk II	Elite Two	Impossible
Disk II	Elite Three	Impossible
Elite One	Disk II	Impossible
Elite One	Elite One	Elite One
Elite One	Elite Two	Elite One
Elite One	Elite Three	Explained (1)
Elite Two	Disk II	Impossible
Elite Two	Elite One	Elite One
Elite Two	Elite Two	Not allowed
Elite Two	Elite Three	Not allowed
Elite Three	Disk II	Impossible
Elite Three	Elite One	Explained (2)
Elite Three	Elite Two	Not allowed
Elite Three	Elite Three	Not allowed

Source Diskette is Elite Two Format

Source Drive	Target Drive	Target Disk
Disk II	Disk II	Impossible
Disk II	Elite One	Impossible
Disk II	Elite Two	Impossible
Disk II	Elite Three	Impossible
Elite One	Disk II	Impossible
Elite One	Elite One	Impossible
Elite One	Elite Two	Impossible
Elite One	Elite Three	Impossible
Elite Two	Disk II	Impossible
Elite Two	Elite One	Impossible
Elite Two	Elite Two	Elite Two
Elite Two	Elite Three	Explained (1)
Elite Three	Disk II	Impossible
Elite Three	Elite One	Impossible
Elite Three	Elite Two	Explained (2)
Elite Three	Elite Three	Not allowed

Source Diskette is Elite Three Format

Source Drive	Target Drive	Target Disk
Disk II	Disk II	Impossible
Disk II	Elite One	Impossible
Disk II	Elite Two	Impossible
Disk II	Elite Three	Impossible
Elite One	Disk II	Impossible
Elite One	Elite One	Impossible
Elite One	Elite Two	Impossible
Elite One	Elite Three	Impossible
Elite Two	Disk II	Impossible
Elite Two	Elite One	Impossible
Elite Two	Elite Two	Impossible
Elite Two	Elite Three	Impossible
Elite Three	Disk II	Impossible
Elite Three	Elite One	Impossible
Elite Three	Elite Two	Impossible
Elite Three	Elite Three	Elite Three

The explanations for the "explained"s in the tables are as follows:

- (1) The target diskette will contain a backup of the source diskette, however the target diskette cannot be read by any other drive but an Elite Three. This means that the target diskette cannot be moved to the source drive and used just as if it were the source diskette. See explanation (2) for what can be done with the target diskette.
- (2) COPY will assume that the source diskette was one which was created under the condition described in explanation (1) above. These two conditions permit Elite Threes to be used in making backup copies of non-Elite Three diskettes, even though the copy cannot be used just like the original. The target diskette created under (1) above is only good for later "unbacking-up" the information by reversing the drive models used for the source and target drives. An Elite Three backup of a non-Elite Three diskette is not valid for use under anything except COPY, and then only given these two explanation conditions.

What if your system consists of a Disk II drive and an Elite Two? Does this mean you can't backup an Elite Two diskette? First glance at the tables might indicate that such a conflict occurs, but not really. In such a case you would simply specify a single drive copy to the COPY utility by specify both the source and target drives as being your Elite Two. A dual-drive copy can still be performed if you are backing up a Disk II diskette, since the Elite Two will work as both the source and target for a Disk II copy, provided a Disk II defined drive is involved in the copy somehow.

An important note to remember is that COPY does not know exactly which drive models you have placed in various positions, all it knows is what you have specified to the currently booted CP/M operating system (using PROFILE). Therefore, if you have an Elite Two as drive B:, but you've told the currently booted CP/M that drive B: is a Disk II, then you must treat the drive like a Disk II when you look at the copy tables listed earlier.

A studied analysis of the tables will reveal, with the exception of the Elite Three, that the lower capacity drive of the two specified for the copy will always declare what type of copy is to be performed. This is regardless of whether or not the lower capacity drive is the source or the target.

In addition, COPY will not FORMAT the target diskette prior to starting the copy. The target diskette must already have been pre-formatted using the FORMAT utility. The diskette must be formatted in the same format as listed for the target diskette in the preceding tables, with the exception of the special Elite Three conditions. In the Elite Three "explained" case (1), the target diskette must be formatted in an Elite Three format. In the Elite Three "explained" case (2), the target diskette must be formatted in the format correct for the target drive's type.

When making a backup copy of (for instance) an Elite One diskette using an Elite One as the source drive and an Elite Two as the target drive, it is okay to place an Elite One formatted diskette into the Elite Two to use as the target diskette. COPY will only attempt to use the Elite One formatted areas on the diskette since it will be copying an Elite One diskette. The same is true for other copies of this type in which the target drive has more capacity than the source drive (excluding the Elite Three).

On system-only copies, the above tables do not apply. System-only copies always assume that the source diskette will be of the same type as the source drive, and that the target diskette will be of the same type as the target drive. This allows you to copy a CP/M structured (for instance) to boot off of a Disk II, and have COPY restructure it and write it so that an Elite Three can then boot it. The reverse is also true. COPY will restructure an Elite Three operating system so that a Disk II can then boot it. However, the source and target diskettes must be pre-formatted to be compatible with the drive types which will be reading and writing them. Check the PROFILE utility for information concerning "bootability" of system copies.

After you've plowed through all of the above confusion, and finally decide you've chosen the right command and then hit <RETURN>, COPY will respond with:

```
Insert SOURCE disk into drive <source>:  
Insert TARGET disk into drive <target>:
```

Press RETURN to begin

provided your <source> and <target> are two different drives. If your <source> and <target> are the same drive, then COPY will say:

```
Insert SOURCE disk and press RETURN
```

Insert the diskette(s) COPY requests, and then press <RETURN>.

On single drive copies, COPY will first read in as much information as it can into memory from the source diskette, and then say:

Insert TARGET disk and press RETURN

You should then insert the requested diskette and press <RETURN>.

Single drive copying will continue like this until all the information is copied. Two drive copies will run all the way through without an assist from you.

Once the copying is finished (single or two-drive), COPY will say:

COPY Complete

Do you wish to make another copy?

If you answer <N><RETURN> to this question, COPY will terminate. COPY's response to your answering <Y><RETURN> to this question depends upon whether you did a full diskette copy or a system-only copy.

If you did a full diskette copy, COPY will ask for the diskettes to be copied just like it did the first time. If you did a system-only copy, COPY will only ask for the target diskette. This is because COPY was able to fit all of the system information it is copying into memory at one time. Therefore it does not need to read it again off of the source diskette a second time.

Once you answer <N><RETURN> to the "another copy?" question, COPY will check to see if you used drive A: anytime during your copying. If you did, it will prompt you with:

Insert CP/M System disk into drive A:
Hit RETURN

This is just a reminder in case you removed the CP/M system diskette to make a copy of some other diskette. When the CP/M system diskette is in drive A:, press <RETURN> and COPY will terminate.

Special Note: The only diskette restructuring COPY will perform is during a system-only copy. There is no way to convince COPY to restructure and Elite One diskette (for instance) into an Elite Two diskette. This can be done using the "copy all files" feature of the PIP utility. Refer to your CP/M manuals. If you have just a single drive, you will also want to refer to the SGLDRIVE utility instructions later in this section.

10.4. PROFILE Utility

The PROFILE utility is the heart of the enhanced CP/M system. It is this utility which allows you to tell CP/M where various drive models are located on your system, and also allows you to declare the drive as a different model (an Elite Two as a Disk II, for example) to allow you to read and create diskettes to be interchanged with other Apple II CP/M systems.

PROFILE has absolutely no effect on the Elite Controller card since the enhanced CP/M functions with it completely automatically. Enhanced CP/M does not need to be told to use all four drives on the Elite Controller, and to only use two drives on the Disk II controller; it's all automatic.

PROFILE is executed from CP/M command level by typing:

```
<d>:PROFILE<RETURN>
```

where <d> is the drive in which the diskette containing PROFILE is located.

PROFILE signs-on by saying:

```
Apple ][ CP/M
Drive Configuration Utility
Copyright (c) (p) 1982 RANA Systems
Version 1.1
```

*

The "*" is the standard CP/M utility prompt to indicate that the utility is waiting for a command.

The valid command syntax for PROFILE is:

```
[<u>:=][<d>:<t>[<s>][,<d>:<t>[<s>]...]*}
```

where <u> is the drive containing the copy of the CP/M to be altered. <d> is the CP/M drive whose definition is to be altered within the copy of the CP/M. <t> is the drive type to which the drive is to be changed, as given below. And <s> is the seek speed at which the drive is to be positioned from track-to-track. The "*" can replace the entire mess, telling PROFILE to display the current system configuration without making any changes.

The valid <t> entries are:

```
0 = Disk II
1 = Elite One
2 = Elite Two
3 = Elite Three
```

The valid <s> entries are:

S = Slow (all models)
 M = Medium (all Elite models)
 F = Fast (Elite Two and Three only)

The "<u>:=" part is optional. If it is not specified, then PROFILE will assume the change is to be made to the currently booted in-memory copy of CP/M only, and no change to disk copies will be made. This in-memory change would be temporary, and would no longer exist once the system was fully rebooted.

If the "<u>:=" is specified, then the change will be made to the CP/M system on the diskette in the specified drive, and no changes will be made to the in-memory copy of CP/M.

The seek speed parameter is also optional. If it is left off, PROFILE will default to the correct seek speed for the drive model type you specified.

Apart from various "insert disk" and other such instructional messages, PROFILE basically has only one primary line it prints over and over again to reflect any changes it applies or to give a listing of current settings. A sample of this single line message would be:

```
H:+Rana Elite Three, Medium Seek.
AABCCCCCCCCCCCCCCCCDDDDDDDDDDDD
```

The first line is the message, the second is a little added template to assist in the explanation of the various sections on the message (it's not printed by PROFILE).

The "A" section of the message (refer to second line) is the drive for which the information applies.

The "B" section is either a "+" or a space. If a "+" is printed, that means that your system does not currently have a controller card in it which will allow talking to that drive. All drives from a certain drive letter up through drive P: (highest allowable CP/M drive) would have "+"s, depending upon the number of controllers in your system. All drives from I: through P: will have "+"s since enhanced CP/M only supports up to eight drives (A: through H:).

The "C" section concerns itself with the type of drive model which is assigned to that drive letter. This assignment is completely independent of what type of drive is actually connected to your Apple at that particular drive position. What is printed at this position in the message determines how CP/M will treat that particular drive, regardless of whether or not the drive is capable of being treated that way. Some examples of why you would "lie" to CP/M will come later. Drives I: through P:

will not report any model type since the enhanced Apple II CP/M does not support these drives.

The "D" section reports the seek speed at which the drive will be positioned from track-to-track by CP/M. This also is regardless of whether or not the drive is capable of seeking at the given speed. This field is printed for all drives regardless of whether or not the enhanced CP/M supports the drive. This is because very specialized machine language programs can do disk I/O which bypasses the CP/M operating system, but which still rely on the system disk controller routines to position the drive for them.

When a drive's setting is changed, PROFILE will print the message line for the drive twice, preceeded by "Was" for the old setting of the drive, and "Now" for the new setting of the drive:

```
Was B:+Elite Three, Fast Seek.
Now B:+Disk II,      Slow Seek.
```

The best way to show the use of PROFILE is by examples of various PROFILE commands:

```
A:=H:3,C:0,E:1<RETURN>
```

This command will make all changes to the system diskette located in drive A: (A:=). The first change will be to make drive H: an Elite Three with the default seek speed of "fast" (H:3). The second change will be to make drive C: a Disk II with the default seek speed of "slow" (,C:0). The last change is to make drive E: an Elite One with the default seek speed of "medium" (,E:1).

```
G:1F,C:0F,D:0M<RETURN>
```

This command will make all changes to the in-memory (currently running) CP/M system and absolutely no changes to any copies on any diskettes. This would be a temporary change, only lasting until the system is completely rebooted.

The first change is to make drive G: an Elite One with an override for "fast" seeking (G:1F). The override would only make sense if the drive was actually an Elite Two (which can seek fast) which is to be restricted to acting like an Elite One.

The second change is to make drive A: act like a Disk II, but seek at the "fast" rate (,A:0F). Once again, this would have to be an Elite Two pretending to be a Disk II. This would be a common temporary setting since it allows the Elite Two to read a lower capacity Disk II diskette, and restricts any writes the drive makes to the diskette to be perfectly interchangeable with a Disk II drive.

The last change is to make drive D: act like a Disk II but seek at the "medium" seek rate (,D:0M). This also would be a common

temporary setting since it obviously infers restricting an Elite One to acting just like a Disk II to insure that any diskette about to be updated/created by the drive will interchange with a Disk II drive.

Although possible, no changes to the setting for drive A: should ever be made to the in-memory system. All changes take effect immediately, and since the diskette which was booted in drive A: would be of a "pre-change" format, the system will "crash" when PROFILE is terminated and the system is no longer able to read its own system diskette.

Likewise, changes to settings for drive A: in on-disk copies of CP/M have a direct effect on the "bootability" of the diskettes. When the copy of the operating system was placed onto the diskette (by COPY), it was structured to boot for a particular type of drive. The setting for drive A: within that on-disk operating system must match the boot structure, or the boot will fail.

When you use COPY to copy an operating system from (for instance) an Elite One drive to an Elite Two drive, COPY restructures the system into a format compatible with booting off of the Elite Two. However, COPY did not change the configuration setting for drive A: on that new system copy. If drive A: was not set as an Elite Two on the system diskette which was copied, then you will need to use PROFILE to change drive A:'s setting in the Elite Two system diskette to an Elite Two. Otherwise the diskette will begin to boot, but end up crashing. The same is true for other changes in booting structures.

Whenever PROFILE has to read and write a diskette in a particular drive in order to make changes to an on-disk copy of CP/M, it relies completely upon the definition of the drive within the in-memory CP/M to determine the CP/M's structure on the diskette. PROFILE expects the CP/M's structure to match how the drive is defined under the operating system.

This means that Elite Two system diskettes should only be updated in drives defined under the in-memory CP/M as Elite Two's. The same goes for the other types of system diskettes. Also, keep in mind that any changes you make to the in-memory CP/M take effect immediately. This can be a problem to be kept track of, but also an advantage. It will allow you to temporarily change the setting of a drive which is capable of handling a particular diskette's format so that the diskette can be modified. (With the exception of the Elite Three, higher capacity models can all handle the lower capacity models' diskette formats. The Elite Three can only handle, and is the only one which can handle, the Elite Three format.)

The last two examples deal with finding out how a particular copy of CP/M is currently configured:

*<RETURN>

A simple "*" will result in PROFILE displaying the settings in the in-memory CP/M for all drives. No changes will be made.

```
A:=*<RETURN>
```

This example will cause PROFILE to display the current setting in the on-disk CP/M in drive A: for all drives. No changes will be made. A: could be any drive.

For each change in a drive setting made in the above examples, be it on-disk or in-memory, PROFILE would display a "was" and "now" message to show you the change made.

Whenever you either display the current settings within an on-disk CP/M system copy (<u>:=*), or make a change to a setting (<u>:=<d>:<t>[<s>]), PROFILE will first respond with:

```
Insert a system disk in <u>:.  
<RETURN> to continue/retry;  
<ESC> or <CTRL-C> to abort.
```

where <u> is the drive you specified.

This gives you a chance to insert which ever diskette contains the copy of the CP/M you wish to examine or modify. When you have it in the drive, just press <RETURN> and PROFILE will go get the information it needs from the diskette. If you type <ESC>, PROFILE will cancel the command and immediately return to the "*" prompt.

Once PROFILE reads the information, it will then perform the function you requested. If your request was for just a listing of the settings, then the listing will be displayed and PROFILE will return to the "*" prompt.

If you requested changes to be made, PROFILE will make the changes, displaying all the "was" and "now" messages, and then respond with:

```
Ready to update <u>:.  
<RETURN> to continue/retry;  
<ESC> or <CTRL-C> to abort.
```

PROFILE will then wait for you to allow it to make the changes permanently to the diskette. If the changes were all okay, type <RETURN>. If you no longer wish the diskette to be updated, type <ESC> and PROFILE will leave the diskette alone.

If you request PROFILE to do anything with the in-memory CP/M, PROFILE will not need to ask you to insert any diskettes. So, you will get an immediate response to your request. But, before PROFILE actually applies the changes directly to the in-memory CP/M, it will say:

Ready to update in-memory system.
<RETURN> to continue/retry;
<ESC> or <CTRL-C> to abort.

This gives you a chance to change your mind about any modifications to the in-memory system. If you press <RETURN>, PROFILE will go ahead and update the system. If you press <ESC>, PROFILE will cancel the command and immediately return to the "*" prompt.

10.5. SGLDRIVE Utility

The SGLDRIVE utility is designed specifically for CP/M users with only one drive. If you are not such a user, the description of this utility will not be of much use to you. If you are a single drive user, this utility can prove to be invaluable.

Single drive users (on an Apple or any other CP/M system) quickly find that CP/M is not overly friendly to them. CP/M was not really designed with only one drive in mind. The biggest example of this is the PIP utility for which SGLDRIVE was specifically designed (although it can function in other applications as well).

PIP is a standard utility which is part of the CP/M system itself (from Digital Research), as opposed to FORMAT and COPY which were added by Microsoft and which strictly work under the Apple II version of CP/M. PIP's primary function (it has alot of functions, see your CP/M manuals) is to copy individual files or groups of files from one diskette onto another diskette (or possibly the same diskette), without destroying the other existing files on the target diskette.

PIP's problem is that if you specify the source drive (on which PIP is to find the original files) and the target drive (to which PIP is to copy the files) as the same drive, PIP assumes you want the copy of the file to go on the same diskette as the source. This prevents single drive users from copying individual files between two different diskettes. SGLDRIVE solves this not so little problem by doing a little lieing to CP/M itself.

To get SGLDRIVE started, type:

```
<d>:SGLDRIVE
```

where <d> is the drive in which the diskette containing SGLDRIVE is inserted.

After SGLDRIVE is loaded, it will sign-on with:

```
Enhanced Apple ][ CP/M
Dual to Single Drive Mapping Utility
Copyright (C) 1982 RANA Systems
Revision 1.1
```

When SGLDRIVE is first executed, it takes a small section of itself and copies it into some storage space inside CP/M which is only used when you have three or more drives. This little piece of SGLDRIVE will remain inside CP/M until you completely reboot your Apple. This is referred to as the "resident" portion of SGLDRIVE. Once this resident portion is in place, SGLDRIVE will tell you:

```
B: now mapped to A:
```

This means that whenever CP/M or a utility/program running under CP/M (PIP for instance) asks CP/M to read or write some information from drive B: (which, as a single drive user, you won't have), SGLDRIVE will display:

Mount B:, Press <ESC>

This gives you a chance to remove the diskette from your drive and insert whichever diskette you want to pretend is in drive B:. When you have the "drive B:" diskette in the drive, type <ESC> and the resident portion of SGLDRIVE will allow the read or write operation to continue.

When CP/M (or the program running under CP/M) changes back to using drive A:, you will get:

Mount A:, Press <ESC>

Which gives you a chance to replace the "drive B:" diskette with the "drive A:" diskette (the system diskette).

Important Note: Although SGLDRIVE allows you exchange the disk in drive A: between the "drive A:" diskette and the "drive B:" diskette as required by CP/M, you cannot freely exchange which diskettes you are using as the "drive A:" diskette and the "drive B:" diskette. Once you start using a particular diskette as the "drive B:" diskette, you must stick with that diskette. As far as CP/M is concerned, it is actually dealing with two diskettes located in two different drives, and which are not being removed and changed all the time.

There are very specific and defined times which you can change the diskettes you are using. For information on this, see the "R/O" error message under "BDOS Error Messages" in your CP/M manuals.

In order to convince PIP to copy a file from one diskette to another diskette using just one drive, you would tell PIP to copy the file from drive A:/B: to drive B:/A: (the other drive). Then, whenever PIP needs to read or write from the diskette which is not currently in the drive at that particular time, the resident portion of SGLDRIVE will allow you to change the diskettes.

Due to the way SGLDRIVE works, it would be possible to use it with programs other than PIP, but Rana's making no promises. SGLDRIVE was designed specifically to solve PIP's single drive problem, but with the possibility of helping out with other programs at the same time.

There is one particular type of program with which SGLDRIVE will not work correctly at all. SGLDRIVE should not be used with the various system utilities which perform their own disk reads and writes. These programs tend to bypass the CP/M operating system

for their disk reads and writes sometimes and then use CP/M at other times. This will completely confuse SGLDRIVE, and it will not be able to keep track of which diskette should be in the drive at what time.

Such programs include the FORMAT, COPY, PROFILE, and ENHANCE utilities; except when used as outlined in the CP/M Enhancements section of this manual. (Special considerations have been made in the utilities for the enhancing process.)

10.6. ENHANCE Utility

The ENHANCE utility is intended as a one-time-only utility. Once you've performed the CP/M enhancements outlined earlier in this manual, ENHANCE is no longer needed. The COPY utility is used to make new enhanced CP/M diskettes. It is not necessary the use ENHANCE to keep enhancing every new CP/M system diskette you create. The earlier CP/M enhancing instructions are essentially the instructions for using ENHANCE.

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11. SECTION 11

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ACKNOWLEDGEMENT

Rana Systems gratefully acknowledges the help given by Quality Software in the compilation of the following appendix.

We have borrowed some material from a section of their highly informative book "Beneath Apple DOS" by Don D. Worth and Pieter M. Lechner.

For further information on Apple Disk I/O we suggest you refer to "Beneath Apple DOS" Copyright 1981 Quality Software

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APPENDIX A

A. DISKETTE DATA RECORDING

A.1. Introduction

This appendix is designed to show in detail how information is structured on a diskette, beginning with a brief introduction to the hardware involved.

A.2. Tracks and Sectors

Diskettes are divided into tracks and sectors during the initialization process. Each track is identified by its distance from the center of the disk but, unlike the grooves of a record, they are not connected in a continuous spiral. A disk is similar to a record in that it is spun at a constant speed and information is written to or read from its surface with a read/write head. Apple formats its diskettes into 35 tracks, numbered 0 to 34 with track 0 on the outside and track 34 being the innermost.

The Elite One is capable of reading and writing 40 tracks (0 to 39). These five extra tracks are located closer to the center of the disk after Apple's last track (34).

The dual headed Elite Two and Elite Three drives require that the term "cylinder" be introduced. Since the two heads allow the Elite Two and Elite Three to read and write on both sides of the diskette, these drives can actually access two tracks without having to move the read/write heads (which always move together) to another pair of tracks. Each "pair of tracks" at which the read/write head can stop (and successfully read and write data) is called a cylinder.

Since the Elite One (and Apple's Disk II) has only one head, it has only one track for every cylinder. This leads to the two terms ("track" and "cylinder") being interchanged rather freely when discussing single headed disk drives (a problem which tends to spill over into the dual headed disk drive world). For the most part, no problems of understanding arise from this sloppy use of "computerese" (a very sacred language).

This appendix will, in fact, continue this sloppy exchange of these terms since, should you be a user with a little computer experience, you will already be used to the term "track", and "cylinder" probably leaves a bad taste in your mouth (for now).

Like the Elite One, the Elite Two also has 40 cylinders; but the Elite Two is dual headed and therefore has two tracks for every cylinder. This gives the Elite Two a total of 80 tracks.

The Elite Three has 80 cylinders; and since it is dual headed

also, this gives it a total of 160 tracks.

The disk arm can physically position itself over 80 "phases". To move an Elite One or Two past one track (cylinder) to the next, two phases of the stepper motor, which moves the arm, must be cycled. This would suggest that data might be stored on 80 tracks, but only the Elite Three is equipped with heads which are capable of reading and writing data on tracks which are so close together. For the Elite One and Elite Two (and Disk II) the resolution of the read/write heads are such that attempts to use "half-tracks" often invite complications.

A sector, a sub-division of a track, is the smallest unit of "updateable" data on the diskette and Apple has used two different track formats to date. One divides the track into 13 sectors, the other into 16 sectors. The sectoring does not use the index hole(s) provided on most diskettes to locate the first sector of the track. Instead DOS uses an extended "soft sectoring" format which takes up more space but, ultimately allows more flexibility, and reduces drive costs.

Since the existing Apple II operating systems (DOS, CP/M, and Pascal) knew nothing of dual headed disk drives like the Elite Two and Elite Three, special (but very compatible) extensions to Apple's diskette format had to be made to support these higher capacity drives. This was done by leaving the format on the first side of the diskette identical to Apple's, but numbering the sectors on the second side of the diskette as sectors 16-31.

The following tables give an illustration of the amount of data stored on a diskette under an Enhanced DOS 3.3 format for all Elite models.

**ELITE ONE
DISK ORGANIZATION**

Cylinders	per Diskette	:	40
Tracks	per Cylinder	:	1
Tracks	per Diskette	:	40
Sectors	per Track	:	16
Sectors	per Cylinder	:	16
Sectors	per Diskette	:	640
Bytes	per Sector	:	256
Bytes	per Track	:	4096
Bytes	per Cylinder	:	4096
Bytes	per Diskette	:	163840
DOS Reserved Cylinders	per Diskette	:	4
DOS Reserved Tracks	per Diskette	:	4
DOS Reserved Sectors	per Diskette	:	64
DOS Reserved Bytes	per Diskette	:	16384
Available Cylinders	per Diskette	:	36
Available Tracks	per Diskette	:	36
Available Sectors	per Diskette	:	576
Available Bytes	per Diskette	:	147456

Note: The above figures are for an enhanced DOS version 3.3.

**ELITE TWO
DISK ORGANIZATION**

Cylinders	per Diskette	:	40
Tracks	per Cylinder	:	2
Tracks	per Diskette	:	80
Sectors	per Track	:	16
Sectors	per Cylinder	:	32
Sectors	per Diskette	:	1280
Bytes	per Sector	:	256
Bytes	per Track	:	4096
Bytes	per Cylinder	:	8192
Bytes	per Diskette	:	327680
DOS Reserved Cylinders	per Diskette	:	2.5
DOS Reserved Tracks	per Diskette	:	5
DOS Reserved Sectors	per Diskette	:	80
DOS Reserved Bytes	per Diskette	:	20480
Available Cylinders	per Diskette	:	37.5
Available Tracks	per Diskette	:	75
Available Sectors	per Diskette	:	1200
Available Bytes	per Diskette	:	307200

Note: The above figures are for an enhanced DOS version 3.3.

**ELITE THREE
DISK ORGANIZATION**

Cylinders	per Diskette :	80
Tracks	per Cylinder :	2
Tracks	per Diskette :	160
Sectors	per Track :	16
Sectors	per Cylinder :	32
Sectors	per Diskette :	2560
Bytes	per Sector :	256
Bytes	per Track :	4096
Bytes	per Cylinder :	8192
Bytes	per Diskette :	655360
DOS Reserved Cylinders	per Diskette :	2.5
DOS Reserved Tracks	per Diskette :	5
DOS Reserved Sectors	per Diskette :	80
DOS Reserved Bytes	per Diskette :	20480
Available Cylinders	per Diskette :	77.5
Available Tracks	per Diskette :	155
Available Sectors	per Diskette :	2480
Available Bytes	per Diskette :	634880

Note: The above figures are for an enhanced DOS version 3.3.

A.3. Track Formatting

Data is recorded on the diskette uses a "group coded recording" technique (GCR) which requires that a bit with a value of 1 be recorded onto the diskette within a given maximum period of time. This method has some very significant differences from other possible recording techniques, but all of these differences only occur at the hardware level of the computer. Once the data is presented to the software (by the hardware), no real difference can be detected.

This appendix will not attempt to explain the GCR recording technique in the brief explanation of data recording which precedes the software discussion. Instead, the "frequency modulated" recording technique (FM) will be substituted. This is due to a rather extensive difference in the complexity of explaining the two techniques. This will not hinder the remainder of the explanation since, as was already mentioned, differences from the software standpoint are completely hidden by certain rules which must be obeyed when accessing Apple-type disk drives.

In the frequency modulated recording technique, data written on and read back from the diskette takes the form shown in the figure to follow, which represents the binary data pattern 101.

The clock bits and data bits are interleaved, as shown in the next figure. A data bit between two clock bits represents a binary 1. An absence of that bit represents a binary 0. The period between the edge of one clock bit and the edge of the next we will define as a "bit cell".

A byte would comprise eight consecutive bit cells, the most significant of which is normally referred to as cell 7 (with the least significant being cell 0). Data is written and read serially. During a write operation, bit cell 7 of each byte would be written first and 0 last.

When data is being read from the diskette the same sequence applies. The third figure illustrates the relationship of bits within a byte.

These diagrams are a representation of what occurs within the disk drive and controller card. For the purpose of these illustrations, the hardware interface to the diskette will be represented as an eight bit "data latch".

The final figure shows the three bits, 101, being transferred from the data stream into the data latch.

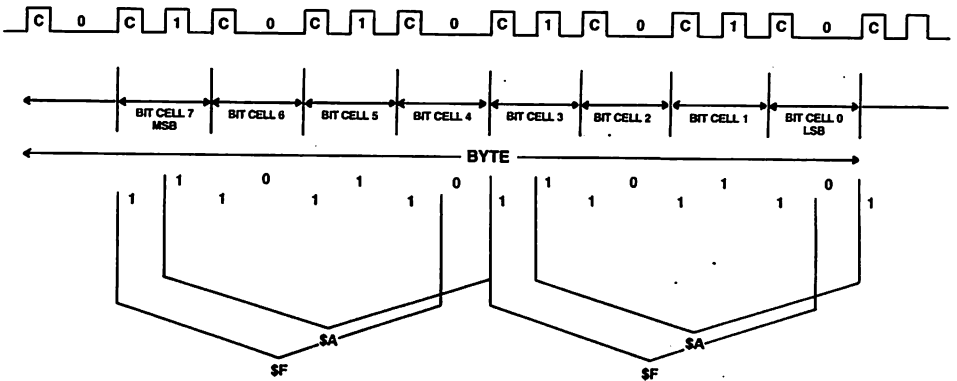


Fig. A-1: FM Recording Pattern

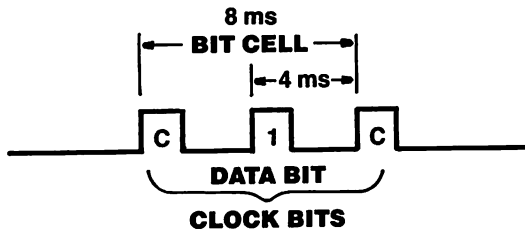


Fig. A-2: FM Bit Cell

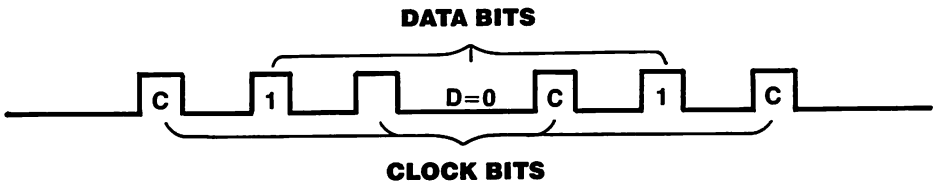


Fig. A-3: FM Byte Recording

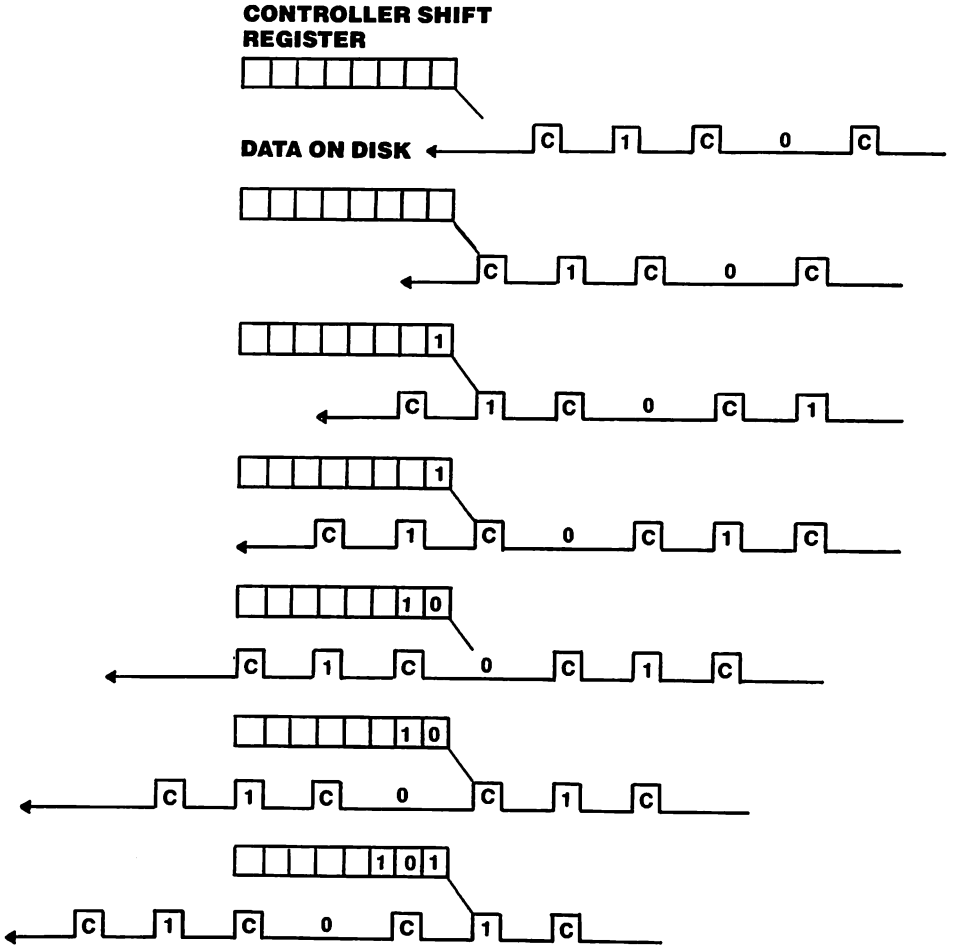


Fig. A-4: Reading Data

The following figure shows how writing data can be illustrated in the same way. The clock bits that were separated from the data must be interleaved with the data as it is written. Notice that, while in write mode, 0's (zeros) are being brought into the data latch to replace data being written.

The software must ensure the latch is loaded and instructed to write in 32 cycle intervals. If not, zero bits will continue to be written every four cycles which is how "self-sync" bytes (explained later) are created.

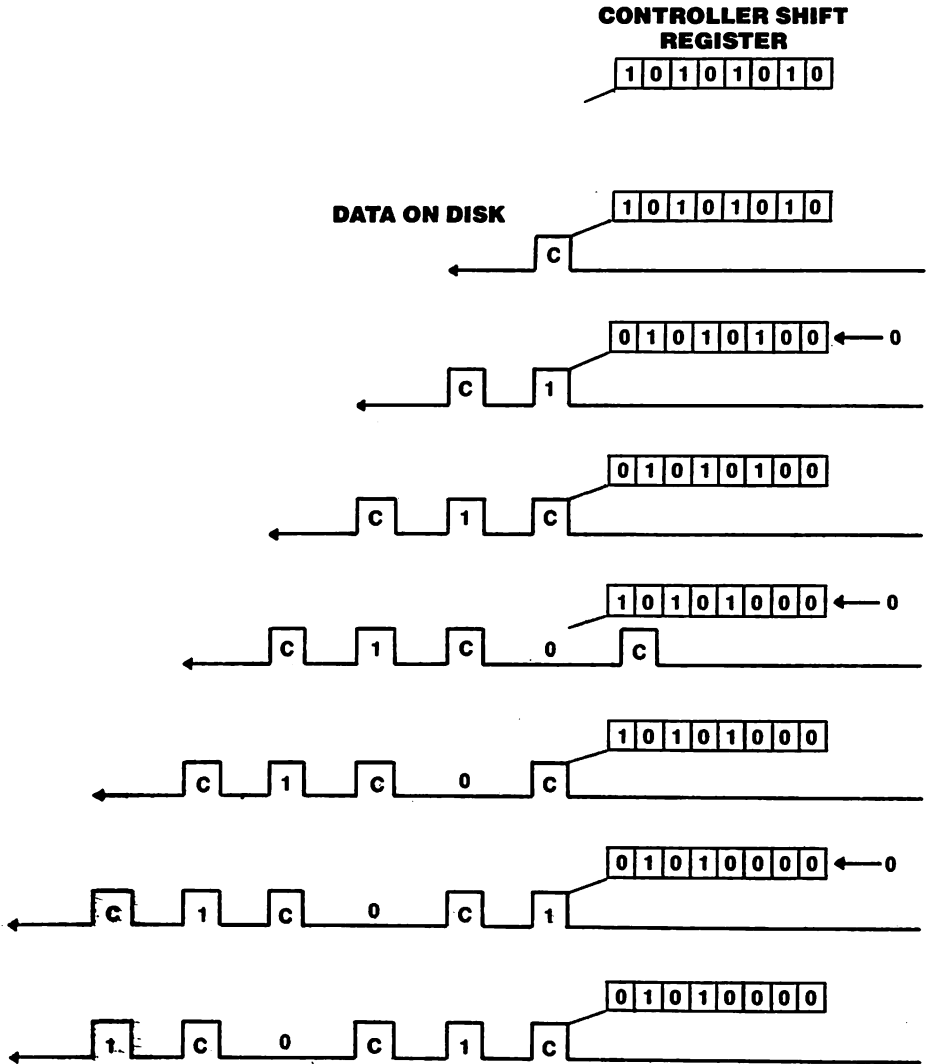


Fig. A-5: Writing Data

A.4. Fields

The two types of fields on a diskette are the Address and the Data fields which both contain a prologue, data area, checksum, and epilogue. Each field on a track is separated from adjacent fields by a number of bytes, called "gaps".

All gaps are made up in the same way comprising self-sync hexadecimal FF's, and vary only in the number of bytes they contain.

The first figure below shows a portion of a typical track divided into its major components.

The three different types of gaps on a track are made up of self-sync or auto-sync bytes, so-called because they automatically bring the hardware into sync with data bytes on the diskette.

A self-sync byte is defined to be a hexadecimal FF with a difference: it is a ten bit byte, rather than an eight bit byte. Its two extra bits are zeros, as shown in the second figure.

A self-sync is generated by using a 40 cycle (slightly less than a microsecond) loop while writing an FF. A bit is written every four cycles, so two of the zero bits brought into the data latch while the FF was being written are also written to the disk, making the ten bit byte.

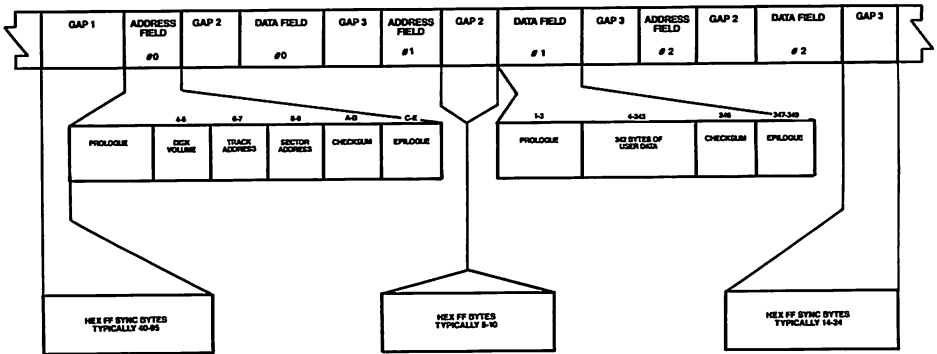


Fig. A-6: Track Formatting

Normal Byte Hex FF	Self-Sync Byte Hex FF
1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 0 0

Fig. A-7: Self-Sync Byte

Five self-sync bytes are sufficient to show that the hardware is reading valid data because the hardware requires the first bit of a byte to be a 1 (an Apple-GCR restriction).

As long as the disk is left in read mode, it will continue to correctly interpret the data unless there is an error on the track.

A.5. Gaps

The size of the three gap types will vary from drive to drive and even from track to track. During initialization (INIT), DOS will start with large gaps and make them smaller until a complete track can be written without overlapping itself.

A minimum of five self-sync bytes must be maintained for each gap type, resulting in reasonably uniform gap sizes within each track.

A.5.1. Gap 1

This is the first data written to a track during initialization. It originally comprises 128 bytes of self-sync, a large enough area to ensure that all parts of the track contain data. Since the speed of a particular drive may vary, the total length of the track in bytes is uncertain and the percentage occupied by data is unknown.

The initialization process is set up so that, even on drives of differing speeds, the last data field written will overlap Gap 1, providing continuity.

A.5.2. Gap 2

This appears after each Address field and before each Data field, its length varying from five to ten bytes on a normal drive. Gap 2 primarily provides time for the data in an Address field to be decoded before a read or write is initiated.

If the gap is too short, the start of the Data field could spin past while DOS was still wondering if this was the sector to be read.

When a data field is written there is no guarantee that the write will occur in the same spot each time because the drive which is rewriting the data field may not be the one which actually INIT-ed, or originally wrote it. Since the speed of the drives can vary, it is perfectly possible the write could start in mid-byte.

Normally, when writing a data field, five self-sync bytes are written prior to writing the data field itself. This is because the five bytes help place the data field near its original location. Secondly, the five self-sync bytes are the minimum number required to guarantee read-synchronization, as demonstrated in the figure below:

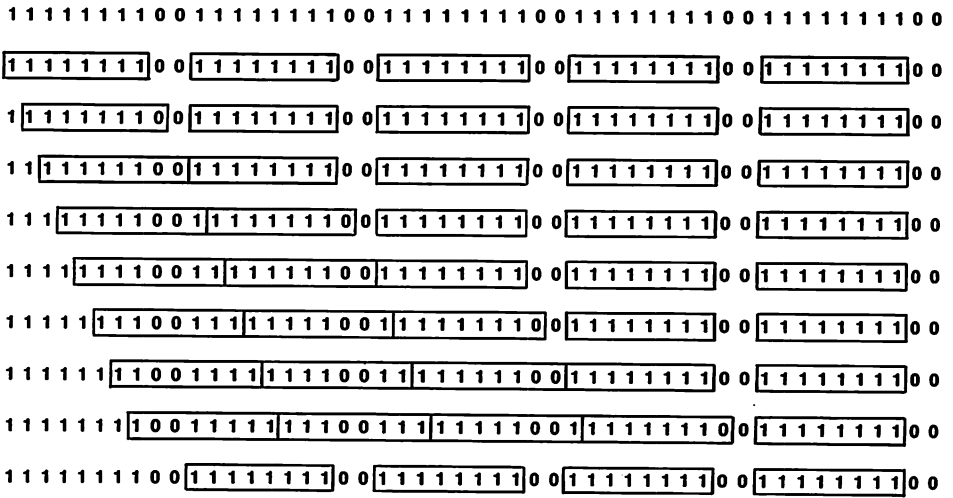


Fig. A-8: Read Synchronizing

Probably, at least one sync byte will be destroyed when writing a Data field because, just as in reading bits on a track, the write may not begin on a byte boundary, thus altering an existing byte. See first figure below.

A.5.3. Gap 3

This appears after each data field and before each address field. Though it is similar to Gap 2, it is longer, generally ranging from 14 to 24 bytes in length. It allows the additional time necessary to handle the data before the next sector is read.

The length of this Gap is not as vital as that of Gap 2 because the DOS can always wait for the next spin under the read/write head if the address field has been missed, a maximum one turn of the diskette. Since address fields are never rewritten, there is no problem with this gap providing sync, because only the first part of the gap can be overwritten or damaged, as demonstrated in the second figure.

The address field contains the "address" or identifying information about the data field which follows it. The volume, track, and sector number of any given sector can be thought of as its address. The third figure gives a more detailed illustration of its components.

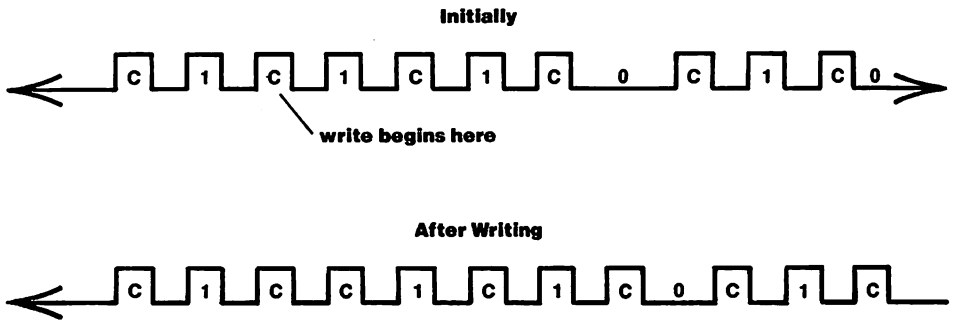


Fig. A-9: Unsynchronized Write

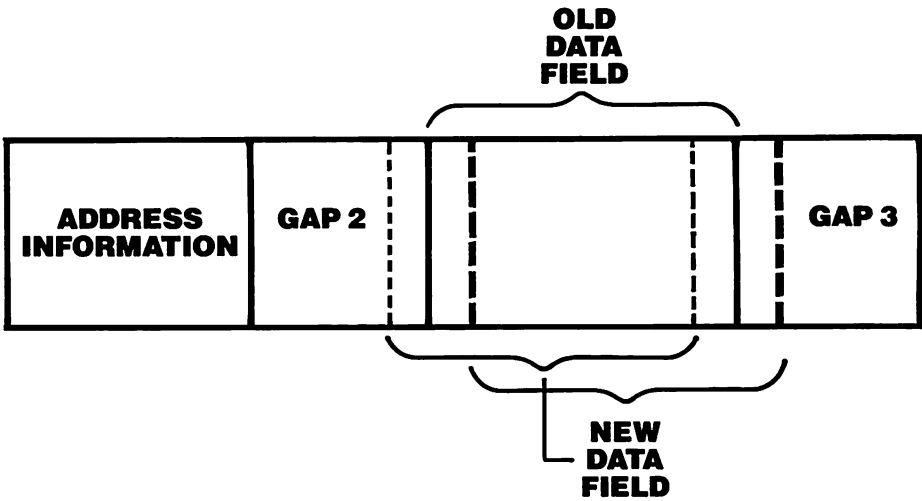
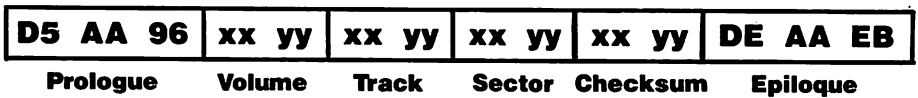


Fig. A-10: Data Field Shifting



4-plus-4 ENCODED

DATA BYTE — D₇ D₆ D₅ D₄ D₃ D₂ D₁ D₀
xx — 1 D₇ 1 D₅ 1 D₃ 1 D₁
yy — 1 D₆ 1 D₄ 1 D₂ 1 D₀

Fig. A-11: Address Field

The prologue comprises three bytes which form an unique sequence found in no other component of the track, enabling DOS to locate an address field almost without chance of an error. The three bytes are \$D5, \$AA, and \$96. The first two are reserved, thus ensuring the uniqueness of the prologue while the \$96 indicates that the data following is an address field rather than a data field.

The address information follows next, comprising volume, track, and sector numbers, and a checksum, all of which is vital if DOS is to know where it is positioned on a particular diskette.

The checksum is computed by exclusive-ORing the first three pieces of information and is used to verify its integrity.

The epilogue contains the three bytes \$DE, \$AA, and \$EB, the last one of which is always written during initialization but is never verified when an address field is read. The epilogue bytes are often referred to as "bit-slip marks" which provide assurance that the drive is still in sync with the bytes on the diskette. These bytes are not vital but are a useful double-check. Like the address field, the data field comprises a prologue, data, checksum, and an epilogue as shown in following figure.



Fig. A-12: Data Field

The prologue differs in the third byte. The bytes are \$D5, \$AA and \$AD also forming a unique sequence which enables DOS to locate the start of the sector's data, which consists of 342 (GCR) encoded bytes, and is followed by a checksum byte used to verify the integrity of the field just read. The epilogue is identical in its function to that in the Address field.

A.6. Data Field Encoding

Since it is not possible to read all 256 possible byte values (an Apple-GCR restriction), data written to the diskette must be encoded. This is done in three different ways:

1. This first method, currently used in address fields, involves writing a data byte as two disk bytes. One contains even bits, the other the odd bits, thus requiring 512 "disk" bytes for each 256 byte sector of data. Using this technique for sector data provides for no more than 10 sectors per track (about 88K of data per diskette, or 72K of space available to the user; typical for 5 1/4" single density drives). Encoding the data in this way would be very similar to the frequency modulated encoding of data.

2. The second method allows 12 sectors per track. It involves a 5-plus-3 split of the data bits (as opposed to a 4-plus-4). Each byte written to the diskette contains five actual data bits, rather than four, thus requiring 410 "disk" bytes to store a 256 byte sector permitting a full 13 sectors per track.

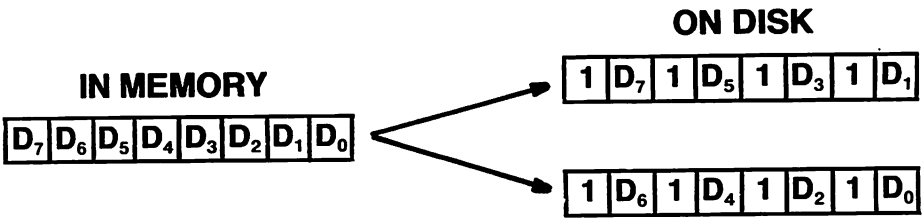
3. A hardware modification (the P6 PROM on Apple's Disk II controller card) allowed the development of 16 sectors per track, providing a 23% increase in storage over the 13 sector format. This is possible because of a 6-plus-2 split of the data, and the PROM allowing two consecutive zero bits in data bytes.

The storage and retrieval of information had been restricted in 13 sector format by the requirement that a disk byte have the high bit set and, in addition, no two consecutive bits could be zero. The odd-even 4-plus-4 technique meets these requirements. Each data byte is represented as two bytes, containing odd and even bits respectively. (See first figure.) Note that the unused bits are all set to one to guarantee meeting the two requirements.

The 4-plus-4 technique is used to store the information (volume, track, sector, checksum) contained in the address field. It is quite easy to decode the data, since the byte with the odd bits is simply shifted left and logically ANDed with the byte containing the even bits as shown in the second figure.

The major difficulty with the above technique is that it occupies a lot of space on the track, so the 5-plus-3 technique was devel-

oped, so named because it splits the bytes into five bits plus three bits and not in half as with the above.



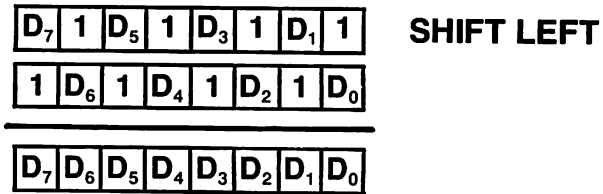


Fig. A-14: 4-plus-4 Decoding

A byte would have the form 000XXXXX where X is a valid data bit. This byte could range in value from \$00 to \$1F, a total of 32 different values. There are 34 valid "disk" bytes, ranging from \$AA to \$FF, which meet the two requirements (high bit set, no consecutive zero bits). Two bytes, \$D5 and \$AA are reserved bytes thus allowing an exact mapping between five bit data bytes and eight bit "disk" bytes.

The 256 bytes that will make up a sector must be translated to five bit bytes by a special "prenibble" routine within DOS's RWTS which involves bit rearrangement. The figure below, shows the before and after of the routine. On the left is a buffer of eight bit data bytes. Each byte in this buffer is given a letter (A, B, C, etc) and each bit a number (7 through 0). The right side shows the results of the transformation. The primary buffer contains five distinct areas of five bit bytes (the top three bits of the eight bit bytes zero filled) and the secondary buffer contains three areas which gave rise to the 5-plus-3 name.

A₇A₆A₅A₄A₃A₂A₁A₀
B₇B₆B₅B₄B₃B₂B₁B₀
C₇C₆C₅C₄C₃C₂C₁C₀
D₇D₆D₅D₄D₃D₂D₁D₀
E₇E₆E₅E₄E₃E₂E₁E₀

800	
833	0 0 0 A ₇ A ₆ A ₅ A ₄ A ₃
866	0 0 0 B ₇ B ₆ B ₅ B ₄ B ₃
899	0 0 0 C ₇ C ₆ C ₅ C ₄ C ₃
800	0 0 0 D ₇ D ₆ D ₅ D ₄ D ₃
900	0 0 0 E ₇ E ₆ E ₅ E ₄ E ₃
933	0 0 0 A ₂ A ₁ A ₀ D ₂ E ₂
966	0 0 0 B ₂ B ₁ B ₀ D ₁ E ₁
999	0 0 0 C ₂ C ₁ C ₀ D ₀ E ₀

Fig. A-15: 5-plus-3 Encoding

A total of 410 bytes is necessary to store the original 256. This is calculated by finding the total bits of data ($256 \times 8 = 2048$) and dividing by the number of bits per byte ($2048 / 5 = 409.6$) with two bits being unused. The data is then transformed to valid "disk" bytes. This involves simply looking at the following table.

Nybbled Data = Disk Byte

00 = AB	10 = DD
01 = AD	11 = DE
02 = AE	12 = DF
03 = AF	13 = EA
04 = B5	14 = EB
05 = B6	15 = ED
06 = B7	16 = EE
07 = BA	17 = EF
08 = BB	18 = F5
09 = BD	19 = F6
0A = BE	1A = F7
0B = BF	1B = FA
0C = D6	1C = FB
0D = D7	1D = FD
0E = DA	1E = FE
0F = DB	1F = FF

* AA and D5 are reserved bytes

Fig. A-16: 5-plus-3 Conversion Table

The data field has a checksum, similar to that in the address field, to verify data. It also involves exclusive-ORing data in pairs before it is transformed by the look-up table above, best illustrated by the figures below.

The read routine must read a byte, transform it and store it, all in less than 32 cycles (time to write a byte) or the information is lost. A checksum computation to decode data greatly speeds up the operation. As data is read from a sector, the accumulator contains the cumulative result of all previous bytes exclusive-ORed together. The value of the accumulator after any exclusive-OR is the actual data byte for that point in the series. (Second figure.)

A third encoding technique, similar to the 5-plus-3, still calls for the high bit to be set but the byte may now contain one (and only one) pair of consecutive zeros. This allows a greater number of valid bytes and permits the use of a 6-plus-2 technique.

A six bit byte would have the form 00XXXXXX with values \$00 to \$3F for a total of 64 different values. With the relaxed requirements for valid "disk" bytes, there are 69 different bytes (\$96 to \$FF). After removing the two reserved bytes (\$AA and \$D5) there are 67 "disk" bytes with just 64 needed. With the mapping one to one (with at least two adjacent bits set, excluding bit 7) exactly 64 valid "disk" values are left. The initial transformation is achieved by the new pre nibble routine with the results shown in the last figure.

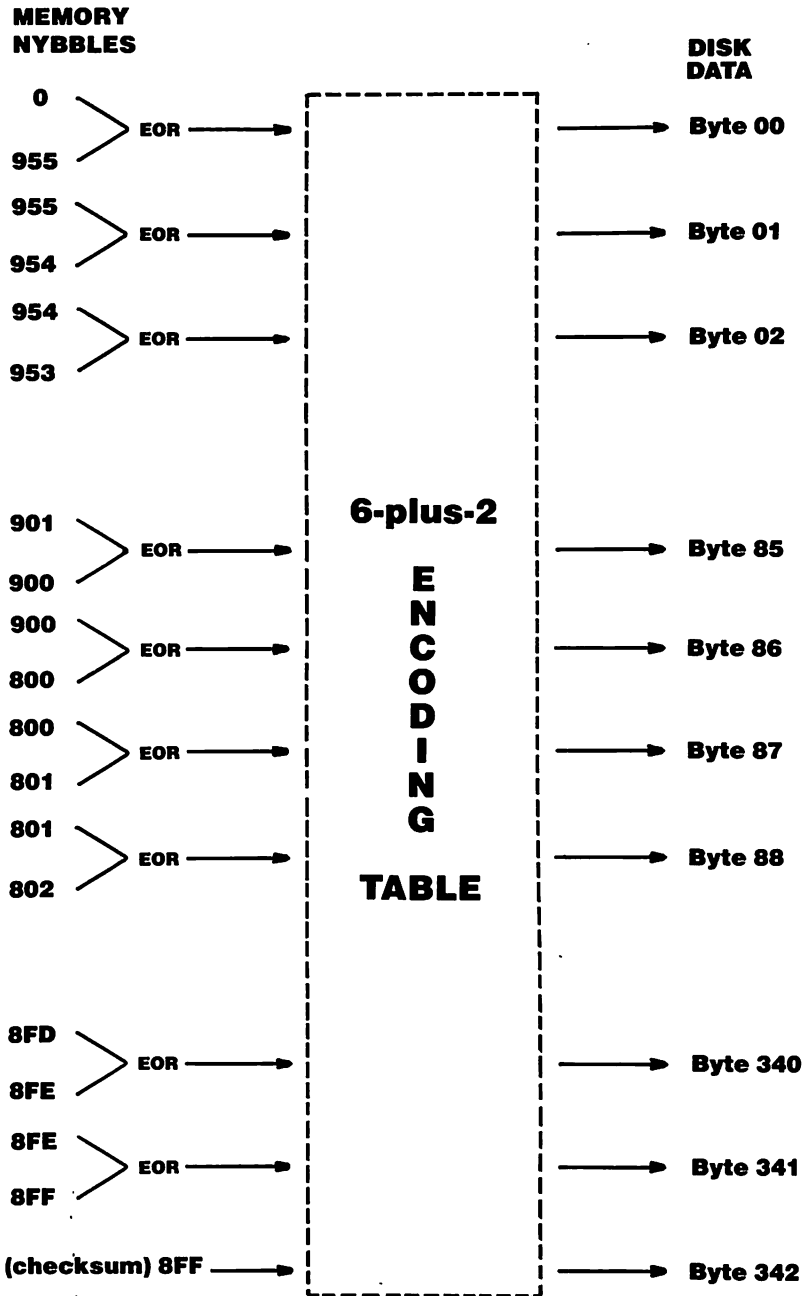


Fig. A-17: Data Encoding

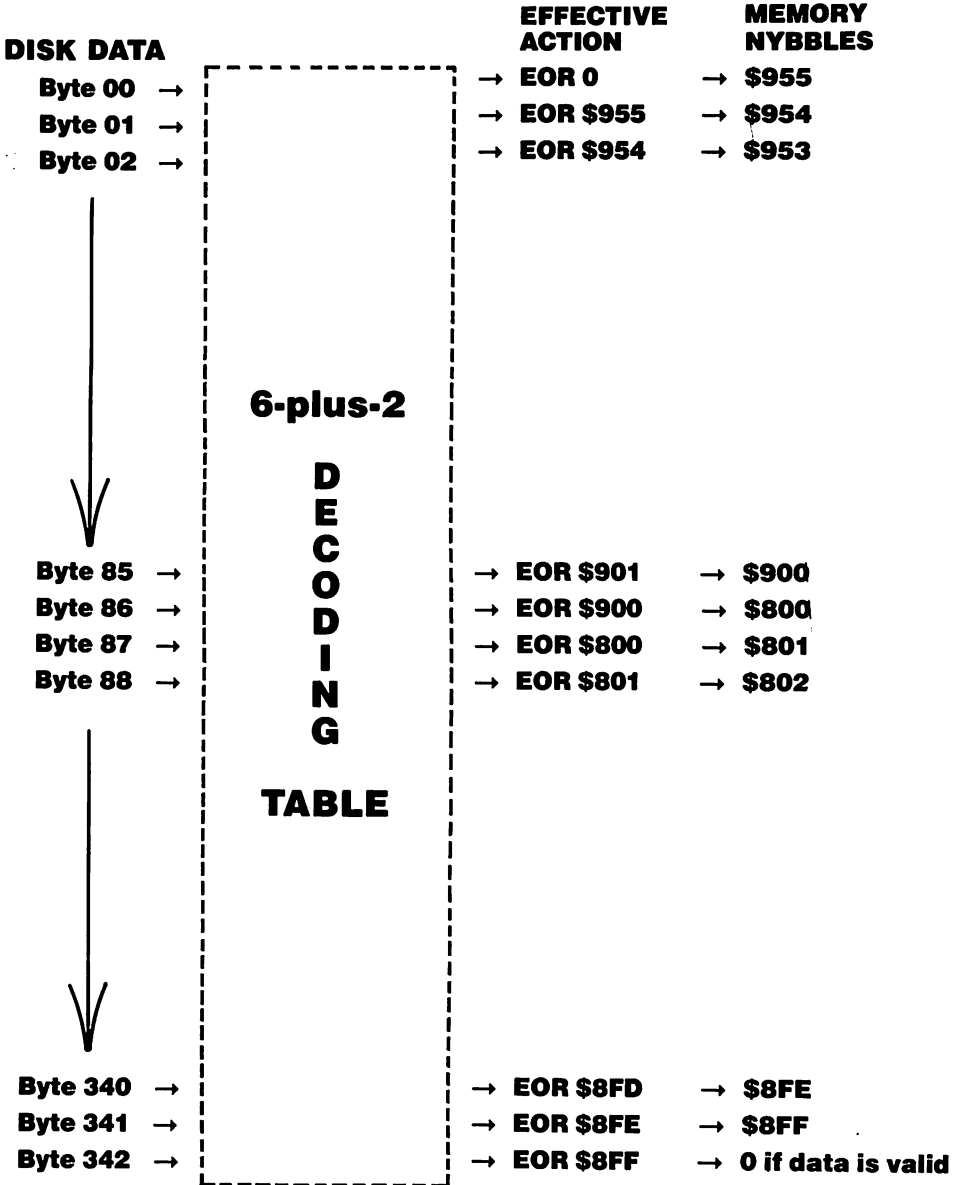


Fig. A-18: Data Decoding

```

A7A6A5A4A3A2A1A0
B7B6B5B4B3B2B1B0
C7C6C5C4C3C2C1C0
D7D6D5D4D3D2D1D0
E7E6E5E4E3E2E1E0
F7F6F5F4F3F2F1F0
    
```

```

800  0 0 A6A5A4A3A2
      0 0 B6B5B4B3B2
      0 0 C6C5C4C3C2
      0 0 D6D5D4D3D2
      0 0 E6E5E4E3E2
      0 0 F6F5F4F3F2
    
```

```

900  0 0 X X X X F0F1
      0 0 X X X X E0E1
      0 0 X X X X D0D1
      0 0 X X X X C0C1
      0 0 X X X X B0B1
956  0 0 X X X X A0A1
    
```

Fig. A-19: 6-plus-2 Encoding

A total of 342 bytes are needed, shown by finding the total number of bits ($256 \times 8 = 2048$) and dividing by the number of bits per byte ($2048 / 6 = 341.33$). The transformation from the six bit bytes to valid data bytes is also performed by a one to one mapping, illustrated in the figure below.

Again, the stream of data bytes written to the diskette are a product of exclusive-ORs, similar to the 5-plus-3 technique shown above.

Nybbalized Data = Disk Byte

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

* AA and D5 are reserved bytes.

Fig. A-20: 6-plus-2 Conversion Table

A.7. Sector Interleaving

This process involves staggering sectors on a track to improve access times. There is usually a delay between reading or writing one sector and reading or writing the next sector. This delay usually depends on the user's program and can vary greatly.

If sectors are stored in numerically ascending order, it may take a full revolution of the diskette before the next sector can be accessed (unless the application was extremely fast). Rearranging the sectors into a different order (interleaving) speeds up accessing.

On DOS 3.2.1 and earlier versions, the 13 sectors are physically interleaved on the diskette. Since DOS is booted from ascending sequential sectors and files are generally stored in descending sector order, no single interleaving technique works well for both booting and sequentially accessing a file.

To maximize performance in DOS 3.3, the interleaving is done in the software. The 16 sectors are placed on the diskette in numerically ascending order and are not physically interleaved. A table is used to translate the physical sector number into a soft sector number used by DOS.

For example, if the sector number found on a disk were a 2, this is used as an offset into a table where the number \$0B is found. Thus DOS treats the physical sector 2 as sector 11 (\$0B), presenting no problem if RWTS is used for disk access.

To eliminate access differences between reading and booting files, DOS is actually loaded backwards into memory in descending sequential order during booting, just as files are accessed. Thus, one interleaving cuts disk access time.

DOS, CP/M, and Pascal diskettes all use software interleaving though each uses a different sector order. The figure below gives the standard interleave tables for each operating system.

For the dual headed Elite Two and Three drives, the sector interleaving tables within the Rana enhanced operating systems are extended to a full 32 sectors. This is due to the fact that the enhanced operating systems treat each cylinder as a single track, with sectors 0-15 on the first side (or first true track) and sectors 16-31 on the second side (or second true track).

Due to the way in which the Rana dual headed diskette formatting utilities operate, it is not sensible to interleave sectors between the two sides of the diskette. Therefore the sectors on the first side are interleaved with themselves, and the sectors on the second side are interleaved with themselves.

Disk	DOS	CP/M	Pas.	Disk	DOS	CP/M	Pas.
00	00	00	00	16	16	16	16
01	13	03	02	17	29	29	18
02	11	06	04	18	27	22	20
03	09	09	06	19	25	25	22
04	07	12	08	20	23	28	24
05	05	15	10	21	21	31	26
06	03	02	12	22	19	18	28
07	01	05	14	23	17	21	30
08	14	08	01	24	30	24	17
09	12	11	03	25	28	27	19
10	10	14	05	26	26	30	21
11	08	01	07	27	24	17	23
12	06	04	09	28	22	20	25
13	04	07	11	29	20	23	27
14	02	10	13	30	18	26	29
15	15	13	15	31	31	29	31

Fig. A-21: Standard System Interleaves

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B. DOS TECHNICAL NOTES

This section reveals the extensions and alterations made to certain DOS calls. If you are not a machine/assembly language programmer, this section will probably make little sense to you. None of this information need be understood to use the enhanced DOS.

The information outlined in this section is proprietary to Rana Systems. It is supplied to you strictly for your own enlightenment. If you wish to make use of this information for your own private non-commercial purposes, please feel free. However, due to the fact that this information extends beyond the point of normal DOS usage, Rana Systems will not furnish any additional support concerning the information provided in this section.

This section relies upon the reader being familiar with interfacing programs to the three main segments of DOS. Information concerning these interfaces is split between two manuals: Apple's The DOS Manual and Quality Software's Beneath Apple DOS. Quality Software's manual is by far the more informative concerning machine level interfacing to the DOS File Manager and RWTS, while it leaves the explanation of the Command Interpreter's text commands to Apple's manual.

B.1. Command Interpreter Alterations

There are only two changes made to the command interpreter from the user's or program's point of view. The first is to allow the specification of a ",D3" or ",D4" parameter on commands. This allows the user to specify the third or fourth drive on an Elite Controller.

The second alteration was to "shut down" the command interpreter's INIT. This was necessary since the majority of the diskette initialization code (located in the File Manager and RWTS) could not be supported for all four drive types (three Rana Elites and one Apple Disk II).

When an INIT command is issued under an unenhanced DOS, it does three things: first, the RWTS section formats the diskette leaving all sectors empty; second, the File Manager initializes the VTOC and directory sectors and then places a slave copy of DOS onto the diskette so it can be booted; and last, the command interpreter performs a "SAVE" command to save the hello file which was in memory at the time.

Under the modified DOS, the only thing which will happen is the "SAVE". This permits the user to pre-format a diskette with the supplied FORMAT utility, and then use that diskette to fool any application program which may insist upon issuing an "INIT" command. Note that the hello file name specified when using FORMAT will not be changed should a different name be used when the "INIT" command is issued. However, the file saved by issuing the "INIT" command will be under the name specified on the "INIT" command.

B.2. File Manager Alterations

The only alteration from a program interface standpoint to the File Manager was to shut down the disk initialization function call. This was done simply by having the File Manager return back to the caller without performing the initialization. The File Manager will return a "no error" condition so that the program making the call can continue.

The File Manager was originally willing to accept a specification of drive 3 or 4 without any complaints. For the most part, the File Manager assumes that the calling program knows what it is talking about and isn't supplying invalid parameters.

B.3. RWTS Alterations

The major change to the RWTS calling interface is identical to the change made to the File Manager. When a call to initialize a

diskette is made to the RWTS, a simple "no error" return will be performed.

Apart from the ignoring of the initialize function call, RWTS also has an extension to the "no operation" function call. ("No operation" actually means that RWTS is to seek the head to the desired track and nothing else.) When a "no operation" call is made to the enhanced RWTS, and the sector number in the RWTS parameter list is set to \$FF, a "formatting error" (\$08) will be returned and the carry flag set. This is a way for the application program to determine whether or not an enhanced DOS is currently in use since a non-enhanced DOS would not care about the sector number during a "no operation" call.

The enhanced DOS will return the error condition without selecting any drives or performing any seeks. In addition, the [AY] register pair will be returned pointing to the base address of the drive configuration table located within the enhanced DOS.

The configuration table is 28 bytes long, providing a one byte entry for each of the 4 drives per 7 slots of controller cards possible. The entry at [AY]+\$00 is for slot 1 drive 1, [AY]+\$01 is for slot 1 drive 2, [AY]+\$1A is for slot 7 drive 3, and [AY]+\$1B is for slot 7 drive 4.

The high four bits (7-4) of each entry are the drive type code, the next three bits (3-1) are the seek rate code, and the low bit (0) is the single phase per cylinder flag.

```

0000 XXXX = Disk II
0001 XXXX = Elite One
0010 XXXX = Elite Two
0011 XXXX = Elite Three
XXXX 000X = Spiral Cam Seek Rate
XXXX 001X = Lead Screw Seek Rate
XXXX 010X = Band Pulley Seek Rate
XXXX XXX0 = Two Phases per Cylinder
XXXX XXX1 = One Phase per Cylinder

```

An additional piece of information can also be obtained by using the [AY] pointer returned by the enhanced DOS. That is the version number of the enhancements applied to the DOS in use. It is stored as a word at location [AY]+\$1C and [AY]+\$1D, low byte first, high byte last. The version is kept in binary coded decimal (BCD) in which the hexadecimal digits \$WXYZ would represent the version number WX.YZ. The low byte (YZ) is the minor revision number, and the high byte (WX) is the major revision number.

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C. CP/M TECHNICAL NOTES

This section reveals the extensions made to certain CP/M Z80 BIOS calls and 6502 RWTS calls. If you are not a machine/assembly language programmer, this section will probably make little sense to you. None of this information need be understood to use the enhanced CP/M.

The information outlined in this section is proprietary to Rana Systems. It is supplied to you strictly for your own enlightenment. If you wish to make use of this information for your own private non-commercial purposes, please feel free. However, due to the fact that this information extends beyond the point of normal CP/M usage, Rana Systems will not furnish any additional support concerning the information provided in this section.

This section relies upon the reader being familiar with Digital Research's CP/M 2.2 Alteration Guide. The Alteration Guide is not provided by Microsoft in the Apple II CP/M manuals primarily because the implementing of CP/M on an Apple is far more complex than for the standard Z80/8080 computers on which Digital Research's guide is based.

C.1. Z80 BIOS Call Extensions

The only BIOS call which has had extensions made to it is the SELDSK vector (BOOT+1BH). Digital Research defines that, prior to calling, the [C] register is to be loaded with the drive number (0-15=A:-P:) which is to be used for any further disk I/O calls. The remaining registers should be assumed to be in an undefined state. Upon return, [HL] must contain the address of the disk parameter header (DPH) associated with that drive provided the drive can be selected (if it exists). If the drive is not selectable, then [HL] must return containing 0000H. The remaining registers (including [C]) can be undefined upon return.

Since CP/M is an 8080 operating system, Digital Research makes no declarations concerning the Z80 [IX] and [IY] registers.

Under the enhanced CP/M the [DE], [IX], and [IY] registers will return standard values which will normally be ignored by standard CP/M software.

The [DE] register will return containing the address of DPBASE, which is the base address of the disk parameter header table as described in the Alterations Guide. Due to memory limitations, there are only eight DPH's which limits CP/M to only drives A:-H:.. This is an increase from the original Microsoft distribution system which only had space for six DPH's.

The [IX] register will return pointing to the slot number times 16 for the controller to which drive [C] is attached. The drive number of drive [C] on that controller card will be at [IX]+16. These values are within a drive mapping table described below.

The [IY] register will return pointing to drive [C]'s seek table entry. The seek table is also described below. **Important:** The seek table is located in the alternate bank of the ramcard (remember, 56K system required). The alternate bank of the ramcard will normally be mapped-out (primary bank mapped-in) whenever the BIOS is not in control of the system (since its the only one expecting an alternate bank). To access the seek tables, the alternate bank must be mapped-in and then back out while leaving the ramcard write enabled.

C.2. Drive Mapping Table

The original Apple II CP/M as distributed by Microsoft assumed that there were only two drives for every controller card it found in the Apple. This allowed the BIOS to do some quick and simple math to calculate where it could find the physical drive (slot and drive number) associate with CP/M's logical drive (A:-P:).

Since the Rana enhancements take into account any combination of Rana four-drive Elite Controllers and Apple two-drive Disk II controllers, quick and simple math was no longer possible. Replacing the simple math is a drive mapping table which is dynamically filled-in during the boot process with the physical slot and drive numbers for each of the 16 possible CP/M logical drives. (Note: The table has room for 16 drive entries, but there are only enough DPH's allocated for 8 drives.)

The cold start initialization code scans all cards in the Apple and determines which are Disk II controllers, which are Elite Controllers, and which are non-disk I/O cards. The scanning goes in reverse order from slot 7 back down to slot 1. Whenever a disk controller is found, the next two or four CP/M logical drives (depending on which controller was found) are mapped (in the mapping table) to that controller card's drives.

The mapping table consists of two parts: the slot numbers times 16 for each of the CP/M drives (A:-P:), followed by the drive number of the controller for the 16 CP/M drives. Both parts consist of single byte elements. If the SELDSK vector is called with [C] equal to 0 (drive A:), then [IX] will return pointing to drive A:'s slot*16 entry which is also the base address of the mapping table. Drive A:'s drive number of that controller card can be found at [IX]+16.

C.3. Seek Configuration Table

The seek table is what informs the 6502 RWTS disk drivers of the head movement characteristics of each drive. The table contains 16 entries, one for each CP/M logical drive. The SELDSK vector will return the [IY] register pointing to drive [C]'s entry within the table. The base of the table is drive A:'s entry, and each entry is a single byte.

Bits 7 (MSB) through 1 determine the seek speed used when seeking the drive from cylinder to cylinder. Bit 0 (LSB) is the single phase per cylinder flag bit.

```

0000 000X = Spiral Cam Seek Rate
0000 001X = Lead Screw Seek Rate
0000 010X = Band Pulley Seek Rate
XXXX XXX0 = Two Phases per Cylinder
XXXX XXX1 = One Phase per Cylinder

```

C.4. 6502 RWTS Alterations

The calling protocol is unchanged for the 6502 RWTS disk drivers. The only difference is that sector numbers from 16-31 will result in the enhanced RWTS trying to access the second head on the drive, which would only be effective for the Elite Two and Elite Three. Also, a request for drive 3 or 4 will cause the RWTS to try to access the second bank of an Elite Controller regardless of the controller card in use. This will result in reselecting drive 1 or 2 on a Disk II controller without the software really being aware of the difference.

When the RWTS attempts to determine the seek rate to use on the drive, it takes the slot*16 and drive values it was given and scans the drive map table in the BIOS to determine the logical CP/M drive being accessed. It then uses this logical drive number to index the seek configuration table. This is the reason for supplying seek configuration tables with entries for all 16 possible drives, even though CP/M itself is only supplied with 8 drives worth of DPH's.

Under normal use, the drive mapping table would not be altered dynamically by a user (transient) program; but if for some reason it is, then the program doing the altering must keep in mind how the RWTS seek drivers index the tables (as explained above).

D. APPENDIX D

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