RanaSystems

EliteSeries
User Manual

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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 WS 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 profes—sional needs have outstripped many of the early Apple designs but our cost effective improve-ments make the sophisticated Elite Series

Products less expensive to run in the comparisions which count: price per kilobyte of drive storage and expandability per controller card purchased.

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

Ta achieve the best results and the most enjoy-ment from your new Elite Product, we suggest you read this manual carefully.

We have tried to avoid including too many tech-nicalities hut,. if you feel we have gone beyond what you require, please hear with us. Like we said, we are proud of our products too!

1.   INSTALLATION

1.1.   Unpacking

During unpacking, care should be taken to ensure that all tools are nonmagnetic 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 were 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

you 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. and 1.2 for correct cable connections to the Elite and Disk If controller cards.
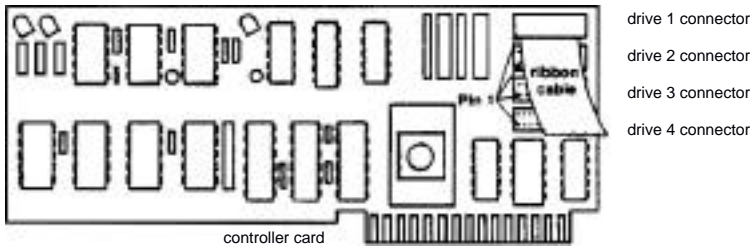
Fig. 1-1:   Elite Cont roller Cable Connections

ribbon cable

to disk drive

drive 1 connector

drive 2 connector
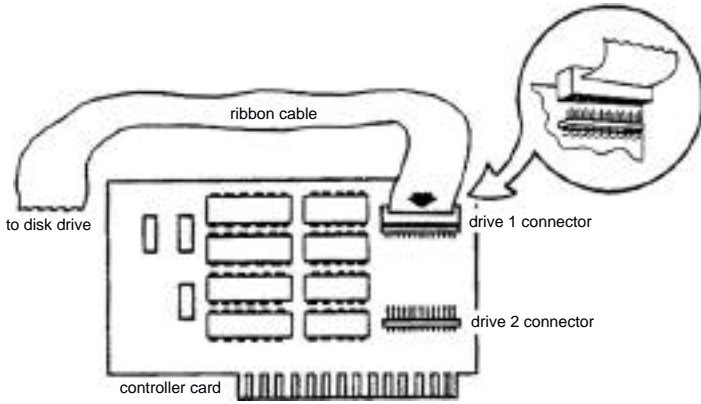
controller card

Fig. 1-2: Disk Il Cont roller Cable Connections

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2. OPERATING

If the only Elite product you currently have is the Elite Controller, then this section probably won't be off must 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 dis-
pute 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 Mainte—nance.

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

```
                     Hard Sec.    Hard Sec.
        Soft Sec.    16 Sec.      10 Sec.
        Dbl. Dens.   Dbl. Dens.   Dbl. Dens.
        Sgl. Sided   Sgl. Sided   Sgl. Sided


Dysan
  Part Nbr.    104/1D      107/1D       105/1D
  Ord. Nbr.    801787      801014       807188

 Maxell
  Part Nbr.    MD1-M      MH1—10M     MD1—16M
  Maxell does not use independent order numbers.

Verbatim
  Part Nbr.  MD525-0l   MD525-10     MD525-16
  Ord. Nbr.    18158      18167        18176
```

Recommended Diskettes **for the** *Elite Two*

```
                    Hard Sec.    Hard Sec.
        Soft Sec.   16 Sec.      10 Sec.
        Dbl. Dens.  Dbl. Dens.   Dbl. Dens.
        Sgl. Sided  Sgl. Sided   Sgl. Sided

Dysan
  Part Nbr.    104/1D      107/1D       105/1D
  Ord. Nbr.    802060      802062       802061

 Maxell
  Part Nbr.    MD1-DM     MH1—10DM    MD1—16DM
  Maxell does not use independent order numbers.

Verbatim
  Part Nbr.  MD550-0l    MD550-10    MD550-16
  Ord. Nbr.    18188       18197        18106
```

Diskettes for the Elite Three

```
                       Hard Sec.    Hard Sec.
         Soft Sec.     16 Sec.      10 Sec.
         Dbl. Dens.    Dbl. Dens.   Dbl. Dens.
         Sgl. Sided    Sgl. Sided   Sgl. Sided

Dysan
 Part Nbr.    204/1D       207/1D       205/1D
 Ord. Nbr.    802067       800455       802066

 Maxell
  Part Nbr.   MD2-DM        ----         ---
  Maxell does not use independent order numbers.

Verbatim
  Part Nbr.  MD557-0l    MD557-10     MD557-16
  Ord. Nbr.    18239       18248        18257
```

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 LI drives. The seek rate can also be
increased by the PROFILE program to take advant-
age 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 initial-
ize 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 br 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 addi-
tion, 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 dis-
tribution 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 ina DOS format, allow-
ing 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 addi-
tional DOS system diskettes that utilize the
desired Rana features, but don't have all the
DOS utilities and demonstration programs occupy-
ing 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 con-
tained in a later section of this manual. Since
the time required to perform the following en-
hancement 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 ap-
proach 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 instruc—
tions 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 in-
structions 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 "digup" 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 prob-
ably rearrange your system into this configura-
tion for the duration of the enhancing proced-
ure.

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, hut it will make things easier when following these instructions.) Drive one off of slot six will be referred to as your system, or hoot 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 "some-thing" should he:

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, &, $, etc.), the key label will be enclosed in angle brackets. For example, <RETURN> indicates that the "RETURN" key should be pressed. Some special characters require that one, key he held down while another is pressed. For example, <CTRL-P> means to hold down the <CTRL> key while pressing the 'P' key. This is just like holding down the <SHIFT> key in order to type "$".

After the "6<CTRL—P><RETURN>" sequence is typed on a non-autostart 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 "]" 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, alot 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 ("]" 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:

to see more of the list. If MASTER CREATE is
not on the diskette, you are not using an ori-
ginal Apple DOS 3.3 distribution diskette (or an
exact copy af 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 off 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 an making an Elite Three your system
(boot) drive, then you will also need two addi-
tional diskettes for later. If you plan on
using diskettes which already contain some in—
formation, remember that all that existing in—
formation 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 WS 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 he 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 pro-
gram 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 HELW<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 disk-
ette, 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   our new disk-
ette.

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 1.

    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 fin-
ished.

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 course, 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 Sys-tems 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 la-
belled "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 disk-
ette. 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 hack 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 he 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 instruc—

tions 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 "con-
figured 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> WREN 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 con-
taining 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 if 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 set-
ting 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 (O=DISK -II). If you just
hit <RETURN> (don't!), PROFILE will not change
the setting. But, you want to change the set-
ting (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 spec-
ified 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 (with-
out <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
     0) TERMINATE PROFILE

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

    0

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 con-
figured diskette probably won't boot correctly.
Following the termination message, the BASIC
prompt will appear.

The reason why this newly configured DOS prob-
ably 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 En-
hancer 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 config—
tired 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 (760 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 com-
mand 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 he
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:

    INVOICE 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 TN 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 disk-
ette 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 (with-
Out <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 pro-grams 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 diskette. 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 he 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 ques-
tions. Now for the destination ones:

    DESTINATION:
    SLOT NUMBER (1—7)? 6

The default is okay, so press (Elite Three on-
ly):

    <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 <u>destination</u> 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 <u>correctly</u> 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 being 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 response from you. When finished, the new
modified FID will he saved onto the diskette as
FIDR. FIDR should always he used with the high-
er 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 re-
turned 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 ca-
pacity system master.

To do this, type:

```
    BRUN FIDR<RETURN>
```

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

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

```
     1<RETURN>
```

FIDR will then ask for the source and destina-
tion 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 cop-
ied, or "no" you don't want it copied.

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

    HELLO
    APPLESOFT
    BOOT 13
    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 destin-
ation 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 alot 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 he gin 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 mas-
ter" 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 if 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 ad-dressing any combination of Apple Disk II 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 If drives. The seek rate may also be increased by the PROFILE program to take advan-tage of the increased speed of Rana drives. If the disk is run on another Apple the enhanced CP/M will automatically recognize which control-lers are Rana and which are Disk If 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 If 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 in-structions 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 he modified to support the Elite Series products without steal-ing space from the user's memory area, because Rana used a little "hidden~ section of memory in the 16K RuM/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 if 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 he a controller card in slot six, and any additional controller cards must he in slot five, etc. Although CP/M as an operating system recognizes drives A: through P:, Microsoft's Apple if version of CP/M has a necessary limitation of only supporting up to six drives (A: through F:). The enhanced ver-sion of Apple if CP/M will support up to eight drives (A: through H:). This allows all drives on two four-drive Elite Controllers to he used. (Of course, four two-drive Disk if controllers could also be used; or any combination totaling no more than eight drives.)

On both enhanced and non-enhanced CP/M, drives A: and B: would he drives one and two on which-ever 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 hooted, 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 It 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 control—lers 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 hooted from a CP/M master. The Rana Elite Enhancements Disk will he used to create a new enhanced CP/M master diskette. The system tracks from this diskette can then he used to create any number of additional CP/M system diskettes that utilize the desired Rana fea-

tures, 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 ap-
proach to creating an enhanced CP/M for any
valid combination of Elite drives, Elite Con-
trollers, Disk 1! drives, and Disk][control-
lers which any user can possibly dream up. This
places upon these instructions an almost impos-
sible task, considering the vivid imagination of
many users. Since the use of only a single
drive complicates the instructions by a con-
siderable 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. AU of these instruc-
tions 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. <u>You</u> <u>are</u> <u>encouraged</u> <u>to</u> <u>read</u> <u>these</u> <u>in—</u>
<u>structions</u> <u>completely,</u> <u>all</u> <u>the</u> <u>way</u> <u>through,</u>
<u>before</u> <u>starting</u> <u>the</u> <u>procedure</u>. 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 ter-
ribly 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 sys-
tem in a different configuration than what will
be your final configuration. A temporary prob-
lem 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 follow-
ing 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 he 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 hit and then sit there quietly spinning waiting for a diskette. If you have an old Apple, you may not have the Auto-start 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 instruc—tions will show the key enclosed in angle brackets (RETURN>) to indicate that the single key with that label is to be pressed, and <u>not</u> 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 1!) 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 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. 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 <u>read</u> 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 format-
ting an Elite Two or Three diskette (higher
capacity) you should check the Recommended Disk-
ettes 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 sup-
posed 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 disk-
ettes) 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 disk-
ette. 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 off drive A: so you could insert the blank disk to be format-ted. 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 (NA>) should then ap-pear.

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 E: It won't
matter what type of drive is where, it'll all
come out okay if one of the temporary con figura-
tions 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:; re-
peating this process until the entire diskette
is copied. Once COPY has finished, it will
display:

    COPY Complete

    DD 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:

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 II 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~T 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 II 56K CP/M BIOS
Copyright (C)(P) 1982 RANA Systems
Version 1. 7

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 Programs.) 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 CF/N user, the "[" character is produced

by typing <CTRL—K>, and the "]" character is
produced by typing <SHIFT-M>. The Apple key-
board is not marked with (at least one of) these
characters. If you are using a special keyboard
modification or 80-column board, you will prob-
ably 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 if 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:.
FOR MAT cannot always catch that the drive was
unable to handle the type of format you request-
ed. The disk will appear to be correctly for-
matted 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 informa-
tion, 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 slot 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 ear-
lier 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 cor-
rectly and received the response which would be
correct for whichever type of drive you have as
drive B:, simply press:

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

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

     <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 he slightly different. Type:

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

Just like with the first time you used Micro- soft's COPY, this command tells COPY to copy information from drive A: to drive B:; hut 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 rein-sert 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 H. In fact, that copy of CP/M thinks that all drives on your system are Disk If 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 Cc). (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:=*<RETURN>

This tells PROFILE to go Look at the drive
configuration table contained within the en-
hanced 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 0:) 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—
if. 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 II 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 current-
ly 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 Ap-

ple) 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 didl), 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:

and PROFILE will write out the new configura-
tion.

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 he doing a whole hunch of files,
it will display the name of each file as it is
copied. PIP must he 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 he written to the diskette ac-
cording 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 he completed. De-
fining the remainder of your drives within the
CP/M system so that they are treated as they
should he. Since this falls under PROFILE's
domain, bring it hack 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, preceeded by:

For example, if you have an Elite Two as drive B:, a Disk if as drive C:, an Elite One as drive D:, and another Disk if 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 capa-

city (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 fol-
lowing:

```
      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/track is correct.
When Apple talks about 16 sectors/track, they
are refering to a "sector" which contains 256
bytes. When CP/M refers to a "sector", it is
refering 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 iden—
tical 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 ap-
proach to creating an enhanced CP/M for any
valid combination of Elite drives, Elite Con-
trollers, Disk if drives, and Disk if control-
lers which any user can possibly dream up. This
places upon these instructions an almost impos-
sible 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 pre-
ceeding 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 instruc-
tions 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. <u>You</u> <u>are</u> <u>encouraged</u> to <u>read</u> <u>these</u> <u>in—</u>
<u>structions</u> <u>completely,</u> <u>all</u> <u>the</u> <u>way</u> <u>through,</u>
<u>before</u> <u>starting</u> <u>the</u> <u>procedure</u>. 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 ter-
ribly complex to follow.

In order to use Microsoft Apple If 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 Auto—
start 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][key-
hoard which are not just a single character
(i.e. RETURN, CTRL, ESC, etc.) these instruc-
tions will show the key enclOsed in angle brack-
ets (<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 press-
ed.

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 <u>is</u> in slot
six, then there <u>may</u> 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 Micro-
soft. (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 resist-
ance, 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 copy-
right 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/H 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 <u>read</u> standard Apple diskettes.) This little exercise shows that the enhancer diskette should he 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 CF/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 <u>read</u> 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 format-
ted. Fallow 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 ap-
pear.

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 MISTER 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 disk-ette, 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:
    flit 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 Rena Enhancement utility will now change the CP/M operating system to utilize the features of the Rena 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 Us Apple ][ 56K CP/M BIOS
Copyright (C)(P) 7982 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 ad-
vanced 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 sys-
tem.

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 in-
cludes 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) 7982 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 "resi-
dent" 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 (other-
wise you wouldn't he running SGLDRIVE), this
section of the operating system can he 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:

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 disk-ette. Once you've changed the diskettes, press:

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:

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-
N>. 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 he 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 informa-tion, 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 ear-lier 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 cor-
rectly 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 he 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 It. 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. tAle 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 :/5<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:

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:

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 re-
insert 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 disk-
ette, 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 informa-tion 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 con-
figuration 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 aster-isk ("*") 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 "MA>" 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 capa-city 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 <u>alot</u> 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" re-
quests 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 <u>alot</u> 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 <u>impossible</u>. 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 capa-
city (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 It 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/track is correct.
When Apple talks about 16 sectors/track, they
are refering to a "sector which contains 256
bytes. When CP/M refers to a sector, it is
refering 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 iden-
tical 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.

5. SECTION 5

This section has been intentionally omitted.

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6. SPECIFICATIONS

6.1. Introduction

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

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

```
Capacity                      163K Bytes
Track to Track Access Tune    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
  M72TR                       .5   Hours
  Design Life                 5    Years
Soft Error Rate               1 in lOe+09 Bits
Hard Error Rate               1 in lOe#12 Bits
Seek Error Rate               1 in lOe#06 Steps
Media                         ANSI Std. 5.25" Disk
Interface                     Disk II Compatible
Average Latency               lOOms
Motor Start Time              O.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
Non operating Temp.        -40F - 160F
Operating Humidity         20% - 80% (nancond.)
Nonoperating Humidity      5% - 95% (noncond.)
Max Wet Bulb               85F
```

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

Specifications are approximations based on in-
dustry 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 l0e+09 Bits
Hard Error Rate               1 in 10e+12 Bits
Seek Error Rate               1 in l0e+06 Steps
Media                         ANSI Std. 5.25 Disk
Interface                     Disk II Compatible
Average Latency               l00ms
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% (non cond.)
Max Wet Bulb              85F
```

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

Specifications are approximations based on in-
dustry 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         l50ms
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 lOe+06 Steps
Media                       ANSI Std. 5.25″ Disk
Interface                   Disk II Compatible
Average Latency             lOOms
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 in-
dustry 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
Non operating Temp.         -40F - 160F
Operating Humidity          20% - 80% (noncond.)
Non operating Humidity      5% — 95% (noncond.)
Max Wet Bulb                85F
```

Fig. 6-7: Elite Controller Characteristics

Specifications are approximations based on in-
dustry 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.
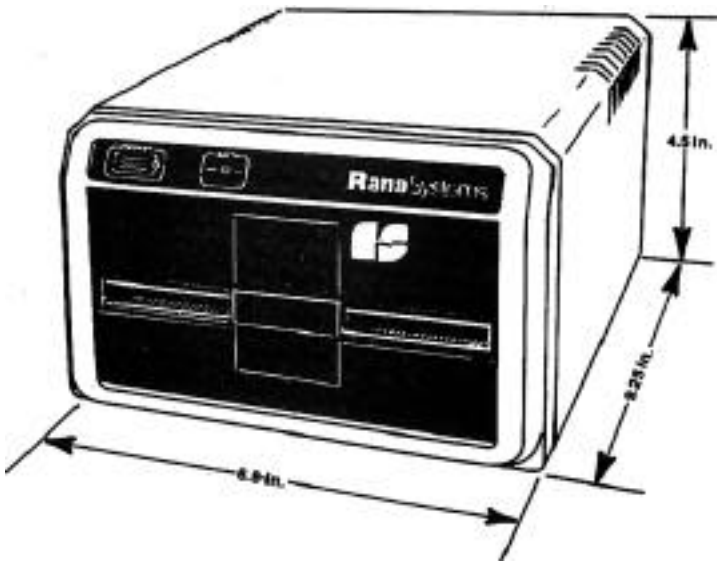
Fig. 6-8: Physical Dimensions of Elite Drives
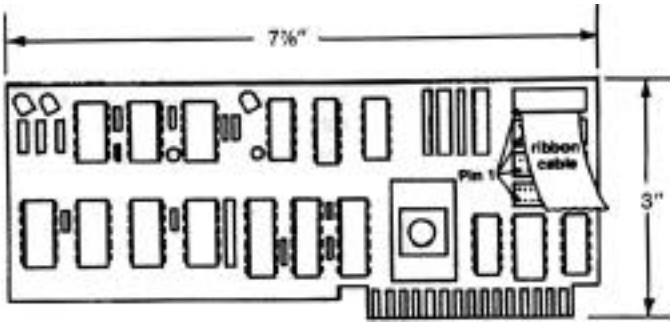
Fig. 6-9: Elite Controller Physical Dimensions

6.3 Controller to Drive Interface

Pin Number   Signal (originates)

        1   Ground
        2   + Stepper Motor Phase A (ctlr)
        3   Ground
        4   + Stepper Motor Phase B (ctlr)
        5   Ground
        6   + Stepper Motor Phase C (ctlr)
        7   Ground
        8   + Stepper Motor Phase D (ctlr)
        9   Not Connected
       10   - Activate Writing (ctlr)
       11   +5v
       12   +5v
       13   +12V
       14   — Select Drive (ctlr)
       15   +12V
       16   +/— Read Data (drive)
       17   +12V
       18   +/— Write Date (ctlr)
       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 preceding 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

AU 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 off the input/output signals passing between the drives and the controller are wire -0Red 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 deselecting 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 with-
out 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 power-
ed-up at any one time (an Apple II power supply
consideration). (The same consideration is
necessary when another device, such as Apple's
Silentype 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 se-
quence. Each phase is activated/deactivated in
direct response to the stepper motor p~ase con-
trol interface signals being set logically
high/low respectively. If the stepper motor
phases are activated then deactivated in ascend-
ing 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 be-
tween activation and deactivation of these sig-
nals 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 control-
ler 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 cur-
rent flowing through the (selected) read/write
head. A logical high level on this line will
cause the (selected) read/write head to magnet—

ize 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 with-
in 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 in-
stalled 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 specifica-
tions and their interface pin designators are
given in various tables earlier in this section.

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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).

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7.1.2.Read/Write/Control Logic

The electronics are packaged on one PCB which contains:

   7. 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 off two mecha-
nisms discussed below. The Apple system software
increments the stepper motor to the desired
track by directly signalling the drive electron-
ics 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
"halftrack" (full track for Elite Three) posi-
tion. It 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. Slack-
ness in the band or the motion of the mechanism

is highly unlikely as the system is pre—ten—
sioned (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 sta-
tionary 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 "Dl" 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-sect or 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 per-ipheral 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, $AOO, 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 buffer-ing, using a bi-directional bus driver, which pro vides more drive than other controllers yet requires very little drive from the bus. Exten-sive power switching reduces the power consump-tion 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)

Slot	Memory Address for EPROM
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 RCA 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 RON 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 RCA space
($C800-$CFFF) is a convention maintained by
nearly all of the hardware and software develop-
ers.

The partitioning of the EPROM is performed by
u16 (7418257) and selection of the expansion
portion is done by U7 (74L574) and U16
(74LS257). Decoding of the off instruction is
performed by U15 (74LS30). A synchronous ap-
proach 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 count-
er) 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 oper—
ating mode of the controller including the se-
lected 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 periph-
eral 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 when-
ever 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 convert-
er 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	$C0L0-$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 Selec±         $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 hits 0 and 1 determine the mode off the
controller:

```
    Controller Mode            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 con-
troller '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.

```
                         Address to Write
       Drives Selected   (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 implement-
ed with a timer circuit that pulls the reset
line down in a "wire—or" fashion. After approxi—
mately 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 Decoupiing

All power supplies to the controller are bypass-
ed 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 di-
rectly 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 writ-
ten operating system to DOS—independent utility
programs. Tbe 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 i in slot #6, add
$60 to $C08A (device address assignment for
engaging drive 1) for a result of $C0BA. How-
ever, 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 com-
mand. 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

$C0B0       PHSOOF        Stepper Phase 0 Off
$C081       PHSOON        Stepper Phase 0 On
$C082       PBSlOF        Stepper Phase 1 Off
$C083       PHS1ON        Stepper Phase 1 On
$C084       PHS2OF        Stepper Phase 2 Off
$C084       PHS2ON        Stepper Phase 2 On
$C085       PHS3OF        Stepper Phase 3 Off
$C086       PHS3ON        Stepper Phase 3 On
$C086       PHS4OF        Stepper Phase 4 Off
$C087       PHS4ON        Stepper Phase 4 On
$C088       MTROFF        Turn Motor Off
$C089       MTRON         Turn Motor On
$C08A       DRVOEN        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
       Q7N after QEL  = Write
       Q7H after Q6M  = 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 ann 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 al-ready 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 re-turning.

```
            LDA     #DSTTRK
            ASL     A
            STA     TEMP1
            LDA     #SRCTRK
            ASL     A
LOOP:
            CMP     TEMP 1
            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 $Cn00 address
    LSR             to access controller
    LSR             slot dependent PROM.
    LSR
    ORA  #$CO
    STA  ZPAGE+ 1
    LDY  #$OO
    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  $CO8C,X
              BPL  READ
```

NOTE: $CO8E,X must already have been accessed to
assure Read mode. The loop is necessary to as—
sure 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 fol-
lowing 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.

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8. USER LEVEL MAINTENANCE

The Elite Controller card has no moving or elec-
trically adjustable parts, so there is no regu-
lar 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 align-
ment 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 <u>absolutely</u> sure that the second (upper) surface of the cleaning diskette is <u>covered</u>. 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 <u>very quickly</u> wear away if "scrubbed" by a cleaning diskette. Also, make <u>absolutely</u> 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. It' your dealer is not an authorized Rana service center, then give Rana a call directly for information on the regional service depot nearest you. <u>Correct</u> 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 <u>do</u> <u>not</u> touch the recording surface. Touch them <u>only</u> on the plastic jacket.

2. After you have finished using a diskette <u>do</u> 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 <u>do</u> <u>not</u> use a hard pen, such as a ball point. Use a soft felt tip if the label is already the cover. If you are replacing an ID label, write it out <u>first</u>, 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. <u>Do</u> <u>not</u> fold or bend diskettes. Handle them carefully so they will always keep their shape and make firm contact with the read/write head.

7. <u>Do</u> <u>not</u> use erasers on the ID label. Debris

can easily attach itself to the diskette surface causing loss of data.

8. Always load the diskette <u>gently</u> into the disk drive so it doesn't bend or center improperly. That causes the diskette to rotate eliptically, missing data.

9. Always place the XD 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. <u>Do</u> <u>not</u> 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 disk-
ette 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
<u>protected</u>.

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.
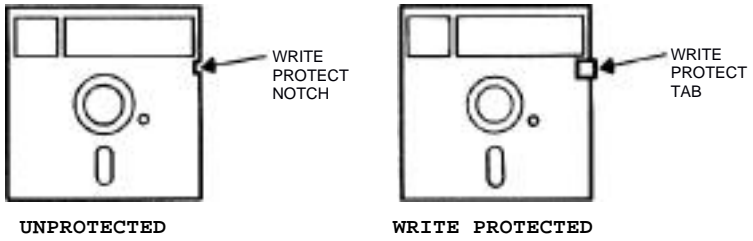
Fig. 8-1: Write Protecting Diskettes

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 informa-tion, sector—by-sector, onto the duplicate (destination) diskette. The enhanced CLONE pro-vides 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 disk-
ettes can he 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 var-
ious modifications that need to be made to Ap-
ple'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 re-
place 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 "others 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 de-
fined (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 per-
form 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 parti-
cular way, it can be used in any drive which
also has "yes" in the above table for the parti-
cular 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 he treated.

If the format type is to he 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
nunber 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 in 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 its unlike-
ly 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 76—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 respone <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 off 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 as 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 you answer. To do this,
simply type <ESC> in response to any question an
you will be returned to the previous question.
You can then press <RSC> 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
he 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 re-
stricted by what the drives being used are phys-
ically 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 <u>read</u> 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 <u>not</u> 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 <u>not write</u> 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 WS 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 destina- tion 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 disk-
ette 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 instruc-
tions 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, hut 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 dest-
ination 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
being 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 being 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 he changed be defined (in
the currently hooted 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 neces-
sarily 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
manages 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 lo-
cated on your system, and also allows you to
declare the drive as a different model (an Elite
Two as a Disk TI, 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 auto-
matic.

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 WADED?

    ENTER SLOT NUMBER (7-7)

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 led 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> WREN 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 fol-
lows:

     DISK2 = Apple Disk II
     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 II 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 2V 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 b~ 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 fox- 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 he 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)
  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 he 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>
    WREN 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 paint 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 he 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 in-
structions 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 informa-tion, sector—by—sector, onto the duplicate (tar-get) diskette. The enhanced COPY provides the capability of duplicating all the various dif-ferent 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 per-
manent) 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 distri-
buted by Microsoft in order for the system to
use the extra features of the Elite Series pro-
ducts.

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 permissable to select none.

!   The exclamation point is used to sep-
      arate 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 re-
place the original FORMAT utility supplied by
Microsoft. The new utility is capable of for-
matting 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 util-
ity 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:

```
    O = 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 <u>not</u>
format diskettes for the higher capacity drives,
but the higher capacity drives can format disk-
ettes for the smaller capacity drives. The
exception which makes this rule true is the
Elite Three.

Since the Elite Three achieves its 652K of stor-
age 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 disk-
ettes 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 de-

fined under CP/M and what type of already for-
matted 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 circum-
stances 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
he 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 sys-tem diskette is back in drive A: and then just answer the question with <RETURN>.

If you used drive A: anytime during your format-ting, 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 <u>not</u> place a copy of <u>any</u> operating system onto the newly formatted disk-ette. This means that the diskette will <u>not</u> 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 Tran-sient 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.

Alot 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 II 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 he the same drive.

If you specify the "/S" option at the end of the command, the you will he 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 he 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 he dealing.

When performing a full diskette copy, three variables influence the type of diskettes which can he copied, what type of drives can he 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 <u>cannot</u> 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 as 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). There-fore, 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 condi-
tions. In the Elite Three "explained" case (1),
the target diskette must be formatted in an
Elite Three format. In the Elite Three "ex-
plained" 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 format-
ted 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 any 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 SCLDRIVE 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 com—mand.

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 who's 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 configura-tion 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.
AABCCCCCCCCCCCCCCCCCCCDDDDDDDDDDDDD
```

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 "med-
ium" (,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 abso-
lutely no changes to any copies on any disk-
ettes. This would be a temporary change, only
lasting until the system is completely rebooted.

The first change is to make drive C: 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 he 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 up-dated/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 hooted 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 cop-
ied, then you will need to use PROFILE to change
drive A:'s setting in the Elite Two system disk-
ette to an Elite Two. Otherwise the diskette
will begin to boot, but end up crashing. The
same is true for other changes in booting struc-
tures.

Whenever PROFILE has to read and write a disk-
ette 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 ex-
pects 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 temp-
orarily change the setting of a drive which is
capable off 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 capaci-
ty 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 config-
ured:

        *<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 on 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 com-
mand 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 he 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 over-ly friendly to them CP/M was not really de-signed 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 pare 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 func-tion (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 de-stroying 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 be-

tween 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 re-ferred 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/pro-gram 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, <u>you</u> <u>cannot</u> <u>freely</u> <u>exchange</u> <u>which</u> <u>diskettes</u> <u>you</u> <u>are</u> <u>using</u> <u>as</u> <u>the</u> <u>"drive A:"</u> <u>diskette</u> <u>and</u> <u>the</u> <u>"drive</u> <u>B:"</u> <u>diskette</u>. 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 vs single
drive problem, but with the possibility of help-
ing 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 out-
lined 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.

11. SECTION 11

This section has been intentionally omitted.

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ACKNOWLEDGMENT

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 <u>successfully</u>
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 lan-
guage).

This appendix will, in fact, continue this slop-
py 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 ann 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 disk-
ette and Apple has used two different track
formats to date. One divides the track into 13
sectors, the other into 16 sectors. The sect or—
ing does not use the index hole(s) provided on
most diskettes to locate the first sector of the
track. In stead DOS uses an extended "soft sec-
toring" 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
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 version 3.3.
enhanced DOS

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 enbanced 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 he 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 he detected.

This appendix will not attempt to explain the OCR recording technique in the brief explanation of data recording which preceeds the software discussion. Instead, the "frequency modulated" recording technique (FM) will he 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 signifi— cant 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 illus- trates 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".

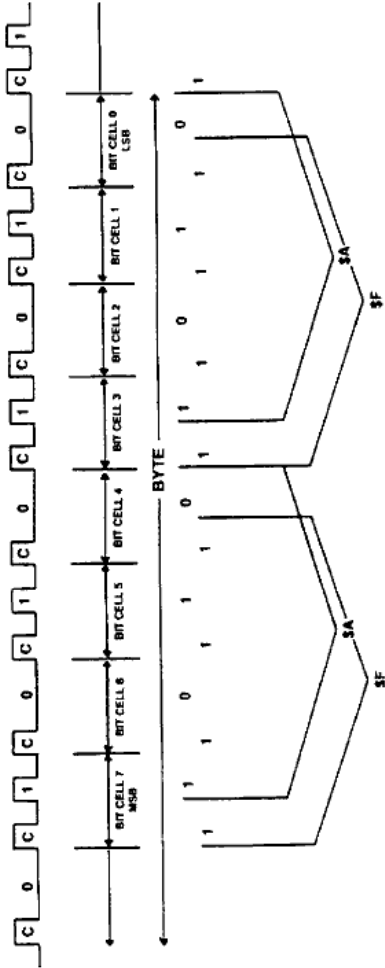The final figure shows the three bits, 101, being transferred from the data stream into the data latch.

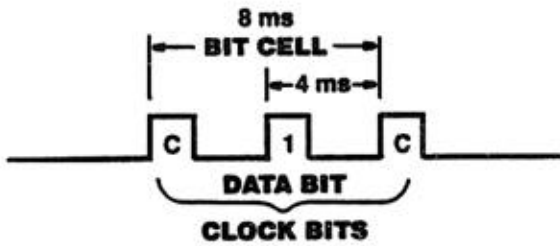**Fig. A-I: FM Recording Pattern**

Fig. A-2: FM Bit Cell
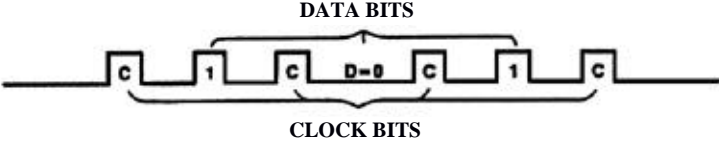
DATA BITS

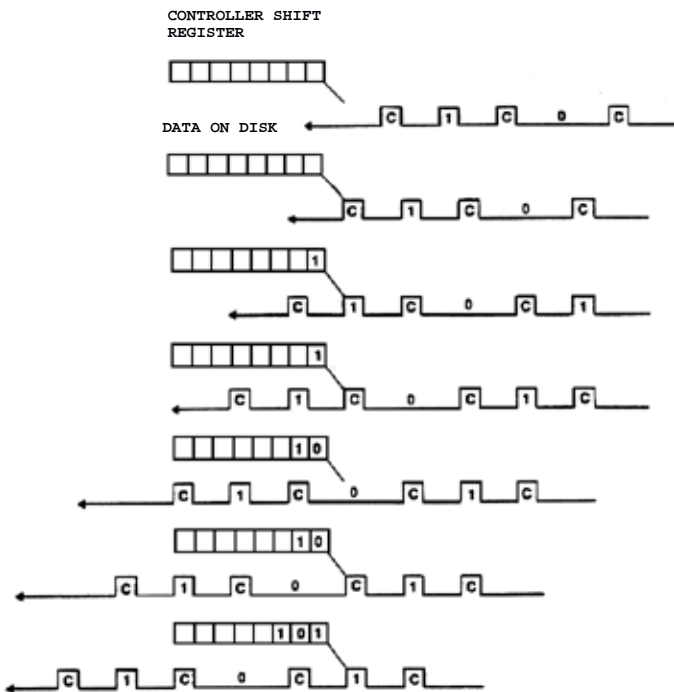**CLOCK BITS**

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 inter-leaved 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 (ex-plained later) are created.
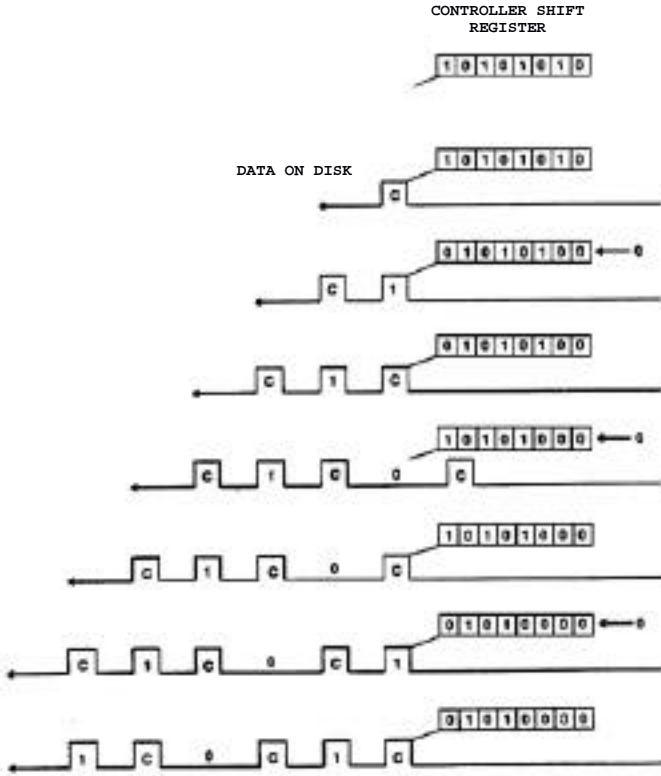
Fig. A-5: Writing Data

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 compo-rients.

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 disk—ette.

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.
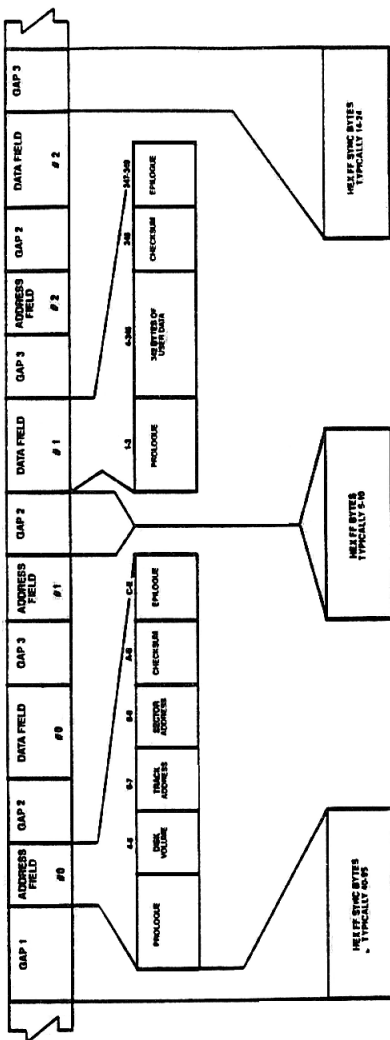
Fig. A-6: Track Fomatting

Normal Byte Hex FF   Self-Sync Byte Hex FT

  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 overlap-
ping itself.

A minimum of five self-sync bytes must be main-
tained for each gap type, resulting in reason-
ably 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 en-
sure 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 uncer—
tam 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, provid-
ing 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 ini—
tiated.

If the gap is too short, the start of the Data
field could spin past while DOS was still won-
dering if this was the sector to be read.

When a data field is written there is na guaran-
tee 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
INITed, 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
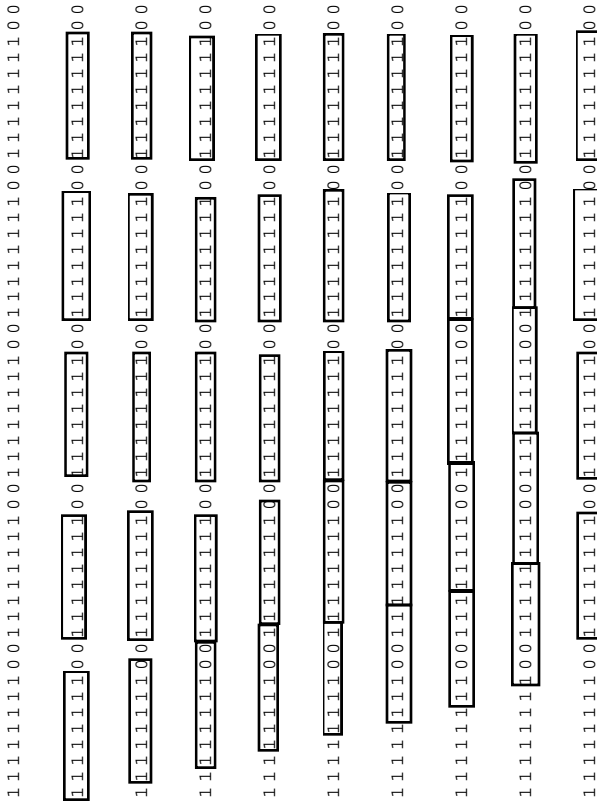read—synchronization, as demonstrated in the
figure below:

Fig. A-8: Read Syncronizing

Probably, at least one sync byte will be des-
troyed 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 ex-
isting 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 de-
tailed illustration of its components.

initially

write begins here

After Writing
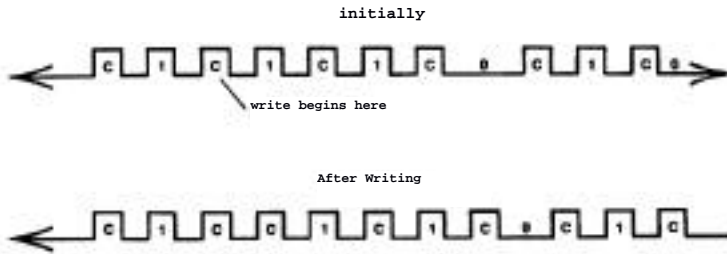
Fig. A-9: Unsyncronized Write
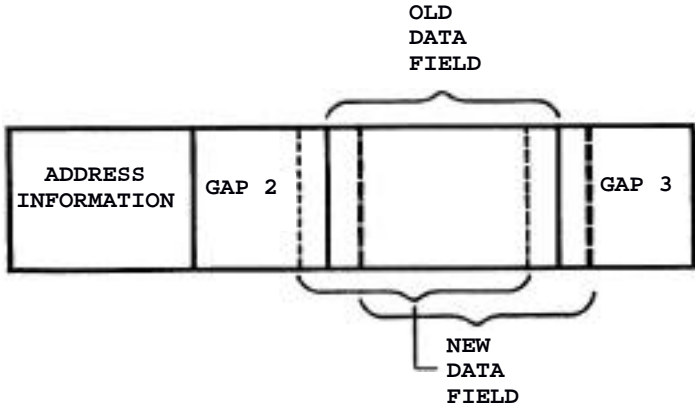
Fig. A-10: Data Field Shifting

D5 AA 96	XX YY	XX YY	XX YY	XX YY	DE AA EB
Prologue	Volume	Track	Sector	Checksum	Epilpgue

4-plus-4 ENCODED

```
DATA BYTE-  D  D  D  D  D  D  D  D
            7  6  5  4  3  2  1  0

      XX-  1 D 1 D 1 D 1 D
            7    5    3    1

      YY-  1 D 1 D 1 D 1 D
            6    4    2    0
```
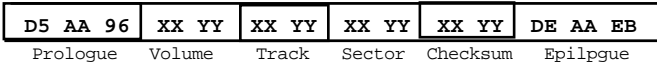
Fig. A-11: Address Field

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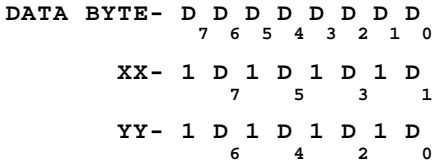 ensuring the uniqueness of the prologue while the $96 indicates that the data following is an address field rather than a data field.

The address information follows next, comprising volume, track, and sector numbers, and a check-sum, 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.
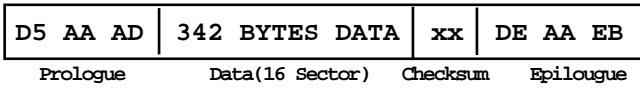
D5 AA AD	342 BYTES DATA	xx	DE AA EB
Prologue	Data(16 Sector)	Checksum	Epilougue

Fig. A-12: Data Field

The prologue differs in the third byte. The bytes are $D5, $AA and $AD also forming an 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 7/4K 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 permit-
ting 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 for-
mat. 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 re-
quirement 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 repre-
sented 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 developed, so named
because it splits the bytes into five bits plus
three bits and not in half as with the above.

```
                              ON DISK
                        ┌─┬─┬─┬─┬─┬─┬─┬─┐
                        │1│D│1│D│1│D│1│D│
    IN MEMORY           │ │7│ │5│ │3│ │1│
┌─┬─┬─┬─┬─┬─┬─┬─┐       └─┴─┴─┴─┴─┴─┴─┴─┘
│D│D│D│D│D│D│D│D│
│7│6│5│4│3│2│1│0│       ┌─┬─┬─┬─┬─┬─┬─┬─┐
└─┴─┴─┴─┴─┴─┴─┴─┘       │1│D│1│D│1│D│1│D│
                        │ │6│ │4│ │2│ │0│
                        └─┴─┴─┴─┴─┴─┴─┴─┘
```

```
            Fig. A-13: 4-plus-4 Encoding
```

D	1	D	1	D	1	D	1
7		5		3		1	

SHIFT LEFT

1	D	1	D	1	D	1	D
	6		4		2		0

D	D	D	D	D	D	D	D
7	6	5	4	3	2	1	0

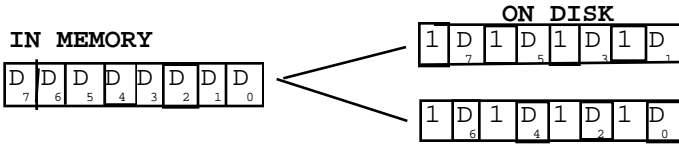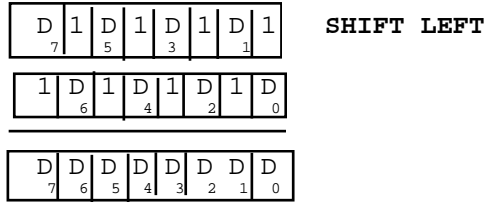**Fig. A-14: 4—plus-4 Decoding**

A byte would have the form OOOXXXXX 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 al—lowing 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 "pre—nibble" 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.

Fig. A-15: 5-plus-3 Encodng

A total of 410 bytes is necessary to store the
original 256. This is calculated by finding the
total bits of data (256 x 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.

                Nybblized 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
           0S = 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 great-er number of valid bytes and permits the use of a 6-plus—2 technique.

A six bit byte would have the form OOXXXXXX 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 prenibble routine with the results shown in the last figure.
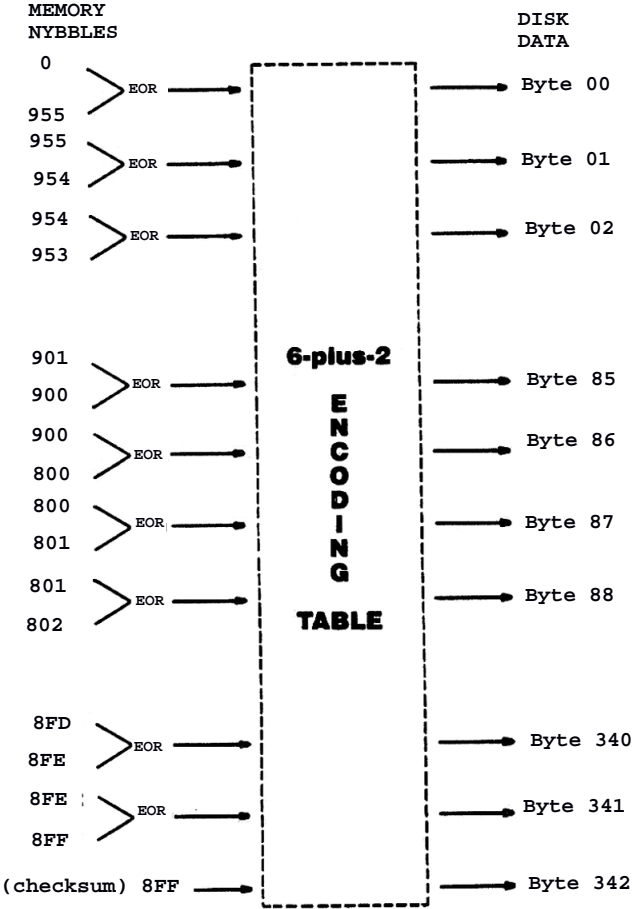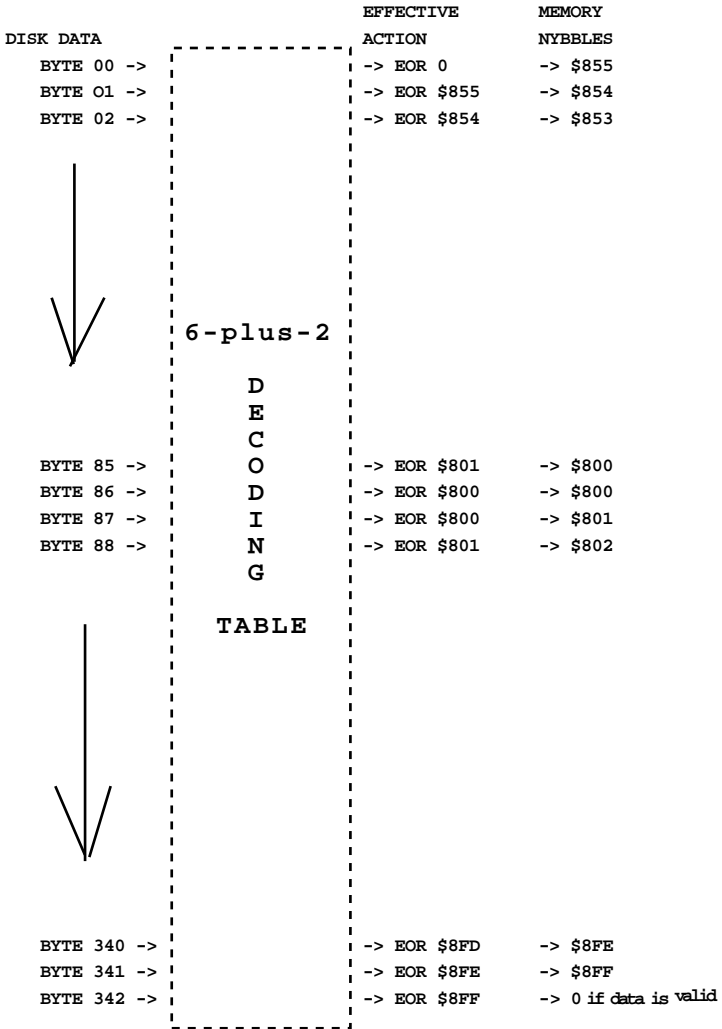
Fig. A-17: Data Encoding

```
                              EFFECTIVE        MEMORY
                              ACTION           NYBBLES
   DISK DATA
      BYTE 00 ->              -> EOR 0          -> $855
      BYTE O1 ->              -> EOR $855       -> $854
      BYTE 02 ->              -> EOR $854       -> $853



            |                6-plus-2
            |
            |                    D
            V                    E
                                 C
      BYTE 85 ->                 O   -> EOR $801       -> $800
      BYTE 86 ->                 D   -> EOR $800       -> $800
      BYTE 87 ->                 I   -> EOR $800       -> $801
      BYTE 88 ->                 N   -> EOR $801       -> $802
                                 G

                               TABLE
            |
            |
            |
            V



      BYTE 340 ->              -> EOR $8FD       -> $8FE
      BYTE 341 ->              -> EOR $8FE       -> $8FF
      BYTE 342 ->              -> EOR $8FF       -> 0 if data is valid
```
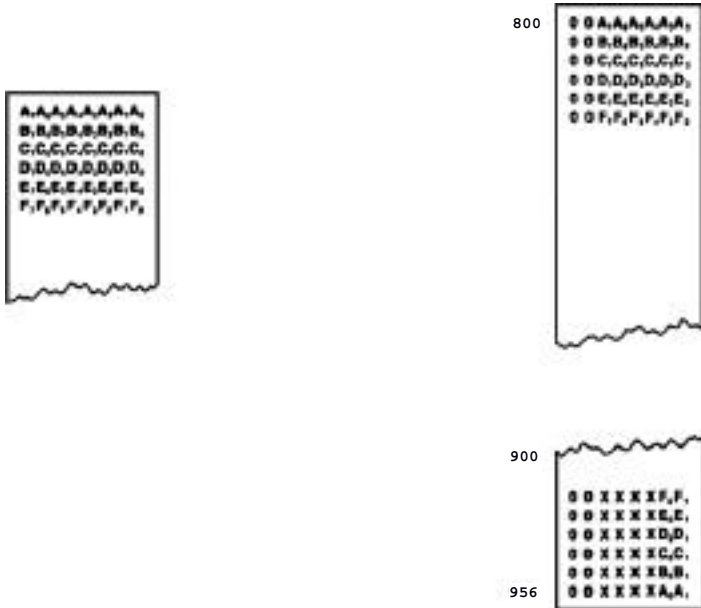
FIG. A-18: DATA DECODING

Fig. A-19: 6-plus—2 Encoding

A total of 342 bytes are needed, shown by find-
ing the total number of bits (256 x 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 exciusive-ORs, similar
to the 5-plus-3 technique shown above.

```
           Nybblized 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 = DE     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     lA = BF     2A = E6     3A = FA
    0B = AD     lB = CD     2B = E7     3B = FB
    0C = AE     1C = CD     2C = E9     3C = FC
    0D = AF     1D = CE     2D = EA     3D = FD
    0E = B2     lB = 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 back-
wards 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 in-
terleave 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 inter-
leaved 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 Systen Interleaves

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B. DOS TECHNICAL NOTES

This section reveals the extensions and altera-
tions 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 infor-
mation extends beyond the point of normal DOS
usage, Rana Systems will not furnish any addi-
tional support concerning the information pro-
vided in this section.

This section relies upon the reader being famil-
iar 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 specifica-
tion 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 initializa-
tion 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 unen—
hanced DOS, it does three things: first, the
RWTS section formats the diskette leaving all
sectors empty; second, the File Manager initial-
izes 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 inter-
preter 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, pro-viding 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 XXYX = Elite One
0010 XXXX = Elite Two
0011 XXXX = Elite Three
XXXX 000X = Spiral Cam Seek Rate
XXXX 001X = Lead Screw Seek Rate
XXXX 0l0X = 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]+$1C and
[AY]$ iD, low byte first, high byte last. The
version is kept in binary coded decimal (BCD) in
which the hexadecimal digits $WXYZ would repre-
sent 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 pro-
grammer, 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 infor-
mation extends beyond the point of normal CP/M
usage, Rana Systems will not furnish any addi-
tional support concerning the information pro-
vided in this section.

This section relies upon the reader being famil-
iar 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. Z8O 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 OOOOH. The
remaining registers (including [C]) can be unde-
fined upon return.

Since CP/M is an 8080 operating system, Digital
Reseach 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 limita-
tions, there are only eight DPWs 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
<u>write</u> <u>enabled</u>.

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
IX 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 character-
istics 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 hit.

```
0000 000X = Spiral Cam Seek Rate
0000 001X = Lead Screw Seek Rate
0000 0l0X = Band Pulley Seek Rate
XXXX XXX0 = Two Phases per Cylinder
XXYX 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 hank 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 ex-
plained above).

D. APPENDIX D

This appendix section has been intentionally omitted.