

BACK IT UP™ III

PROGRAM DISK

Sensible Software, Inc.®

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BEFORE YOU BEGIN

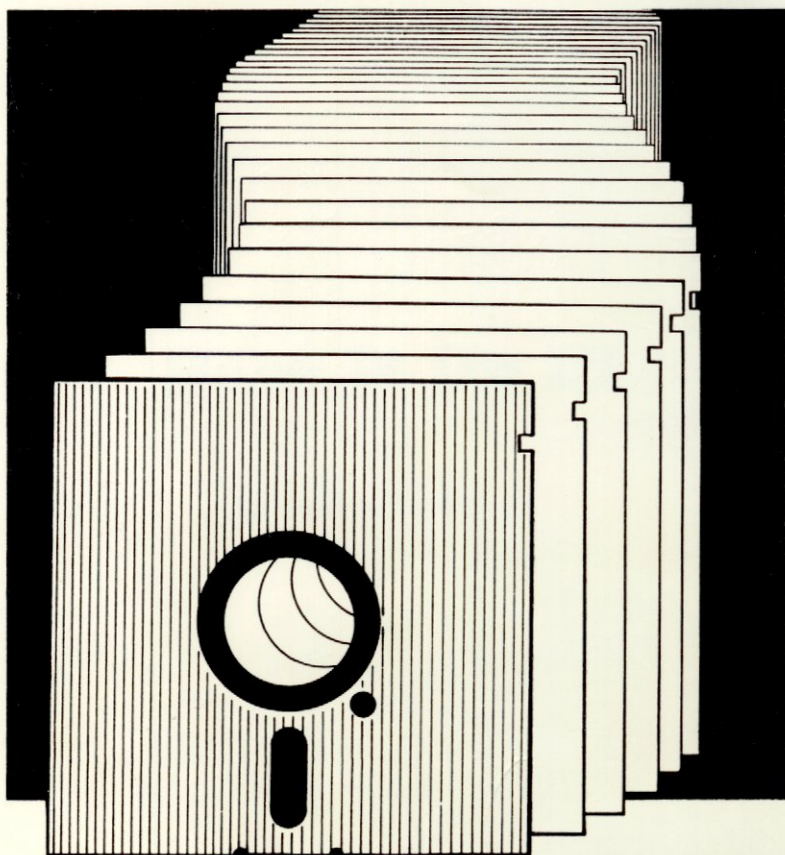
Before you do anything else, check and make sure your copy of BACK IT UP III is write protected. If it is not, place a write protect tab over the notch in the side of your diskette.

READ THE MANUAL BEFORE YOU TRY TO USE BACK IT UP III. It can save you a lot of time and grief. Some things are not obvious: for example ALL of the DISK UTILITIES erase some part of the diskette in the drive.

Take the time to check out your disk drives BEFORE you try to back up a program. If you intend to back up a large number of programs, it would pay to take your system to your dealer to be checked out. NIBBLE COPYING REQUIRES MORE PRECISION OF YOUR DISK DRIVES THAN NORMAL DAY-TO-DAY OPERATION. It is YOUR COMPUTER SYSTEM that backs up your program diskettes. BACK IT UP III only tells your system what to do. A disk drive which will not read or write properly cannot make a reliable back up. At the very least, read the DISK UTILITY section of the manual and check your disk drives for read errors and drive speed.

If you are using a computer with the ability to enter lower-case letters, you need to set the CAPS LOCK. BACK IT UP III only accepts upper-case letters.

Finally, please use this program only to back up your own program library. People who work hard to produce a program deserve to get paid for their work. Do not cheat somebody's family out of their livelihood by giving away copies of programs. For the most part, people are not copy protecting their programs because they have a "chip on their shoulder" -- they are scared. Consider this: if software authors see fewer copies of their programs, they might not try so hard to "lock them up".



BACK IT UP III™

\$75 Worth of Insurance!

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BACK IT UP III

GETTING STARTED

BACK IT UP III is a powerful nibble copier PLUS a diskette editor and complete set of disk utilities. With it, you can "back up" many important diskettes and avoid the problems that come from losing a valuable program.

BACK IT UP III is a third generation nibble copier. This means that it is able to copy many more programs than other nibble copiers and with a lot less effort. Up until BACK IT UP III, nibble copiers were easily confused. Many parameters were needed to back up most programs, and small changes in the format of the original program made back up instructions worthless. New features included are:

- * MOST PROGRAMS CAN BE COPIED WITH NO PARAMETER CHANGES.
- * INVISIBLE "PROTECTION" SIGNATURES ON ORIGINAL DISKETTES ARE AUTOMATICALLY REPRODUCED.
- * A DOS 3.2 & 3.3 SECTOR EDITOR IS INCLUDED. You can read sectors, disassemble them, modify them, list them, and write the modified sectors back out to the diskette.
- * NON-DOS TYPE SECTORS CAN BE MODIFIED. This includes, but is not limited to, special program loaders and data.
- * FULL DISK DIAGNOSTICS ARE INCLUDED. These include a Disk Speed Test which agrees with your dealer's specifications, a read/write accuracy test, a diskette media verify, and the capability of erasing diskettes.
- * SIMPLIFIED PARAMETER AND OPTION ENTRY.
- * EXPANDED AND ENHANCED OPERATING MANUAL.

Please note that nibble copiers in general are not as reliable as the standard Apple II copy programs (such as that supplied by APPLE on your System Master or SENSIBLE SOFTWARE'S Super Disk Copy). Therefore, BACK IT UP III should not be used to back up standard DOS diskettes that are not copy protected.

Also, no one can honestly say that any one nibble copier copies everything. This means that you may not be able to back up all programs in your software library. But you can rest assured that BACK IT UP III is capable of backing up more programs, with less effort, than any other nibble copier in existence at the time this manual was prepared.

Required Hardware

To use BACK IT UP III you need an Apple][Computer (or equivalent) with 48K or more of RAM memory and at least one disk drive. Two disk drives are preferred; single drive users will have to swap diskettes many times during the copy process.

Hexadecimal Notation

Most of the numbers displayed by BACK IT UP III are in a number system called HEXADECIMAL. You normally think of counting numbers starting at zero and ending at ten, with combinations of ten, a hundred, and so forth. This is called a base ten numbering system where the numbers run from 0 to 9. Hexadecimal is a base sixteen number system where numbers run from 0 to F. You count in hexadecimal by going: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10, 11, 12, 13, 14, 15, etc. Larger numbers are made the same way as decimal numbers EXCEPT INSTEAD OF HAVING A TEN'S PLACE IT IS NOW A SIXTEEN'S PLACE. The hexadecimal number 10 is equal to 16 in decimal. The hexadecimal number 20 is equal to 32 in decimal. Hexadecimal numbers are usually written with a '\$' in front to make it clear that the number is written in hexadecimal notation.

BACK IT UP III uses hexadecimal numbers for EVERYTHING except the D-speed test and the DISK DRIVE READABILITY test. For example, track numbers are in hexadecimal, parameters are in hexadecimal, and track length is in hexadecimal. BACK IT UP III does not put a '\$' in front of hexadecimal numbers.

The time some people find this most confusing is while preserving nibble count. The difference in track length is in hexadecimal. A track length difference of 1A sometimes confuses people. You would adjust the D-speed of your drive, so that you had a track length difference of 19 or less. You would continue to count it down like this: 1A, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, F, E, D, C, B, A, 9, 8, 7, 6, 5, 4, 3, 2, 1, and finally 0.

This is enough about hexadecimal numbers (probably more than enough!). For those of you who are still interested, most assembly language books offer a chapter on hexadecimal notation.

Loading BACK IT UP III

To load BACK IT UP III, remove the BACK IT UP III diskette from its protective wrapper, make sure it has the write protect notch covered, insert it in disk drive #1 and close the door. Turn the power switch 'on' (it is located in the left rear of your Apple). The red light on your disk drive will light up. The BACK IT UP III logo appears on the screen after a moment. Notice the version number displayed at the bottom of the screen. This is the only place you can find out what version of BACK IT UP III that you have. Next, the screen changes to:

```

                                BACK IT UP III
                                -----
                                11111111111111112222
                                0123456789ABCDEF0123456789ABCDEF0123
T:
-:

                                1. COPY DISKETTE
                                2. QUICK - SCAN DISKETTE
                                3. DISKETTE UTILITIES
                                4. MODIFY SECTORS
                                5. CHANGE PARAMETERS
                                6. EXAMINE TRACK

                                WHICH :

```

This is the 'main menu'. From it you select which of the BACK IT UP III functions you wish to use. Remove your BACK IT UP III diskette, put it back in the wrapper, and place it in a safe place. It will not be needed again. To select a function, press the number of the function, then press the 'RETURN' key.

BACK IT UP III

USING THE COPY PROGRAM

To select this option, you must be at the main menu. Press the '1' key followed by the 'RETURN' key. The screen then shows:

```
BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:
-:
PRESS 'ESC' TO ABORT RESTART

ORIGINAL DISKETTE IS IN DRIVE
(1 OR 2) :
```

Enter the number of the disk drive that will contain the disk that you want to copy (the "original" diskette). If you intend to place the original diskette in drive 1, simply press 'RETURN'. Notice that the '1' in (1 OR 2) is in inverse video. Inverse video means that the character is black on a white background. All other characters are shown in white on a black background. The '1' was written this way to remind you that it is what you will choose if you simply press 'RETURN'. When you have done this, the screen shows:

```
BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:
-:
PRESS 'ESC' TO ABORT RESTART

ORIGINAL DISKETTE IS IN DRIVE
(1 OR 2) :

COPY DISKETTE IS IN
DRIVE # (1 OR 2) :
```

Note that this time the '2' is written as a black character on a white background. If you simply press 'RETURN', BACK IT UP III assumes that you intend to place your blank diskette in drive 2. The screen clears and looks like:

BACK IT UP III

```
BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:
-:

START TRACK (HEX)
(NORMALLY 0) :
```

BACK IT UP III is asking for the first track you wish to copy. If you wish to begin copying at track 0, simply press 'RETURN'. This is called the "default". If you wish to begin copying at another track, enter the track number and press 'RETURN'. When you have done this, BACK IT UP III asks for the last track you wish to copy (**END TRACK**). Enter this number beside the flashing white square. If you press 'RETURN', you automatically select track 22 (the default). You are allowed to select beginning and ending tracks of 0 to 22 automatically, because this is where most diskettes contain data. If you wish to copy only one track, enter that track number as both the starting and ending track number. Next, you are asked to select the **TRACK INCREMENT**. This is the spacing between tracks. The normal spacing is 1; so that's what you get if you press 'RETURN'. The increment between tracks may, however, be an odd width apart, such as 1.5. To enter a odd track width like 1.5, enter '1.5' and press 'RETURN'. Here is what the screen looks like after entering all this:

```
BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:
-:

START TRACK (HEX)
(NORMALLY 0) : 00

END TRACK (HEX)
(NORMALLY 22) : 22

SELECT TRACK INCREMENT
(NORMALLY 1) : 01
```

BACK IT UP III

Now, BACK IT UP III displays a list of options to use while making your back up:

```
BACK IT UP III

-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:
-:

1. COPY NORMALLY
2. DECODE SECTOR DATA
3. DECODE OTHER DATA
4. SYNCHRONIZE TRACKS
5. PRESERVE NIBBLE COUNT
6. COMPRESS THE TRACK
7. ERASE DESTINATION TRACKS

WHICH :
```

You can enter the option numbers in any order, BUT DON'T PRESS 'RETURN' UNTIL YOU HAVE ENTERED ALL OF THE OPTIONS THAT YOU WANT TO USE!

Press the 'RETURN' key when you are through selecting options, and BACK IT UP III will ask you to insert your diskettes and press the 'SPACE BAR' to begin. The copy diskette DOES NOT HAVE TO BE INITIALIZED. IN FACT ANY INFORMATION ON THE COPY DISKETTE WILL BE TOTALLY DESTROYED. **MAKE SURE YOU PLACED A WRITE PROTECT TAB OVER THE NOTCH IN THE ORIGINAL PROGRAM DISKETTE.** Press the 'SPACE BAR', and BACK IT UP III begins duplicating the contents of your original diskette one track at a time. The process normally takes about 5 minutes. If you wish to stop the copy process, press the 'ESC' key. It may take a moment, but everything will stop.

BACK IT UP III

The Status Line And Error Messages

BACK IT UP III continually keeps you informed of its progress in copying your diskettes. As each track is copied, a letter code appears on the status line under the number of the track. The number of the track is displayed in hexadecimal notation. Here is an example of the status line:

```
BACK IT UP III

-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....R
-:
```

In this example, tracks 0 to 9 have been copied correctly. BACK IT UP III is in the process of reading track A. Each dot, '.', under a track number shows that the track probably copied correctly.

BACK IT UP III copies each track using four to six stages. As each stage is entered, the status is displayed in inverse video (black characters against a white background).

The six possible stages of copying a track are:

- R Read the track
- A Analyze the contents of the track
- S Synchronize the track (optional)
- E Erase the copy track (optional)
- W Write the track to the copy diskette
- V Verify the copy of the track

Just before writing to the copy diskette, BACK IT UP III displays some additional information for very advanced users. If you are a beginner, don't worry about the display, just ignore it. This information consists of 3 rows of hexadecimal nibbles. This is the start of the track. Some of the nibbles may have their most significant bit turned off. For example an FF might appear as a 7F. Usually, but not always, these bytes are written at the self-sync timing rate. Once in a while, part of the address marks may have their most significant bit turned off (D5 AA 96 becomes 55 2A 96). Don't worry about it; this is normal. Here is an example of what it looks like while writing track "A" to the copy diskette:

BACK IT UP III

```

-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....W
-:

7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
7F 7F 7F 7F D5 AA 96 FF FE AF AA AF AE
FF FA DE AA F0 F0 A0 BC CF 7F 7F 7F 7F

TRACK LENGTH IS 18B2

```

ERROR CODES

When BACK IT UP III is finished copying the track a code is displayed under the appropriate track in the STATUS LINE. The possible codes are:

- . TRACK COPIED CORRECTLY
- N TRACK CONTAINS NO DATA
- R TRACK DID NOT READ CORRECTLY
- D DISK ERROR -- COULD NOT FIND SAME POINT ON DISK TWICE
- W TRACK DID NOT COPY CORRECTLY
- L TRACK WAS TOO LONG

When BACK IT UP III has finished copying all of the tracks from the START TRACK to END TRACK, or you have pushed the 'ESCAPE' key anywhere in the program, BACK IT UP III displays:

BACK IT UP III

```

-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....W
-:

<S>AME DISK, <N>EW DISK, <Q>UIT

```

If you choose the 'same disk' option, the status line stays the same, and none of the parms are changed. If, on the other hand, you choose the 'new disk' option, the status line clears and all parms except global parms are returned to their original values (Parms are described in detail in the section CHANGING THE WAY BACK IT UP III WORKS). If you want to leave BACK IT UP III, remove both your original and copy diskette, insert the program diskette you wish to boot, and then push 'Q'. If you do not wish to boot another program diskette, simply turn off the power switch on your APPLE.

A Brief Description Of The Options

1. **COPY NORMALLY:** This is the standard copy option. It ignores things like address marks and self-sync values (they don't have to be FF or FE). If you are a beginner, don't worry about how it works. It just does. You will find that an amazing number of programs can be copied with this option alone, or perhaps this option in combination with option 4 (synchronization).
2. **DECODE SECTOR DATA:** This is another method of copying a track. For an explanation of what "sector data" is, please read the section of this manual on copy protection techniques.
3. **DECODE OTHER DATA:** This is a third method of copying a track. It finds 4x4 encoded data. This, too, is explained in the section on copy protection techniques. It should be tried if the first two options do not copy a track properly.
4. **SYNCHRONIZE TRACKS:** All diskettes naturally have some sort of distance relationship between the start of one track and the start of the next track. It is possible to measure this relationship when a program boots, and if it is not correct, stop the program. This is called measuring the track synchronization. It is a good method of testing to see if the diskette in the drive is the original or a nibble copy. Normally nibble copiers place the starting point of each track at random. Synchronizing the tracks keeps the same relationship between tracks as the original. If a program appears to copy properly, but the copy doesn't work, synchronizing tracks frequently helps.

YOU MUST COPY TRACK ZERO PROPERLY IN THE SYNCHRONIZATION MODE IF YOU WISH TO SYNCHRONIZE ANY OTHER TRACK. FAILURE TO SO RESULTS IN THE ORIGINAL DISKETTE SPINNING FOREVER WITH AN 'S' ON THE STATUS LINE.

5. **PRESERVE NIBBLE COUNT:** Another technique frequently used by programs to test for a nibble copy is to count the number of bytes on one or more tracks. At the time the program was produced, this was counted and the number stored somewhere. While the program is booting, it is counted again and the two counts are compared. If they are different, the program assumes a copy is booting and not the original. If a copy is detected, the program stops booting, reboots, or asks you to please use the original.

Using this option requires that you open your copy drive and adjust the disk speed slowly and in very small steps to make the counts match. (For a description of where the D-speed adjustment is located and how to adjust it, see the section of this manual on disk utilities.) BACK IT UP III continuously re-writes the track until the number of nibbles match. The difference in counts between the original and the last attempted copy is displayed at the top of the screen. When they match, the word 'MATCH' appears in place of the difference, and BACK IT UP III stops attempting to write to the copy diskette. When the nibble count of one track matches, BACK IT UP III goes on to the next track.

If BACK IT UP III detects an error when writing to the copy diskette, it does not update the difference in nibble counts. Instead, it prints the word 'ERROR' where the last difference was displayed. If this happens, turn the drive speed control counter clockwise one quarter turn. Wait a moment for this change to reflect on the screen. Repeat until the difference in nibble counts is again displayed.

6. **COMPRESS THE TRACK:** This option is best used when a track is copied with 'Write' errors. Compressing tracks removes some of the nibbles between sectors. Write errors are usually the result of the track ends overlapping. This happens when the speed of the copy drive is faster than the speed of the drive which produced the original diskette. The D-speed of a drive determines how far nibbles are spread apart on a track: the faster the drive, the further the nibbles are spread apart. Think of it this way: if you were sitting in the back of a truck and dropped pebbles on the highway, the faster the truck is moving, the further apart the pebbles would drop. The disk drive works on the same principle. Each track has a specific number of nibbles. If they are spaced farther apart on the diskette, one end of the track overlaps the other. You can slow the copy drive D-speed (which must be done anyway for some programs), or you can COMPRESS TRACKS. When you remove some of the nibbles between sectors, the track is shorter and the ends no longer overlap.

This option should be tried only when a track copies with 'Write' errors.

7. **ERASE DESTINATION TRACKS:** This option clears away all of the old data on the track and writes 'FF' nibbles. It also writes a 'D5' nibble and one other which changes.

Choosing The Options

Many of the options are meant to be used in combination. First, you choose exactly one of the first three options. In addition to one of the first three options, you can choose any or none of the remaining four options (4-7). The best way to determine which of the first three options to use is to 'QUICKSCAN' the program diskette using option 1 (QUICKSCANNING a diskette is described later in the manual). If any or all tracks have 'No data', the diskette should be 'QUICKSCANNED' again using option 2 and if necessary option 3.

Most program diskettes can be copied using option 1. If you encounter 'Write' errors on any track, you would next use option 6 (compress track) to get a 'dot' on that track. If the copy fails to work properly, you would next synchronize the tracks (option 4) and if that failed, you would want to preserve nibble count on one or more tracks (option 5).

To use an option, enter the number of the option. As you enter a number, that number is displayed. When you enter a second option, the second number is displayed, separated from the first by a space. When you have entered all of the options you want, press the 'RETURN' key to begin the copy process.

CHANGING THE WAY BACK IT UP III WORKS

The way BACK IT UP III copies a program diskette can be fine tuned by several methods. All of these ways are accessed by option 5 in the main menu. When you enter this option, the screen goes blank and the following line appears across the bottom:

```
<P>arms <G>lobal <S>tandardizer <M>arks
```

To select one of them, press the first letter of its name (the letter inside the brackets).

This is really another menu of four items: change parameters, modify BACK IT UP III, standardize self-sync to one value, and copy by searching for address marks. To exit any of these, press 'ESC'. 'ESCAPE' also returns you to the main menu.

Changing Parms

These are values and definitions used in copying a track, such as the number of times to retry copying a difficult track. After you press 'P', the screen shows:

PARAM #	DESCRIPTION	VALUE
1-4	ADDRESS MARKS ..	D5 AB B5/96
5-7	DATA MARKS ..	D5 AA AD
8-A	END OF FILE ..	DE AA EB
	B MIN SYNC BYTES .	06
	C # FRAME BITS ..	FF
	D MIN DATA LEN. ..	03
E-F	TRACK LENGTH ..	00 00
10	AMT SYNC INSERT.	0C
11	ALT WRITE SLOT..	00
12	MAX RETRIES ..	01
PARAM #		

BACK IT UP III is waiting for you to enter a parm number. These are the numbers to the left of the screen. NOTE: all parm numbers must be entered as 2 digits. For example, PARM C must be entered as '0C'. DO NOT PRESS THE 'RETURN' KEY. The back arrow key, '<-', cannot be used to back up over a mistake. In case of an error, you must use the 'ESC' key to back up to the previous menu, press 'P' and begin entering the PARM again. When the <N>EW DISK option is pressed, all parms revert to their original values. Pressing <S>AME DISK does not affect any parms. When you are ready to enter the new value, the screen shows:

PARAM #	DESCRIPTION	VALUE
1-4	ADDRESS MARKS ..	D5 AB B5/96
5-7	DATA MARKS ..	D5 AA AD
8-A	END OF FILE ..	DE AA EB
	B MIN SYNC BYTES .	06
	C # FRAME BITS ..	FF
	D MIN DATA LEN. ..	03
E-F	TRACK LENGTH ..	00 00
10	AMT SYNC INSERT.	0C
11	ALT WRITE SLOT..	00
12	MAX RETRIES ..	01
PARAM #0C		VALUE:02

In this example, we have changed parm 0C to 02. Enter the value the same way you enter the PARM number. A more complete description of the PARMS and their definitions follows:

NOTE: When you change the value of a PARM, the upper part of the screen does not change: it is a template showing the normal values for the different PARMS.

PARAMETERS AND THEIR DEFINITIONS

PARAM #	DEFAULT	DESCRIPTION
00	FF	This is the standard value for self-sync. When self-sync is standardized, self-sync nibbles are changed to this value.
01-04	D5 AA B5/96	These are the standard 13 and 16-sector address marks.
05-07	D5 AA AD	These are the standard data marks for both 13 and 16-sector diskettes.
08-0A	DE AA EB	These are the standard end of file marks.
0B	06	This is the <u>minimum</u> number of self-sync bytes required to define a sector separator.
0C	FF	This is the number of frame bits used for self-sync. FF is a wild card and attempts to determine the proper value. The other values are 01 and 02.
0D	03	This is the minimum number of nibbles on a track that must read reliably for the track to contain data.
0E-0F	00 00	These parms define the length of a track. PARM 0E is the low order byte and PARM 0F the high order. To define the track length at \$80D, set PARM 0E to '0D' and PARM 0F to '08'.
10	0C	This is the number of self-sync nibbles that are placed in front of a set of address marks or sector.
11	00	This is the alternate write slot times 10 hex. If it is 00, the slot which the copy will be written to is the same as the slot from which it is read. DISK UTILITIES uses this slot if it is set to any value besides 00. If you wish to write to a disk drive in slot 5, then change parm 11 to 50. (5 X \$10 = \$50).
12	01	This is the number of times to try reading a track after the first failure. For example, the value 01 means that BACK IT UP III will try once past the initial attempt to copy the track...or twice in all. The value 02 would result in 3 attempts to copy the track.

There are several additional parms which do not show on the screen during parm changing. These parms are not often useful and could be very confusing for anyone but the most advanced user. If you are a beginner, skip this part.

13	10	This is the maximum number of bytes removed between sectors during the compress option.
14-15	00-00	This is the FORCED phase angle of a track from track 0, sector 0. If parm 15 is other than zero, the real phase angle is not measured and this is substituted instead. For example, to force a phase angle of \$D00 set parm 15 to \$0D and leave parm 14 alone. If parm 14 is changed and parm 15 is left as 00, the phase angle is not forced.
16-17	00-23	This is the maximum number of bytes that can be in a sector separator. It is normally defined at \$2300--much longer than any track!

SYNC INSERT PARMS

18	00	This is the key that determines which nibbles have extra sync bits inserted and which do not. Normally, each bit of the key corresponds to the search mask described by parms 1C-23. If a bit is on (a 1) then the corresponding nibble TO THE IMMEDIATE LEFT is written at the self-sync rate determined by parm 0C.
19-1A	00-00	This is an offset for parm 18. Parm 19 is the low order byte and parm 1A is the high order byte. For example, if the search key is set to D5 AA 96 and parm 19 is set to 0C, then parm 18 will correspond to the start of the bit slip marks--remember each bit causes the nibble to its immediate left to be written at the self-sync rate. In the example above, if parm 18 were set to 20, then the third nibble of the bit slip marks would be written at the self-sync timing rate.
1B	00	This is the number of nibbles in the search string described next.

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- 1C-23 00-00 This is the bit insert search string. The number of bits checked is defined by parm 1B. If one of the values in the string is 00, then it will match any nibble. For example D5 AA 00 would match D5 AA 96, D5 AA B5, D5 AA AD, and so forth.
- 24 00 Setting this parm to 04 causes BACK IT UP III to modify any sectors defined by address marks or the DECODE OTHER DATA option. The steps required to modify such sectors requires a special table be set up with the GLOBAL PARM CHANGE and is described in a separate section.
- 25-26 00-00 These are track shortening parms. They follow the standard format of least significant byte first. If either one of them is not zero, the track is shortened by that amount. For example, setting parm 25 to 01 shortens the track by 1 nibble. Setting parm 26 to 10 shortens the track by \$1000 nibbles hexadecimal!
- 27 00 If this parm is set to non-zero, BACK IT UP III reverts to the standard way of copying tracks. If it is set to FF, then any string of FF bytes is considered a likely candidate for a sector separator. Likewise you can use other common self-sync values such as FE. If parm 27 is set to 01, self-sync is ignored altogether. Tracks can still be copied, but two other things must also be done. self-sync must be standardized, and one of the decode options must be used or address marks specified.
- 28 00 This is the number of 256 byte pages to be used when computing a checksum. Note that this is in effect only if options 2 or 3 are used (decode or address marks).

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Changing Global Parameters

BACK IT UP III can modify itself. These are called GLOBAL PARM CHANGES. To enter this mode, press 'G' from the main parameter menu. BACK IT UP III clears the main parameter line, and prints this at the bottom of the screen:

LOCATION :

BACK IT UP III is waiting for you to enter 4 digits the same way you entered 2 digit parameter numbers. Remember, you do NOT press the 'RETURN' key. The screen looks like this after you enter the location:

LOCATION :5555 VALUE :

You can now enter a 2 digit number the same way you entered a 2 digit parameter number. Unlike the other parameter functions, this one never changes until BACK IT UP III reboots.

Since this is modifying the program itself, the location numbers can have any value. They do not look like normal memory location. Also, it is not normally possible for you to "figure out" global parm changes for yourself. Some are listed elsewhere in this manual while others will be part of copy instructions for programs.

After making global changes, the only way to restore BACK IT UP III to its original copy mode is to quit and re-boot it. If you make a "typo" and enter the wrong values, you will also need to quit and re-boot to correct the error.

Standardizing Self-Sync

This is the Standardize option in the parm change menu. Pressing 'S' toggles this option on and off. Pressing 'S' for the first time causes the 'S' in <S>TANDARDIZE to be displayed in inverse video (remember, inverse video is black characters on a white background). Pressing 'S' again turns the standardize option off, and the 'S' in <S>TANDARDIZE is displayed in normal video. Every time you select the <N>ew DISK OPTION this reverts to non-standardized self-sync.

Standardizing self-sync changes whatever nibbles are present in front of a sector to parm 00 (normally FF). This option should only be used when using either of the DECODE options. Once in a great while it can be used in the normal copy mode, but usually results in a bad copy.

Using Address Marks

Sometimes it is necessary to copy a track by looking for the address marks. For a normal DOS 3.3 diskette, this means searching for a D5 AA 96. Once found, this is a good place to break the track. BACK IT UP III is capable of doing this with the <M>ARKS option under the parameter menu. It results in an extremely fast copy, but may require that the D-speed of the copy drive be set several D-speed units slow. The track is separated at this point, and BACK IT UP III sets the sector separator to the width of parm 10 (normally 0C hex or 12 bytes decimal).

To copy by address marks, enter the parameter menu from option 5 in the main menu. Press 'M' and BACK IT UP III clears the screen and prints:

ADDRESS MARKS :

Enter the address marks separated by a space, followed by a 'RETURN'. For example, D5 AA 96 would look like:

ADDRESS MARKS :D5 AA 96

When using address marks, they override all of the first three options. you need not enter any of the first three options, but many people feel better if they can use at least one of the options. If this is you, use option 1.

USING BACK-UP INSTRUCTIONS

Included with BACK IT UP III is a list of back-up instructions for popular software. These instructions tell you: what tracks to copy, what options to use, and what parameters to change. The instructions should be followed exactly in the order given and have the format:

TRACK NUMBERS : OPTIONS : PARAMETERS (if any)

For example, to copy your DOS 3.3 System Master you would copy tracks 0 through 22 using the "normal" copy mode and erase the tracks on the copy. The back up instructions would be:

0 - 22 : 1 7

The 0 is the starting track and the 22 is the ending track. Since the track increment is 1, it is not listed. Had the track increment been anything other than 1, 2 for instance, the instructions would have been:

0 - 22/2 : 1 7

The "normal" copy mode is option number 1. Erasing destination tracks is copy option number 7. These numbers (1 and 7) appear to the right of the track numbers. If there were any parameter changes, they would appear to the right of the copy options:

0 -- 5 : 1 4 6 7 : 0C = 01
6.5 - 22.5 : 1 6 7

Notice that the parameter change (changing parm 0C from FF to 01) is not repeated for tracks 6.5 to 22.5. What do the copy instructions mean? In this case the copy instructions tell us to change parm 0C to 01. Copy tracks 0 through 5 using the main copy option, synchronizing, compressing and erasing the destination tracks. Tracks 6.5 to 22.5 are copied the same way, except they are not synchronized. Parameter 0C is left at the previous setting. Here is a typical entry in the back up instructions:

WORD HOLDER 0 : 2 4 6 7
 1 -- C : 3 4 6 7
 11 -- 22 : 1 7

This is one of the more complicated programs to back up. It requires copying three sets of tracks. First, you copy track 0 using options 2, 4, 6, and 7. This means using the DECODE SECTOR DATA option, the SYNCHRONIZE option, the COMPRESS TRACKS option, and finally the ERASE DESTINATION TRACKS option. For tracks 1 through C use the DECODE OTHER DATA option instead of the DECODE SECTOR DATA option. Tracks 11 through 22 are copied using the COPY NORMALLY option and ERASE DESTINATION TRACKS. NOTHING IS SAID ABOUT TRACKS D THROUGH 10. They are not copied, because they contain NO data. Don't worry about them. We mention this, because we frequently receive phone calls from people who are

worried because we 'left out' some of the tracks. If we do not list copy instructions for a track, it does not contain data.

Special Instructions

A program may require special instructions. For example, some programs will not boot if the program diskette isn't write protected! Such programs have a 'WP' to the right of the copy instructions. Here is an example:

```
PERSONAL INDEX CARD 0 -- 22 : 2 4 6 7 WP
```

This says to copy tracks 0 through 22 using the DECODE SECTOR DATA, SYNCHRONIZE, COMPRESS, and ERASE options. When you are finished copying the diskette, write protect the copy.

Another special notation is STANDARDIZE self-sync. This notation appears the same place as the 'Write Protect' notation:

```
GARGOYL      0      : 1 7
              1.5 - F.5 : 3 4 7 S
```

If it is necessary to copy a range of tracks with address marks, the notation looks like:

```
SYSTEM MASTER 0 - 22 (D5 AA 96) : 1 7
```

Sector modifications are listed last, after all other back-up instructions. They are not used unless other methods of backing up a program diskette prove to be too unreliable or unworkable. They have the form:

```
MASK OF THE MOON 0 - 22 : 1 7
                SECT. MOD. 0/3: 25=18 26=60
                    2/E: 31=60
```

This means to modify track 0, sector, 3 by changing offset bytes 25 to 18 and 26 to 60. Modify track 2, sector E, by changing offset byte 31 to 60.

There is one other possibility. It does not exist at the present time, but probably will in the near future. It may be necessary to enter several GLOBAL PARM CHANGES before copying a track. The format for these are:

```
GLOBAL  LOCATION : VALUE      LOCATION : VALUE
        LOCATION : VALUE      LOCATION : VALUE
        LOCATION : VALUE      LOCATION : VALUE
```

```
PROGRAM XYZ 0 - 22 : 3 4 7 (or what ever else is
                           appropriate)
```

What To Do If Back-Up Instructions Don't Work

In spite of the fact that a great deal of care goes into our back-up instructions, they may not always work on all systems. We test our back-up instructions repeatedly, but a few things are outside our control. Here are a few things to try:

1. Be certain you followed the back-up instructions IN ORDER. Parm changes are for the tracks listed on the same line AND THE TRACKS LISTED ON ALL FOLLOWING LINES. Be SURE you use the SAME DISK option while copying the program.
2. Be certain you followed ALL of the instructions, such as write protecting the copy before using. Some programs erase sections of the disk if they aren't.
3. Be certain you are using high quality diskettes to make the copy...you can be certain the original program diskette was on such a diskette.
4. If the status line shows Write errors or Disk errors, compress the track. This compensates for drive speed to some extent.
5. Try swapping drives--that is put the original in drive 2 and the copy in drive 1. **MAKE CERTAIN YOU WRITE PROTECT THE ORIGINAL**, otherwise you might accidentally write to the original and destroy it.
6. Try putting the copy on another diskette--you can encounter defective diskettes in even the best brands.
7. Try to back up the program on at least one other set of drives. Some drives are better or worse than others. (Did you have your drives aligned by a competent dealer before you started backing up your library?)

Proper disk drive alignment cannot be stressed too much. If you have not done so, read the disk drive check-out procedure listed in the BEFORE YOU BEGIN section.

HOW YOUR DISK DRIVE STORES INFORMATION

This section describes how data is recorded on a blank diskette. When a piece of information is in the computer, it is called a byte. Once it is written onto a diskette, it is called a nibble. It is not as simple as directly storing the data onto the diskette. All that can be done with a diskette is to store a magnetic pulse on one tiny part as the diskette turns inside of the drive. The pulse is like a light bulb. It can be either on or off. There is no in-between. A 'byte' of information must contain many pulses. This means that data must be stored on a diskette one pulse at a time. D5 is not put onto the diskette all at once. Rather it is broken up into eight bits, each bit a 1 or 0. One-at-a-time, each bit is pulsed onto the diskette. It's like splashing dabs of paint on a slowly turning wheel.

Written as bits, D5 looks like this: 11010101. Beginning at the front, this is stored by pulsing the write head in the disk drive on, on, off, on, off, on, off, and finally on. If this is followed by writing an AA to the diskette, the bits which make up AA would look like this: 10101010. Altogether, the D5 AA would be written as: 1101010110101010. When it begins reading, the drive doesn't automatically begin at the start of a byte. It could easily start anywhere. If it started reading on the third bit of our D5 AA, it would read 10101100. This is neither D5 nor AA. It is the byte AC. The 1010 is the hexadecimal number A, and the 1100 is the hexadecimal number C. Remember the AC is hexadecimal, and only a convenient way for humans to think about the binary 1's and 0's. So, don't be confused because there wasn't even a 'C' in the original data. Groups of bits can be recombined into almost anything! What we need is a way to tell where a byte begins.

There is a way to make the drive begin reading at the start of a byte. We call this 'locking up' properly. It is done by writing a special kind of byte to the diskette. Data is written by putting the bits out to the diskette just as they are. These bytes are called DATA BYTES. This special kind of byte is called a SELF-SYNC byte. A self-sync byte is different from a data byte in two ways. It has more bits, and not every data byte can be used as a self-sync byte. The standard self-sync byte is FF, although there are others as we shall see later. A data nibble has 8 bits, a self-sync nibble has 9 or 10. Does that mean there are two kinds of self-sync? Yes. Dos 3.2 has a single extra bit, DOS 3.3 has two extra bits. These are called FRAME BITS. They center the self-sync byte inside of a window, and from then on it begins reading each byte at the proper starting point--even after reading many data bytes.

Inside DOS 3.3 And 3.2

Each track of a diskette is divided into one or more blocks of data. These blocks of data are called SECTORS. Each sector begins with a few self-sync bytes to insure that everything has locked up properly. Each sector then begins with a series of bytes which are different from data bytes--i.e., they never appear as data within the sector. These are called ADDRESS MARKS. The address marks contain three bytes. For standard 13-sector formats, the bytes are: D5 AA B5. The same address marks in a 16-sector format, would be: D5 AA 96. Following the address marks comes the volume number, track number, sector number, and a checksum value. Each of these exists as two bytes instead of one, because most bytes cannot be written directly to the drive. The rules of what can and what cannot be written directly are complicated, but simply put, if you have too many zeroes in a row, the data gets out of sync again. Because of this limitation, numbers and other information must be converted to a form the disk drives can use. The sector header ends with two bit slip marks which are: DE AA. Following this are some more self-sync bytes and the data marks. The standard DATA MARKS are the same for 13 or 16-sector formats: D5 AA AD. Data follows this until the end of file marker is found. The normal END OF FILE MARKER is DE AA EB. Here are two examples of what a normal diskette looks like when examined by the EXAMINE TRACK function (which is option number 6 from the main menu):

```
AA EB FB C0 FB FF FF FF FF FF FF FF FF FF FF
FF FF FF D5 AA 96 AA AA AA AA AA AA AA AA DE
AA ED C0 F0 FD FC E2 FF FF FF FF D5 AA AD AB
```

The position of the various bytes is not important. A track on a diskette is, like a wedding ring, an endless circle without beginning or end. Because of this, you might begin examining a track in the middle of some data one time and the beginning of a sector the next. It is difficult to look at a track twice, and tell if it is the same track! The same track might look like this a second time:

```
96 96 96 96 96 96 96 96 96 96 96 96 96 96
96 96 96 96 96 96 96 96 96 96 96 96 96 96
96 96 96 96 96 96 96 96 96 96 96 96 96 DE
```

The '96's are the bottom part of an empty sector. There can be many empty sectors on a standard diskette. When a diskette is initialized, the diskette is set up with \$23 tracks of empty sectors (remember track 0 is also a number and the tracks 0 through \$22 are initialized for a sum total of \$23).

How Bytes Are Converted To Nibbles

There are currently three ways bytes are converted to nibbles. DOS 3.2 converts program information to combinations of 32 different nibbles. The way in which data is converted into combinations of the 32 nibbles is complicated. Basically, it converts the 256 bytes of data into 410 bytes which range in value from \$0 to \$1F (32 decimal). Each of these bytes is converted to a nibble by a look-up table. This isn't efficient, just necessary. DOS 3.3 converts data to combinations of 64 nibbles. It is more efficient and only requires 342 nibbles to represent 256 bytes of program.

THE DECODE SECTOR DATA copy option looks for sectors that are similar to DOS 3.3 or DOS 3.2.

4X4 NIBBLIZATION

There is another way information is stored. It cannot be used to save and load things like text files on a diskette, but it does make a program load very quickly and copy protect it very well at the same. The idea is to put one long sector per track instead of several short ones. To do this, you only need the address marks and the data. The beginning of a sector would be:

```
FF FF FF FF FD FF FF FF FF FD FF FD FF FF FD
FF FF FF DD F6 AD AB AA AE AF AF AF AA AA AB
AE AF AE AF AE AB AA AB AB AB AA AA AF AF
```

Note the FDs in the middle of the FFs. This confuses old fashion nibble copiers. The address marks are DD F6 AD. The first part of the data follows. This technique uses the third encoding technique. Every byte is encoded as two nibbles on the diskette. Thus, 256 bytes become 512 nibbles on the diskette. This has the advantage of being very fast to decode.

THE DECODE OTHER DATA copy option looks for this type of sector.

HOW DISKETTES ARE COPY PROTECTED

The very first copy protection techniques were very simple. Produce a program diskette with one erased track. When a copy program tried to read a sector from the erased track an I/O error resulted. The diskette could still be cataloged, so they moved the Catalog track from track \$11 (hex) to another track (usually track \$10). Next, software producers began changing the sectors themselves. Any diskette which changes address marks, bit slip marks, data marks, end of file marks, or check sums is copy protected. Normal DOS 3.3 or 3.2 cannot read the sectors. Normal copy programs do not work, Super Disk Copy, and FID cannot transfer the files. Attempts to Catalog the disk or copy the files result in the disk drive clattering and the words I/O ERROR printed on the screen. Frequently, diskettes were produced which contained some erased tracks AND altered sectors.

This was what the early nibble copiers copied so well. They copied the programs by reading the entire track into memory, dividing the track at the FF nibbles between sectors and writing the entire track back out to the copy diskette. The format could be changed completely, yet the nibble copiers always found the same strings of FF timing bytes between sectors. It was thought that FF was the only nibble which could be used as self-sync. Here is an example of a copy protected track from an early space battle type program:

```
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FF FF FF DB D5 DE FF FF AA BB AB AF FE EB DF
AA EE FF FF FD FE FF FF FF FF FF FF FF FF
DB D5 DE FF FF AA BB AB AF FE EB DF AA EE FF
```

-- DATA CONTINUES HERE --

```
AB AB AB AB AB AB DF AA CF EF F7 FB FD FE FF
```

In this example, the ADDRESS MARKS were changed to DB D5 DE. The BIT SLIP MARKS and END OF FILE MARKS were changed to DF AA. The DATA MARKS were changed to DB D5 DE. This was still easily nibble copyable.

The author of the first nibble copier was faced with the dilemma of providing a copier which could copy 'anything' except itself. He hit on the idea of measuring the phase angle between tracks. That is, he measured the distance between sector zero of one track and sector zero of the next track and compared it to the proper range of values. The copy appeared to be O.K., but wouldn't work. This was the first nibble copy test. Others began doing the same thing and soon he was faced with the necessity of reproducing this phase angle himself. He called it synchronizing the tracks.

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These have been examples of the two main types of copy protection techniques. The first technique attempts to provide a format which cannot be read, the second technique attempts to look for the difference between the original and a nibble copy. TO DATE ALL COPY PROTECTION TECHNIQUES HAVE FALLEN UNDER ONE OF THESE TWO CATEGORIES....with one interesting exception. Remember the author of the first nibble copier? When he added the ability to synchronize the tracks of his copies he once more copied himself. What did he do? He wrote a special 'signature' on his tracks. If he saw that 'signature' he stopped processing the track! Several companies figured out the 'signature' and put it on their own programs! That worked until other nibble copiers like BACK IT UP came to be. Since they didn't look for this signature, they copied the track anyway....they also copied the nibble copier!

Attempts to prevent nibble copiers from reading diskettes became increasingly bizarre. Here are the fundamental protection techniques.

HALF TRACKING

One of the early techniques involved placing the data on half tracks. When tracks are skipped altogether and much of what's there placed on half tracks, finding the program tracks can be most difficult. Using the QUICKSCAN OPTION finds this type of data. Also, see AUTOMATIC HALF TRACKING in the next section.

ALTERNATE SELF-SYNC BYTES

Alternate self-sync bytes were found. The first alternate self-sync byte was FE. By placing this in front of sectors, nibble copiers had no way to tell were to divide the track. They reported that there wasn't any data on the track, or they divided the track at the FF nibbles in front of the data marks....that didn't work. Remember our space battle program that changed the address marks and everything else? They found they could use the nibbles D5 AB as self-sync. Their same space battle program began to look like:

```
D5 AB D5 AB D5 AB D5 AB D5 AB D5 AB D5 AB D5
AB D4 AA B7 FF FF AA BB AB AF FE EB DF AA EE
FF FF FD FE FF FF FF FF FF FF FF FF D5 AA AD
```

Nibble copiers couldn't find ANY SINGLE BYTE TO CALL SELF-SYNC, AND COULDN'T FIND A PLACE TO DIVIDE THE TRACK. Nibble copiers could not change the byte it considered self-sync because there were two! Because the address marks, bit slip marks, or end of file marks were different, normal DOS couldn't access the program diskette. Nibble copiers responded by allowing the user to specify the address marks, and dividing the track in front of them. Someone had to supply the address marks (usually the author of the nibble copier), but it worked. BACK IT UP II contained the address marks for normal DOS 3.2 and 3.3. The user

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can just use the DECODE UNREADABLE TRACKS option without needing to enter address marks much of the time. In either case the nibble copier placed normal self-sync bytes in front of the address marks and the diskette copied.

TRACK 23

Sometimes, producers of programs put data on track 23 of their program diskette. This was not done often since some drives can't read this track reliably. Therefore, nibble copiers usually try to copy only tracks 0 to 22. BACK IT UP III can copy track 23, if desired.

SPIRALING

This is sometimes also called track arcing. The basic idea is to place data on adjacent half tracks in such a way that it can be read but not easily written. This method has fallen into disfavor, since a significant portion of the drives in existence cannot read anything written on half tracks and nibble copiers did, in time, learn to reproduce it.

LONG TRACKS

At the time of this writing, a popular technique has been to produce the program on a disk drive which was running much slower than normal. Normal DOS 3.3 tracks are about 1880 or 1890 hexadecimal bytes long. DOS 3.2 tracks and others are usually a little longer: normally 18A0 to 18B0. Tracks using this technique usually (but not always) are between 18D0 and 1930 bytes long. Sometimes compressing the tracks will copy such a program diskette. However, it may become necessary to set your own copy drive speed slow. Having to adjust the D-speed to +35 units is not uncommon.

Nibble Copy Tests

As we have pointed out, there are only two ways to attempt to defeat a nibble copier: produce a format which cannot be read or reproduced, or look for an invisible signature of some sort (a nibble copy test). The four nibble copy tests are:

1. Synchronization of the tracks. This means that sector zero of each synchronized track is a predictable distance apart. This distance is usually measured as an angle. For a DOS 3.3 diskette, each sector is rotated 90 degrees from the same sector on the previous track. The nibble copy of a diskette normally does not reproduce this phase angle. Also, many programs have begun requiring a much closer match. The idea is to require a closer match than a nibble copier can provide. Synchronize functions, like everything else, have a certain

error, and some nibble copiers are more accurate than others. As an example a popular pool program requires that the tracks be synchronized very accurately. BACK IT UP III is the only nibble copier which is able to repeatedly reproduce a working copy of this program. SEE SYNCHRONIZE TRACKS.

2. Testing the D-speed of the drive which produced the diskette. The most common way to do this is count the nibbles on one or more tracks and compare the total to the known nibble count of the original diskette. See 'PRESERVING NIBBLE COUNT'.
3. Writing data at the self-sync timing rate. Information on a track is written according to very rigid timing standards. Remember our discussion on self-sync bytes? Self-sync bytes have one or two extra FRAME BITS than data bytes. Normally, nibble copiers write long strings of FFs and FEs with the extra frame bits. Everything else is written at the data rate. There is nothing to keep you from writing a specific nibble with the extra frame bits and then counting the bits in that nibble. The original will have the extra bits, old fashion nibble copies won't insert the extra bit without a lot of parameter changing. BACK IT UP III does this automatically.

Frequently, more than one technique is used at a time. As an example, many programs check the nibble count of a nearly empty track. Other programs require synchronizing nearly empty tracks and preserving the nibble count! A popular data base program places strange self-sync bytes between the sectors and then looks for those bytes with the extra framing bits. Normally, a nibble copier will not be able to reproduce the track without filling in the area between sectors with self-sync. By checking the area between sectors, the program uses both of the two basic approaches to defeating nibble copiers.

A TUTORIAL ON NIBBLE COPYING

Here are several examples of ways to approach backing up a program diskette without having special instructions. The techniques rely on the QUICKSCAN mode and on AUTOMATIC HALF TRACKING, and a few hunches. First, lets define what we mean by these terms.

Quickscan

This is an option in the main menu. It is used in combination with copy options 1, 2, or 3. It attempts to quickly find data on a diskette. It searches every track and half track from a beginning track number to an ending track number which you supply. If you don't supply numbers, the QUICKSCAN option checks from track 0 to 22 (the whole disk). It is capable of checking part of a diskette or everything to track \$23. Interpreting the results takes a little experience. Here is what it looks like to QUICKSCAN a DOS 3.3 System Master:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:RRRRRR.RRRRRRRRRRRRRRRRRRR.DDRRR.RRR..
    
```

A dot shows that there might be data on a track or half track. D and R show that errors occurred. Note that there were dots on tracks 6 and a half, 17 and a half, 21 and a half, and 22 and a half. Sometimes, BACK IT UP III can read data accurately a half track away. This looks like what happened here. Since there was a full line of dots on the full tracks, it is unlikely that there is data on just a few widely separated half tracks. The length at the bottom of the screen is listed as about 189D on each track, so it should copy properly at normal D-speed. When you try to copy the System Master, the status line should be:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:
    
```

BACK IT UP III

PROBLEMS

If, instead you get Read errors when you attempt to copy it:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:...R.....RR.....R.....R
-:

```

There is probably something misaligned in the disk drive which contained the original diskette, OR the original diskette is defective. If instead, the status line looks like this you have a different problem:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:WWW..W.W..W.....
-:

```

Notice that most of the Write errors are on the lower number tracks. In fact, there are no write errors after track A. This means that the disk drive which contains the copy is probably spinning too fast. Turn to the section on disk speed alignment and check the drive speed of both drives. Adjust the speed if necessary. Remember the disk speed can be a few units slow, but CANNOT BE FAST. If there were Write errors on higher number tracks, there might be problems with the diskettes themselves. Remember, DOS 3.3 is nearly double density. Is the diskette you are putting the copy on double density? Is it a well known, high-quality brand? You can be sure your System Master was recorded on a high quality diskette. Of course, the disk drive itself may have a problem. Nibble copying requires disk drives in first class shape. Did you check out your drive as suggested in the BEFORE YOU BEGIN section?

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Some Examples

Here are some examples of how you go about copying protected diskettes. By adapting these methods, you can copy a tremendous number of diskettes.

VERSATILE CALCULATOR

If everything is O.K, lets look at a copy protected diskette. We'll call it the Versatile Calculator. It's an electronic spreadsheet program with lots of features, and you want to back it up BEFORE you spill coffee on your only copy. When we QUICKSCAN the program diskette, we get:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.D.....R..R.....DDDDDDDDDDDD
-:..D..RDR.R.R.D.DDR.DDDDDDDDDDDDDDD

```

On a guess, we'll try copying tracks 0 to 16 using copy options 1 and 7 (These options look for regular data and erase the tracks before attempting to copy them onto the copy diskette). When we are finished, the copy looks like this:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.D.....
-:

```

We still didn't copy track 1 correctly. Maybe there really isn't anything there to be copied correctly. So let's go ahead and give it a try. Guess what, it boots!

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VERSATILE COMPUTER TERMINAL

We'll call the next program we look at the Versatile Computer Terminal. It turns your computer into a computer terminal with an 80-column screen. When we QUICKSCAN the program, we get:

```

BACK IT UP III
-----
111111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:R..R..D.D.RR.RRRD.RD..RRDR..RDRR..
-:RD...RRR.....R...DD..R.DD...RR..D

```

It is hard to tell where data is, but when the program booted it looked and sounded something like a DOS 3.3 System Master. Maybe it contains data on tracks 0 to 22 like the System Master, so we'll try copying tracks 0 to 22 using copy options 1 and 7. Half way through, the screen shows:

```

BACK IT UP III
-----
111111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:..WWR..D.RWWW..RW
-:

```

We seem to be onto something, but not quite reading it properly. Let's QUICKSCAN the diskette using copy option 2. When we do, it looks like this:

```

BACK IT UP III
-----
111111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:RR..RR.RRRDR...RRR.RRR.DDRRR.RRR..

```

BACK IT UP III

This IS starting to look like the System Master. Maybe we can copy it using option 2. When we try:

```

BACK IT UP III
-----
111111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:WWWWWWWWW..WWWWWWWWW.WWWWWWWWWW.WWWW
-:

```

Since the main cause of Write errors is drive speed, and the track length was 18DD, lets do it again using copy options 1, 6, and 7. Remember, copy option 6 is compressing the tracks. This removes a few nibbles from between each sector. Now the copy looks like this:

```

BACK IT UP III
-----
111111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:

```

We write protect the copy since the original was write protected and try to boot it. It works!

BACK IT UP III

PERSONAL INDEX CARD

The next program in our pile of things to back up is the PERSONAL INDEX CARD. It allows us to store all kinds of information easily and get back what we want at a later time. When we quick scan it, it looks very much like our System Master:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....D.....
-:RRDDRRDDRRDDRRDDRRDDRRDDRRDDRRDD

```

Maybe we can back it up using options 1 and 7. When we try, we get:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....D..D.....W.....W..
-:

81 80 80 80 A2 82 82 85 85 A0 82
82 8A 7F 7F 7F 7F D5 AA 96 FF FE
AA AF AA AB FF FA DE AA EB C8 C8

```

Since this is a copy protected diskette, and not something simple like a System Master, I won't worry about the errors. Also, I noticed something strange between the sectors while copying. I'll just try copying the tracks with errors again.

BACK IT UP III

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....D.....
-:

```

All but one track copied correctly. I'll try track 16 again.

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....D.....
-:

```

Being stubborn, I'll change the maximum number of retries to 3 and try this track one more time. It seemed to copy O.K. Since the original was write protected, I'll write protect my back up and try it. It works!

BACK IT UP III

CHOMP THE DOTS

Since all this success has gone to my head, I'll pull an old game I've always wanted to back up called Chomp the Dots by Triple Crown Software. This time, I think I'll just try to back it up using copy options 1 and 7. When I finished, this is what I find:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....NNNNNNNNNNNNNNNNNN
-:

```

Hmm! Either the game didn't take all of the diskette, or they did something strange on the last few tracks. The original wasn't write protected, so I won't write protect my back up. It is simpler to just try it and see if it works than waste time trying to figure out if there really is data on tracks \$10 to \$22.

It works. I'm going to take a break while I clear away a few screens of dots.

BACK IT UP III

GALAXY WARRIOR

I've got another Triple Crown game in my pile somewhere. Here it is: Galaxy Warrior! I think I'll try it the same way:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:..RRRD.RR.....NNNNNNNNNNNNNNNNNN
:

```

Hmm. This doesn't look quite right. I'll try tracks 1 through 4 and 6 through 7 again.

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:..RDRR.RR.....NNNNNNNNNNNNNNNNNN
-:

```

No change. Maybe I had better use AUTOMATIC HALF TRACKING on tracks 1 through 7. To do this, I enter 1 as my starting track and 7 as my ending track. When it asks for track increment, I enter '.5'. Now, BACK IT UP III searches by half tracks until it finds data, copies that data, and skips one track. This way it may copy any track which contains program data. When I finished, the STATUS LINE shows:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:..RRDR.RR.....NNNNNNNNNNNNNNNNNN
: R..RD.

```

It looks like there may be data on tracks 2 and a half, 3 and a half, and 6 and a half. That really looks bizarre, but I think I'll write protect it and try it anyway. It works!

BACK IT UP III

TYPEWRITER ///

Here is a program for my APPLE ///. It is called TYPEWRITER ///. It is a word processor and I would be in trouble if something happened to it. Lets see what happens when I Quicksan it.

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:RRR.RR.RR.RDR...RR..RRRDDRRR.RRR..

```

That looks suspiciously like my System Master. I think I'll try copying tracks 0 through 22 (all of them) using copy options 1 and 7. This is what I got when I finished:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:

```

Time to boot it. It boots for a while then comes up....SYSTEM ERROR?!? What do I do now. The drive didn't rattle like it did when I don't have a diskette in the drive, so it must not be an I/O Error. Maybe they did a nibble copy test. Maybe if I try making a back up using option 4 (synchronize) as well as options 1 and 7, it will work.

I do.

It worked this time!

BACK IT UP III

ADDLED LOGO

I'm going to try one more before I quit. Here is a graphics package for kids....of any age. You can run a little bug around the screen and it's pretty easy to use. I could use a back up BEFORE my 12 year old puts jelly on it this time! I think I'll just try to copy it from track 0 to 22 using options 1 and 7. Here is what I get:

```

BACK IT UP III
-----
11111111111111112222
0123456789ABCDEF0123456789ABCDEF0123
T:.....
-:

```

Time to try it and see if it works. It doesn't. Time to sync the tracks. I do and it still doesn't work. Maybe I didn't want to back it up much anyway. Hmm. Come to think of it track number 1 looked different from all the rest. I wonder what would happen if I preserved nibble count on that track. 'Sigh!' I might as well get a small screwdriver and get ready to adjust the D-speed on track 1. I used options 1, 5, and 7 on track 1. It takes a few minutes to adjust the D-speed until the nibble count matches...and I have to use the D-speed test to reset the D-speed correctly afterwards.

But you know what...

IT WORKS!

BACK IT UP III

Having Problems

Here are a few things worth remembering when you have problems:

1. DO BE SURE YOU PUT YOUR BACK-UP COPIES ONLY ONTO THE HIGHEST QUALITY DISKETTES! ANYTHING ELSE CAN LEAD TO FRUSTATION.
2. Did you have your drives checked by a dealer who is competent to use the Apple Disk Alignment pack? A NUMBER OF PROGRAMS SIMPLY CANNOT BE BACKED UP WITH DRIVES THAT AREN'T ALIGNED PROPERLY.
3. If a diskette partially boots, but gives a lot of I/O errors, set the number of frame bits to 02.
4. We have seen a few programs which wouldn't work unless you standardized self-sync. Remember, however, you will likely get into trouble unless you can also use one of the decode options--or address marks.
5. Some programs use more than one method of copy protection. You may have to preserve nibble count and synchronize. For example, a lot of tracks which have mostly FFs should be nibble counted and synchronized.
6. If all else fails, pray.

BACK IT UP III

BACK IT UP III DISK UTILITIES

WARNING!!!

EVERY ONE OF THE DISK UTILITIES DESTROYS WHATEVER DATA IS ON THE DISKETTE AT THE TIME. DO NOT PUT A DISKETTE IN THE DRIVE WHICH CONTAINS A PROGRAM OR INFORMATION YOU WISH TO KEEP.

The DISK UTILITIES attempt to access the drives from the same slot number as BACK IT UP III was booted. If, however, an alternate slot number is specified in the parameters, that slot will become the active slot.

Testing Disk Speed

To use the D-speed test, select DISK UTILITIES (option 3) from the main menu, and option 1 from the DISK UTILITIES menu. THE BACK IT UP III D-speed test measures the same way as the D-speed test your dealer uses. This means that if he measures a D-speed of +3, BACK IT UP III's D-speed test will also measure a D-speed of +3. YOUR DEALER'S D-SPEED TEST IS, HOWEVER, MISLEADING. WHEN IT SAYS YOUR D-SPEED IS POSITIVE IT IS REALLY SLOW. IN THE SAME WAY, WHEN IT SAYS YOUR D-SPEED IS NEGATIVE IT IS REALLY FAST. BACK IT UP III's D-speed test gives exactly the same results. We realize this is confusing, but we felt it was even more confusing if the two D-speed tests measured exactly backwards! The proper D-speed setting of your drives is between +2 units and +4 units. This setting is slightly SLOW. However, it is the best setting for backing up the majority of programs on the market as well as day-to-day use. Apple Computer tells their dealers that disk drive speed is O.K., if it is plus or minus 25 D-speed units.

WARNING! OPENING YOUR DRIVES AND ADJUSTING YOUR D-SPEED MAY VOID YOUR WARRANTY. IF YOU ARE AT ALL UNCOMFORTABLE ABOUT DOING THIS, TAKE YOUR DRIVES TO YOUR DEALER.

To set your D-speed, you will need a very small screwdriver or alignment tool. An alignment tool is best. They can be bought at almost any electronic shop and are sometimes called "diddle sticks". They are usually round, made of plastic, and have a small, flat, blade sticking out of one end. The other end is hollow except for a similar blade pushed all the way inside. They are very inexpensive. If you use a screwdriver, it should be only slightly larger than required to tighten the screws found in glasses.

First, turn off all power to your APPLE. Disk drives are electronic, and can short out if small pieces of metal get inside them, or a screwdriver accidentally touches something. Open the case of your disk drive by removing the four screws in the bottom. When all four have been removed, carefully slide the cover, BACKWARDS, over the cable and away from the front of the drive. Place the drive in front of you, right side up, with the

front side of the drive facing you. There is a green circuit board on the top of the mechanism. DO NOT ADJUST ANYTHING ON THIS CIRCUIT BOARD. The part you want to adjust is located in the back of the drive, along the right side. There is an adjustment screw located very close to the back wall of the case.

To adjust the D-speed, boot BACK IT UP III. Select option 3 (DISK UTILITIES) from the main menu. Press option 1 from the DISK UTILITIES MENU. Place a blank, or otherwise unimportant, diskette in the drive you wish to measure, and enter that drive number when asked. As soon as you do, the drive's red light will come on and the drive will begin to spin. BACK IT UP III will display the drive number being tested and the D-speed. Adjust the tiny screw on the back, right-hand side of the drive until the D-speed reads about +2. The D-speed will jump around a little. This is normal and nothing to worry about. The D-speed of each drive should, however, ALWAYS be just barely on the plus side of zero. After you are finished adjusting the D-speed, turn off your computer, slide the cover back on the drive, and replace the four small screws in the bottom. Repeat this procedure for both drives.

Erasing Diskettes

Once in awhile, it is desirable to erase a diskette. BACK IT UP III can erase any part or all of a diskette. Enter the beginning and ending track numbers you wish to erase. You will be asked to press the 'SPACE BAR' when you are ready to begin. When BACK IT UP III erases a track, it writes FF's to the entire track and then writes a single D5.

Verifying Diskette Media

This function checks usability of diskettes. Any diskette which fails this test should not be used. However, diskettes which pass may or may not be usable in all applications. Simply put, this is a single density test. The diskette may not be capable of storing double density information.

To test a diskette, enter the drive number that contains the diskette followed by the beginning and ending track numbers you wish to test. If you wish to test the entire diskette, simply press the 'RETURN' key for beginning and ending track numbers. Insert the diskette and press the 'SPACE BAR'. Each track and half track will be tested. If the track passes, a '.' will be placed on the status line. If the track fails, a '*' will be placed on the status line. A '*' for any track shows a failure of the diskette.

Verifying Drive Read Accuracy

This function checks the ability of your disk drive to write and read a track of data. The test continues indefinitely, until the 'ESC' key is pressed. Each time the track is read, the number of errors is displayed.

To test a drive, press '4' from the DISK UTILITIES menu. Enter the drive to be tested. Insert a high quality blank diskette (or one which contains no useful data) and press the 'SPACE BAR'. The screen will show:

```

                BACK IT UP III
                MEASURE DRIVE READABILITY
                *****
                WHICH DRIVE DO YOU WISH TO MEASURE :1

                NO. ERRORS :000
    
```

The test continues indefinitely, re-reading the track and counting errors. The red light on the drive remains on, and the drive continues to spin. The 'NO. ERRORS :' should appear to never change. IF the number beside 'NO. ERRORS :' is anything other than '000', the drive has failed. The test may be left running for several minutes unattended. Any reading other than '000' places an '*' to the right of the numbers. If your drive fails, place another high quality diskette in the drive, and attempt the test again. If it fails a second time, take your drives to your dealer and have them checked.

THIS TEST DOES NOT FIND ALL TYPES OF PROBLEMS. Only a dealer with the proper training and tools can do this. Proper diagnosing of drive problems requires the Dealer Disk Alignment Pack, an oscilloscope, and special training. Not all dealers are so equipped or trained. Most dealers are well trained and competent, but you should check your dealer's reputation in this area BEFORE ENTRUSTING YOUR DRIVES TO HIM!

NOTE

SOME ASPECTS OF NIBBLE COPYING REQUIRE A TIGHTER AZIMUTH ALIGNMENT THAN IS REQUIRED BY APPLE SPECS. APPLE SPECIFICATIONS WILL ACCEPT AN AZIMUTH ERROR OF 12 MINUTES OR LESS. IF THE AZIMUTH ERROR OF THE COPY DRIVE APPROACHES 12 MINUTES, HOWEVER, THERE WILL BE SIGNIFICANT ERRORS IN TRACK SYNCHRONIZATION, PRESERVING NIBBLE COUNT, AND THE WAY SOME BYTES ARE WRITTEN TO THE COPY DISKETTE. ALSO IT MAY EFFECT YOUR ABILITY TO PROPERLY SET THE D-SPEED OF THAT DRIVE.

It is not necessary that you understand azimuth alignment. Just know that it exists. If you take your drives to a dealer for service, he will normally consider them O.K. as long as they meet APPLE specs. This may not be good enough for some programs which require synchronization or the preserving of nibble count. If you are able to get some idea of the amount of azimuth error from your dealer, you may want to use the drive with the least error as the drive which writes your copies. If you feel the need to get such a drive repaired, be aware that it will **NOT** be covered by warranty and will involve replacement of the drive mechanism. This costs a lot of money. It may be cheaper to back up a particular program diskette on a friend's drives.

MODIFYING DISKETTES

BACK IT UP III has the ability to modify DOS 3.3 and 3.2 type sectors, as well as 4 X 4 nibbled sectors. The DOS type sectors and the 4 X 4 sector modifications are done quite differently, however. They will be discussed separately. The greatest flexibility is in modifying DOS type sectors. You will be able to:

1. READ SECTORS
2. LIST SECTORS TO THE SCREEN
3. DISASSEMBLE SECTORS
4. MODIFY SECTORS
5. WRITE SECTORS BACK OUT TO THE DISKETTE

The DOS type sector modifications are entered from option 4 in the MAIN MENU. The diskette to be examined or modified must be in drive one. Alternate slots are not allowed. You must supply the following information, before a sector can be read and modified: DOS type, track number in hex, and sector number in hex. Once this information is entered, the drive will begin spinning and the drive's light will come on. The screen will clear, and a ':' appears in the lower left hand corner. At this point BACK IT UP III will have read the sector into the buffer. From here, there are five commands: Read, Write, List, Disassemble, and Modify.

Read

Read brings you back to the beginning of this option and allows you to read another sector. It attempts to read a DOS sector with normal address marks, and data marks. Checksums, bit slip marks and end of file marks are ignored. See the table at the end of this section for ways to read non-standard address and data marks.

Write

Write does as the word implies and writes the modified sector back out to the diskette.

List

List prints the sector to the screen in hexadecimal like this:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00:	8EE9B78EF7B7A901	8DF8B78DEAB7ADE0														
10:	B78DE1B7A9028DEC	B7A9048DEDB7ACE7														
20:	B7888CF1B7A9018D	F4B78A4A4A4A4AAA														
30:	A9009DF8049D7804	2093B7A2FF9A8EEB														
40:	B74CC8BF208DFE4C	849DADE7B738EDF1														
50:	B78DE1B7ADE7B78D	F1B7CEF1B7A9028D														
60:	ECB7A9048DEDB7A9	028DF4B72093B7AD														
70:	E7B78DFEB6186909	8DF1B7A90A8DE1B7														
80:	38E9018DFB68DED	B72093B760000000														
90:	000000ADE5B7ACE4	B720B5B7ACEDB788														
A0:	1007A00FEAEACEEC	B78CEDB7CEF1B7CE														
B0:	E1B7D0DF60087820	00BDB00328186028														
C0:	3860ADBCB58DF1B7	A9008DF0B7ADF9B5														
D0:	49FF8DEBB760A900	A89142C8D0FB6000														
E0:	1B020A1BE8B700B6	016001FE0001FBB7														
F0:	006000000100FE60	0200000001EFD800														

PRESS SPACE TO CONTINUE

The numbers along the top and side allow you to easily find the position of any byte. The buffer is \$100 hexadecimal bytes long. There are \$10 hexadecimal bytes to a line and \$10 hexadecimal lines. To find hexadecimal byte \$78, go down to line 70 and over to the 8th column. Where the line and column meet, is byte number \$78. In this case the byte is '8D'. This position is called the OFFSET.

Reading Sectors As ASCII Characters

It is possible to read sectors as ASCII characters. This is useful when reading catalogs and text files. To do this, it is necessary to make a GLOBAL PARM change. Change location EC18 to ED. To change it back to printing the sector as hex, insert DA into the location.

Disassemble

Disassemble acts just like the disassemble command in the Apple Monitor ROM. When you press 'D', it asks you for an offset. This is the hexadecimal byte number in the \$100 byte read buffer. After this is entered, 20 lines of assembly language are listed. Along the left hand side, the memory location of the buffer is displayed. The last two digits of this are the buffer offset. It looks like:

```

DISASSEMBLE  ENTER OFFSET :00

6000-  8E E9 B7  STX $B7E9
6003-  8E F7 B7  STX $B7F7
6006-  A9 01    LDA #$01
6008-  8D F8 B7  STA $B7F8
600B-  8D EA B7  STA $B7EA
600E-  AD E0 B7  LDA $B7E0
6011-  8D E1 B7  STA $B7E1
6014-  A9 02    LDA #$02
6016-  8D EC B7  STA $B7EC
6019-  A9 04    LDA #$04
601B-  8D ED B7  STA $B7ED
601E-  AC E7 B7  LDY $B7E7
6021-  88      DEY
6022-  8C F1 B7  STY $B7F1
6025-  A9 01    LDA #$01
6027-  8D F4 B7  STA $B7F4
602A-  8A      TXA
602B  4A      LSR
602C  4A      LSR
602D  4A      LSR
602E  4A      LSR
      PRESS SPACE TO CONTINUE

```

This is the first part of the same buffer we saw in the List command. By disassembling a sector, we can (hopefully) change the program to better suit our needs.

Modify

Modify changes the buffer. When you press 'M', this will appear in place of the ':' and flashing cursor:

MODIFY -- ENTER OFFSET :

The offset is, of course, the byte number in the buffer. Enter the byte number and press the 'RETURN' key. The screen now shows:

**MODIFY -- ENTER OFFSET :01
REPLACEMENT :**

Enter the replacement value and press the 'RETURN' key. The new value replaces the old in the buffer.

Repairing Blown Diskettes

It sometimes is possible to repair a blown file or diskette with the sector modify function. The repair may result in some data being changed, but that is usually easier to repair than replacing the whole file.

DATA BASE FILES MAY NOT BE EASY TO REPAIR, BECAUSE THEY HAVE THEIR OWN INTERNAL POINTERS. IF A POINTER IS CHANGED, THE ENTIRE DATA BASE MAY FAIL OR BECOME VERY ERRATIC.

If a normal diskette does not Catalog, it is frequently because track 11, sector 0 does not read properly. This sector is called the VTOC. DOS stores the address of the rest of the Catalog and which sectors are in use in this sector. To repair some blown Catalogs, you can simply read track 11, sector 0 and write it back to the copy diskette. The details of how to do this are explained in the next paragraph. It may be necessary to read track 11, sector 0 from a known good diskette and write it to the defective copy. ONCE YOU HAVE DONE THIS, HOWEVER, YOU MUST USE SUPER DISK COPY OR FID TO TRANSFER THE FILES TO ANOTHER DISKETTE. Otherwise, it may be possible to write over data and destroy it.

The basic principle involved in repairing blown diskettes is to copy the diskette onto a new diskette using BACK IT UP III, then using SECTOR MOD, read the damaged sector and write it back to the copy diskette. This works because most I/O errors are the result of data checksums not matching. When DOS writes a sector to diskette, it does a checksum of the data and stores this number at the end of the sector. The checksum is similar to a running total of all the bits in the sector. When you try to read the sector again, the data is read into memory and another checksum calculated. This checksum is compared to the one at the end of the sector. If they do not match, you have an I/O error.

BACK IT UP III

When BACK IT UP III copies a diskette, the checksums are ignored. The entire track is read 'as-is' and written the same way. When the SECTOR MOD function reads a sector, it ignores the checksum. HOWEVER, IT NORMALLY WRITES A PROPER CHECKSUM. In this way, the checksum is now correct and the sector can be read. If part of the data was changed, that can usually be corrected without much trouble, and the file saved. The best way to determine which tracks and sectors contain errors is with the program **DISK RECOVERY** by Sensible Software.

Converting Half Tracked Programs For Micro-Sci A40 Use

BACK IT UP III can translate half tracks to full tracks if required. Converting half tracks to full tracks means that when the original diskette is read, all half tracks are read as half tracks. The same half tracks are changed to the next lower full track during the write process. For example, track 2.5 become track 2. To remind you of the track changes, BACK IT UP III leaves a white block above the half track status line. To translate half tracks, use Apple drives and make this GLOBAL PARM CHANGE:

LOCATION :C9EB VALUE :FE

Many fast boot programs do work on a MICRO-SCI A40 drive with no further effort. THEY WILL NOT BOOT ON AN APPLE DRIVE. The basic rule is: if the drive's read head ever tries to move toward track 0, it will not work. Such programs must also have their loader changed.

Modifying 4 X 4 Nibblized Sectors

Loaders and other 4 X 4 nibblized sectors can be modified. However, it is very difficult to determine how programs need to be modified. Most people will only be able to use this function if they have specific directions.

To activate this function, you must do three things. Change parm 24 to 04. Specify either the ADDRESS MARKS option or DECODE OTHER DATA option during copy. A special table, called a MODIFICATION TABLE, must be entered through GLOBAL PARM CHANGES at \$F053. This table consists of 3 sections, each one separated by a '0':

1. The offset from the beginning of the sector.
2. The original value(s) present in the sector.
3. The replacement value(s).

BACK IT UP III

MODIFICATION TABLE EXAMPLE

Here is an imaginary program called 'GORGE-ON'. It contains data on track 0, and tracks 1.5 to E.5. It has been converted to full tracks, but the read head moves backward at the end of the load to read a half track. We want to change things so it will read a full track. To do this, we must modify track 2.5 by changing byte \$143A from \$AF to \$AE and byte \$1450 from \$AA to \$AB.

THE MODIFICATION TABLE

```
3A 14 00 AF 00 AE 00
50 14 00 AA 00 AB 01
```

THE PARTS OF A MODIFICATION TABLE

3A 14	00	AF	00	AE	00
location	break	original value	break	replacement value	break

This can be repeated for a total of FF bytes hexadecimal. When the LAST entry has been made into the MODIFICATION TABLE, the table ends with a '01' instead of the usual '00' separator.

ENTERING THE MODIFICATION TABLE

To actually enter the table, invoke the GLOBAL PARM CHANGE mode and enter the MODIFICATION beginning at F053 like this:

```
F053=3A F054=14 F055=00 F056=AF F057=00 F058=AE F059=00
F05A=50 F05B=14 F05C=00 F05D=AA F05E=00 F05F=AB F060=01
```

Here are the changes described by the modification table. Notice, that the first two bytes (3A 14) are written in reverse order. This is followed by a '00' the original byte (AF), another break, '00', and finally the new value, 'AE', and another '00'. The new changes show the same information, but end in a '01'. This tells BACK IT UP III that all of the changes are finished.

If any expected byte is not found in the sector, the process IS STOPPED IMMEDIATELY AND YOU ARE NOT NOTIFIED OF THE ERROR. Normally, this is not much of a problem. If you are using a supplied MODIFICATION TABLE, you will know than an error occurred as soon as you try to boot the modified copy of the program.



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TECHNICAL NOTES AND BACK UP INSTRUCTIONS BACK IT UP 3.6

Nov 13, 1984

NOTE: These instructions assume your drive speed is set to approximately +3 and meets the specifications described in the section of the manual called "testing drive readability".

IF YOU FAIL TO SET YOUR DRIVES PROPERLY, AND HAVE THEM CHECKED OUT, YOU MAY HAVE DIFFICULTY COPYING SOME PROGRAMS. A NUMBER OF PROGRAMS, SUCH AS THE WIZZARDRY SERIES, ARE VERY D-SPEED SENSITIVE! OTHERS, SUCH AS CHOPLIFTER ARE VERY SENSITIVE TO DRIVE MISALIGNMENT! THERE ARE 5 DIFFERENT WAYS DRIVES CAN BE OUT OF ALIGNMENT AND EXTENSIVE USE MAY PUSH DISK DRIVES OUT OF ALIGNMENT IN A YEAR'S TIME!

If a program is not listed, try using the instructions for another program from the same company.

THE MAJOR PROBLEM IN BACKING UP A LOT OF CURRENT PROGRAMS LIES IN THE FACT THAT THE TRACKS ARE MUCH TOO LONG (SEE PAGE 27). THERE ARE 4 WAYS TO DEAL WITH THESE PROGRAMS:

1. USE COMPRESS TRACK OPTION
2. SLOW DOWN THE D-SPEED OF THE COPY DRIVE
3. SET PARM 0C TO 01
4. SET parm 27 to 01
standardize self sync
use a decode option or address marks

SPIRALING

BACK IT UP 3.6 will copy diskettes which copy protected by spiraling. It is necessary to make 5 GLOBAL PARM changes. These will be referred to in the back up instructions as the 'SPIRALING PARMS'.

CA06 = F0 CA07 = 08 C998 = 10 C934 = D0 C935 = 34

These changes cause BACK IT UP 3.6 to allow a .5 track increment (now that causes automatic half tracking) and will not attempt to write to the copy diskette if the READ wasn't O.K. It also reduces the amount of self sync written to the copy diskette.

In order to produced spiraled copies, you must also define the track length, and synchronize the tracks. If your copy does not work, try slowing the D-speed of the copy drive a few units (up to +10)

DYNAMIC ADDRESS MARKS CHANGE

Some copy protection methods change the address marks for each track on the disk. The address marks for the NEXT track are usually tacked on the end of the current track. The way it works is like this. The loader for the diskette finds the address marks for the current track, reads in the data, and then reads a new set of address marks. The track is incremented, and the process begins again with the new address marks. In most cases, it isn't necessary to copy tracks by address marks, but it can be done. We will use this method to copy several programs like Choplifter, because without address marks, some BETA test sites didn't have as consistent results as we would have liked.

TO INVOKE DYNAMIC MODIFICATION OF ADDRESS MARKS CHANGE PARM 24 TO 40. The next address marks are expected 6 bytes back from the end of the end of the track, (as defined by parms 0E and 0F) and in reverse order. For example, Choplifter inserts the next tracks address marks \$807 bytes from the beginning of the track. Bytes \$807 to \$809 contain the marks for the next track, in reverse order. Bytes \$80A to \$80C contain some other information. Adding 6 to \$807 gives a track length of \$80D. Setting the track length parms 0E to 0D and 0F to 08 will chop off the track at the proper place and define the next tracks address marks. Some programs, like A.E. put the address marks for the next track in forward order.

TO DEFINE THE NEXT TRACKS ADDRESS MARKS IN FORWARD ORDER, CHANGE GLOBAL PARM DF8B TO BD.

Choplifter back up instructions will then look like this:

```
CHOPLIFTER 0 - B : 1 7
  ERASE TRACKS C - 22
  C - 1E.5/.5 : 1 4 : (D5 AA D4): S : SPIRALING PARMS
    0E=0D, 0F=08, 24=40 27=01
  NEW DISK (clear status display)
  20 - 21 : 1 7
```

These instructions mean copy tracks 0 - B using options 1 and 7. Using option 3 from the main menu, erase range of tracks C - 22. Change parm 0E to 0D, 0F to 08, 24 to 40, 27 to 01, and set address marks to D5 AA D4. Make the spiraling global parm changes, and finally copy tracks C to 1E.5 (incrementing by .5 and using options 1 and 4). DO NOT USE OPTION 7 WHEN USING THE .5 TRACK INCREMENT! Copy tracks 20 and 21 using options 1 and 7. At this point, you can spend the rest of your evening playing your back up of choplifter without worrying about the program diskette.

REDUCED ERROR CHECKING

It is possible to reduce the amount of error checking used by BACK IT UP III. Most of the time, this is not a good idea, but once in a while (programs such as LANCASTER or the last few tracks of BANK STREET WRITER) it is easier to reduce the amount of error checking performed. In cases such as the new LANCASTER (you can't find

anything that looks like sectors or data in the new version), BACK IT UP III's full error checking does not produce any better copies. To reduce error checking, make the following global parameter changes:

```
C8F8 = F0 C8F9 = 2D
BACK IT UP III BACK UP INSTRUCTIONS
```

*** BUSINESS SOFTWARE ***

APPLEWRITER PREBOOT 0 -- 22 : 1 7

APPLEWRITER II 0 -- 22 : 1 7

APPLEWRITER /// 0 -- 22 : 1 4 7

BANK STREET WRITER 0 -- 22 : 1 7

0 -- 19 : 1 7

OR...

1A -- 22 : 1 7 (reduced error checking. Copy tracks with 'N' using opt. 3)

OR...

1A -- 22 : 3 7 S

BANK STREET WRITER (alternate SCHOLASTIC version)

0 -- 1 : 1 4 7

3 -- 1C : 1 4 7

spiraling parms & erase tracks 2 -- 3

2 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08

2.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)

3.0 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)

BPI (all software) 0 -- 22 : 2 6 7 S

CATALYST (by QUARK ENG. for the APPLE ///) 0 -- 22 : 1 4 7

CHEQUE MATE PLUS 0 -- 22 : 1 4 7

COMPLETE GRAPHICS SYSTEM 0 -- 22 : 1 4 7

DATA REPORTER 0 -- 22 : 2 4 6 7 *

DATA SPECTRUM 0 -- 2 : 1 4 5

3 -- 22 : 1 4 7

DEALER SERVICE DIAGNOSTICS 0 -- 22 : 1 7

DB MASTER (3.0 -- 3.02) : 0 -- 5 : 1 4 6 7 : 0C = 01

6.5 -- 22.5 : 1 6 7

DESK TOP PLANNER 0 -- 22 : 2 6 7

DICTIONARY (ON LINE) see instructions for Screen Writer II

DOCTORS OFFICE COMPANION 0 -- 22 : 1 7 *

DOLLARS AND CENTS 0 -- 22 : 2 4 7
 15 : 2 4 5 7

EXEC BRIEFING 0 -- 22 : 1 4 7 (disk speed critical)

EXEC BRIEFING FONTS (see EXEC BRIEFING)

FIRST CLASS MAIL 0 -- 22 : 1 4 7

FORTRAN 0 -- 22 : 1 7

GENERAL MANAGER 1 -- 22 : 2 4 7 (if copy fails then recopy 0
 0 : 2 7 : 00 = C9 : S

GRAPHICS PROCESSING SYSTEM 0 -- 22 : 1 4 7

HOME ACCOUNTANT (SOFTSMITH)
 0 : 1 7
 3 -- 22 : 1 7
 spiraling parms -- erase tracks 3 & 4
 1 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=0B
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 2 : 1 4 : (D5 AA 96 AA AA AA AF AB AF AB)

HOMEWARD see Screenwriter II

HOMEWARD SPELLER see Screenwriter II

INCREDIBLE JACK 0 -- 22 : 1 7

INFORMATION MASTER 0 -- 22 : 2 4 7 *

INSTANT RECALL 0 -- 22 : 2 4 6 7 *

MAGIC MAILER 0 -- 22 : 2 4 7 *

MAGICCALC 2.0 0 -- 22 : 2 4 7 *

MAGIC OFFICE SYSTEM 0 -- 22 : 2 7

MAGIC WINDOW II 2.0 0 -- 22 2 4 7

MASTER DIAGNOSTICS 0 : 1 5 7
 1 -- 22 : 1 7 (ignore track with 'no data')

MULTIPLAN PREBOOT 0 -- 22 : 1 4 7

PERSONAL FINANCE MANAGER : 0 -- 22 : 1 7

PFS (all versions including ///) 0 -- 22 : 2 4 6 7 WP

PRACTICAL ACCOUNTANT 0 -- 22 : 2 7 : S : 27=1

PRISM PRINT 0 -- 22 : 1 4 7

SCREENWRITER II 1 -- 22 : 2 4 7 (if copy fails recopy 0
 0 : 2 6 7 : 00 = C9 S

SUPER TEXT 0 -- 22 : 1 7

VIDEX PREBOOT 0 -- 22 : 1 7

VISICALC 16 0 -- 16 : 2 6 7 (no data on track 1)

VISICALC /// 0 -- 22 : 1 4 7

VISI(everything else) 0 -- 22 : 2 6 7

WORD HANDLER (vers. 3.4) 0 : 2 4 6 7
 1 -- C : 3 4 6 7
 11 -- 22 : 1 7

*** HOBBY/HOME/UTILITYS ***

APPLE-CILLIN 0 -- 22 : 1 4 7

AUTO ATLAS 0 -- 22 : 2 4 7 *

BAG OF TRICKS 0 -- 22 : 1 4 6 7 : 0C=02

BANK STREET WRITER (see business listings)

BILL BUDGES 3-D GRAPHICS 0 -- 22 : 1 7 (no data on many tracks)

BLACKJACK STRATEGY 0 -- 22 : 1 7 *

BRAINSURGEON (old) 0 -- 23 : 1 7 (yes 23!)

COLORING BOARD 0 -- 22 : 1 4 7 *

COMPLETE GRAPHIC SYSTEM 0 -- 22 : 1 7 *

DISK LIBRARY 0 -- 22 : 2 4 7 *

DISK MUNCHER 1.1 0 -- 22 : 1 4 7 *

EINSTEIN COMPILER 0 -- 22 : 1 4 7

ELECTRIC DUET : 00 -- 22 : 1 7

EXPEDITER (new) 0 -- 22 : 1 4 7

E-Z DRAW 0 -- 22 : 1 7

GENESIS 0 -- 22 : 1 7

GRAPHIC SOLUTION 0 -- 22 : 1 4 7

HAYES TERMINAL PROGRAM 0 -- 22 : 2 7

HOME ACCOUNTANT : 0 -- 22 : 1 7
 HOMEWARD see Screenwriter II
 HDS STATISTICS 0 -- 22 : 2 4 6 7 *
 MUSIC MAKER 0 -- 22 : 1 7
 PINBALL CONSTRUCTION SET 0 -- 22 : 1 7 :no data 6-7, F-10, 12, 1C-22
 PRINT SHOP 0 -- 21 : 1 7 sect mod (16 sect) 12/9 F4=60
 3-D SUPER GRAPHICS 0 -- 23 : 1 7
 TRANSEND II : 0 -- 22 : 2 7 : S : 27=01
 WIZTYPE see SCREENWRITER II
 WIZMAKER 00 -- 22 : 1 7
 WRITE STUFF 0 -- 2 : 1 7
 5 -- 20: 1 7
 spiraling parms & erase tracks 3 -- 4
 3 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 3.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 4.0 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)
 ZOOM GRAPHICS 00 -- 22 : 1 4 7

 *** GAMES ***
 ABM 0 -- 22 : 1 7
 A.E. 0 : 1 7
 1.5 --C.5 : 1 7
 GLOBAL DF88 = BD
 E --1E.5/1.5 : 1 7 (D5 AA 96) : 24=40 0E=09 0F=18
 (side b use COPYA)
 ALI BABA 0 -- 22 : 1 6 7 : 0C=02
 APVENTURE ATLANTIS 0 -- 22 : 1 7
 ADVENTURE INTERNATIONAL HI-RES 0 -- 21 : 1 7
 GRAPHIC ADVENTURES 22 : 1 5 7
 ALIEN RAIN 0 -- F : 1 7
 APPLE ADVENTURE 0 -- 22 : 1 7
 APPLE PANIC 0 -- D : 1 7
 AUTOBAHN 0 -- 6 : 1 4 7 (no data 1-3)

9.5 -- C.5 : 1 4 7
 AZTEK 0 -- 22 : 1 7
 BATTLE FOR NORMANDY 0 -- 22 : 1 4 7
 BATTLE OF SHILOH 0 -- 22 : 1 4 7
 BEER RUN 0 : 1 4 6 7
 1.5 -- D.5 : 1 4 7
 BENEATH APPLE MANOR 0 -- 22 : 1 6 7 : 0C=02
 BEYOND CASTLE WOLFENSTEIN 0 -- 22 : 1 4 7 (note: tracks are long
 BOMB ALLEY 0 -- 22 : 1 4 7
 BORG 0 : 1 4 6 7
 1.5 -- B.5 : 1 4 7
 D -- 14 : 1 4 7
 BRUCE LEE 0 -- 22 : 1 5 7
 BUG ATTACK : 0 -- 12 : 1 4 7
 1D -- 22/5 : (AA D5) : 1 4 5 7
 CANNONBALL BLITZ 1 -- 22 : 2 7
 0 : 1 5 7
 CANYON CLIMBER 1 -- 22 : 1 7
 0 -- 11/11 : 1 5 7
 CARTELS & CUTTHROATS 0 -- 22 : 1 4 7
 CASINO 0 -- 22 : 1 7
 CASTLE WOLFENSTEIN 0 -- 22 : 1 4 7
 CASTLES OF DARKNESS : 0 -- 22 : 1 7
 CENTIPED 0 -- 22 : 1 7 (ignore error on track 22)
 CHOPLIFTER 0 - B : 1 7
 ERASE TRACKS C -- 22
 C -- 1E.5/.5 : 1 4 : (D5 AA D4) : S : SPIRALING PARMs
 0E=0D 0F=08 24=40 27=01
 NEW DISK
 20 -- 21 : 1 7
 COMPUTER AIR COMBAT 0 -- 22 : 1 4 7
 COMPUTER AMBUSH 0 -- 22 : 1 4 7
 GLOBAL PARMs 3DC9=D4 CDDE=B7
 sect. mod. (dos 3.2) 1F/4
 00=A9 01=00 02=85 03=00 04=60

COMPUTER BASEBALL 0 -- 22 : 1 4 7
 COMPUTER BISMARCK 0 -- 22 : 1 4 7
 COMPUTER QUARTERBACK 0 -- 22 : 1 4 7
 COPTS & ROBBERS 0 : 1 4 6 7
 1.5 -- F.5 : 1 4 7
 COSMIC BALANCE 0 -- 22 : 1 4 7
 GLOBAL PARMS 3DC9=D4 CDDE=B7
 sect. mod. (dos 3.2) 16/3
 00=A9 01=00 02=85 03=00 04=60
 COSMIC BALANCE II 0 -- 22 : 1 4 7
 COUNTY FAIR 0 -- 22 : 1 7
 COVETED MIRROR (both sides) 0 -- 22 : 1 7
 or try: 0 -- 22 : 2 7 : S : 27=01)
 CRANSTON MANOR 0 -- 22 : 1 7 (if copy fails, erase track 18)
 CRAZY MAZY 0 -- 22 : 1 7
 CROSS CLUES 0 -- 22 : 1 6 7 : 0C=02
 CROSSWORK MAGIC see listing under 'EDUCATIONAL SOFTWARE'
 THE CROSSWORK MACHINE: 0 -- 22 : 1 7
 CRUSH CRUMBLE AND CHOMP 0 -- 22 : 1 7
 CRYPT OF MEDIA 0 : 1 5 7
 1 -- 22 : 1 4 7
 8 : 1 4 5 7
 CUBIT 0 -- 22 : 1 5 : WP : if copy fails recopy track 0
 CUTTHROATS see SUSPENDED
 CYBORG 0 -- 22 : 1 7
 CYTRON MASTERS 0 -- 22 : 1 4 7
 DARK CRYSTAL see SCREENWRITER II
 DARK FOREST 0 -- 1F : 1 4 7 (no data 6-9)
 DAVID'S MIDNIGHT MAGIC (vers. 3.4 only)
 0 -- B : 1 7
 21 -- 22 : 3 7
 C -- 12 : 1 7 : (D5 FD F5) : 0E=15 0F=18 24=40
 13 -- 15.5/.5 : 1 4 : 0E=0D 0F=08 SPIRALING PARMS
 DEADLINE same as SUSPENDED

DEATH IN THE CARIBBEAN 0 -- 22 1 4 7
 DEFENDER 0 -- 22 : 1 7 (ignore error on track 22)
 DONKEY KONG 0 -- 22 : 1 7 (ignore error on track 22)
 DUNTZN 0 -- 22 : 1 4 7
 EAGLES 0 -- 22 : 1 4 7
 ELIMINATOR 0 -- 22 : 1 7
 21 : 1 5 7
 ENCHANTER see SUSPENDED
 EPIDEMIC! 0 -- 22 : 1 4 7
 ESCAPE FROM RUNGISTAN 0 -- 22 : 1 7
 sect. mod. 0/0 49=EA, 4A=EA, 4B=EA
 FALCONS 0 -- 1A : 1 7 (ignore errors -- not all tracks have data)
 1.5, 4.5, 5.5, 13.5, 14.5, 17.5, 18.5 : 1 7
 FATHOMS 40 1 -- 22 : 1 7
 0 -- 11/11 : 1 5 7
 FIGHTER COMMAND 0 -- 22 : 1 4 7
 FLIGHT SIMULATOR 0 -- 21/1.5 : 1 7
 7 -- 8 : 1 7
 9.5 : 1 7
 FLIGHT SIMULATOR (new version - A2 FS2) 0 -- 22 : 1 5
 GALACTIC ADVENTURES 0 -- 22 : 1 4 7
 GALACTIC ATTACK 0 -- 21 1 7
 22 1 5 7
 GALACTIC GLADIATORS 0 -- 20 : 1 4 7
 SET SPIRALING PARMS
 ERASE COPY TRACKS 21 -- 22.5
 21 -- 22.5/.5 : (D5 AA D5) 1 4 : : 0E=0D 0F=08
 GALAXIAN 0 -- 22 : 1 7 : (ignore errors on track 22)
 GAMMA GOBLINS 0 -- D : 1 4 7
 1.5 -- B.5 : 1 4 7
 GENETIC DRIFT 0 -- 3 : 1 7
 4.5 -- 6/1.5 : 1 7
 7.5 -- B.5 : 1 7
 D : 1 7
 E.5 -- 22.5 : 1 7

GEOPOLITIQUE 1990 0 -- 22 : 1 4 7
 GERMANY 1985 0 -- 22 : 1 4 7
 GOBBLER 0 -- 22 : 1 7 : (if copy fails erase track 3)
 GOLD RUSH 0 -- 22 : 1 7
 GORGON 0 : 1 4 6 7
 1.5 -- F.5 : 1 4 7
 GUADALCANAL CAMPAIGN 0 -- 22 : 1 4 7
 HELL FIRE WARRIOR 0 -- 22 : 1 7
 HI RES CRIBBAGE 0 -- 22 : 1 7 (if copy fails, erase track 3)
 HI RES ADVENTURES (#0 -#2) 0 -- 22 : 1 7
 IFR FLIGHT SIMULATOR 0 -- 22 : 2 4 7
 INFIDEL see SUSPENDED
 KABUL SPY (sides 1 & 2) 0 -- 22 : 1 7
 (side 1 only) sect. mod. 0/4 79=EA, 7A=EA, 7B=EA
 KNIGHT OF DIAMONDS 0 -- 22 : 1 4 7 (both sides) WP program side
 KNIGHTS OF THE DESERT 0 -- 22 : 1 4 7
 LABYRINTH (see choplifter)
 LACANSTER (old version) 0 -- 22 : 1 7 :(set D speed to + 10)
 (new version) 0 -- 22 : 1 7 :(set D speed to + 10
 reduced error checking recopy tracks with No data
 or use decode option 3)
 LAFF PAK 1 -- 22 : 2 6 7 S
 0 : 1 5 7:
 LOGO 0 -- 22 : 1 7
 1 : 1 5 7 (AA D6 EE)
 LOVERS OR STRANGERS 0 -- 22 : 1 4 7
 LOWER REACHES OF APSHAI 0 -- 22 : 1 7
 MARAUDER : 0 -- 22 : 2 7
 SECT. MOD. 11/7: 90=60 (DOS 3.3)
 MARIO BROS 0 -- 22 : 1 7 (disregard errors on track 22)
 MASK OF THE SUN 0 -- 22 : 1 7
 Sect. Mod. 0/3: 25=18 26=60

2/E: 31=60

MASTER TYPE 0 -- 22 : 1 7
 MICROBE 0 -- 22 : 1 7
 MICROSCOPIC JOURNEY 0 -- 22 : 2 4 6 7 *
 MICROWAVE 0 -- 22 : 1 7
 11 : 1 7 : (AA D5) : 1 5 7
 MINER 2049er 0 : 1 5 7
 1 -- 22 : (D3 96 F2) : 1 4 6 7 : 27=01 : S
 MISSING RING 0 -- 22 : 1 7
 MOUSKATTACK 1 -- 22 : 2 6 7 S
 0 : 1 5 7
 MING'S CHALLENGE same as Miner 2049er
 MISSION ESCAPE 0 -- 10 : 1 7
 NIGHT MISSION PIN BALL 0 -- 22 : 1 7
 MY SIDE OF THE MOUNTAIN 0 -- 22 1 7 *
 NAPOLEON'S CAMPAIGNS 0 -- 22 : 1 4 7
 NORTH ATLANTIC 86 0 -- 22 : 1 4 7
 ODYSSEY 0 -- 22 : 1 7
 OO- TOPOS: 0 -- 22 : 1 7
 OBRITRON 0 : 1 4 7
 1.5 -- E.5 : 1 4 7
 OPERATION APOCALYPSE 0 -- 22 : 1 4 7
 OUTPOST 0 : 1 4 7
 1.5 -- B.5 : 1 4 7
 PACMAN 0 -- 22 : 1 7 (ignore errors on track 22)
 PEGASUS II 0 -- 22 : 1 7 (if copy fails erase track 3)
 PANDEMONIUM 0 -- 22 1 7 *
 PLANETFALL see SUSPENDED
 POOL 1.5 0 -- 22 : 1 4 7 (several tracks do not contain data)
 THE PRISONER 0 -- 22 : 1 7

PRESIDENT ELECT 0 -- 22 : 1 4 7
 PROFESSIONAL TOUR GOLF 0 -- 22 : 1 4 7
 QUEEN OF HEARTS 0 -- 22 : 1 4 7
 QUEST (both sides) 0 -- 22 : 1 7
 QUESTRON 0 -- 22 : 1 4 7
 RAILS WEST 0 -- 22 : 1 4 7
 RASTER BLASTER 0 : 2 4 6 7 S
 1.5 : 3 4 6 7 S
 3.5 -- F.5/4 : 3 4 6 7 S
 5 -- 11 /4 : 3 4 6 7 S
 6 -- 12 /4 : 3 4 6 7 S
 RDF 1985 0 -- 22 : 1 4 7
 REAR GUARD 0 -- 22 : 1 7
 21 : 1 5 7
 RENDEZVOUS same as Miner 2049er
 REVERSAL 0 -- 22 : 1 7
 3.5 : 1 7
 ROAD TO GETTYSBURG same as Galactic Gladiators
 ROBOT WAR 0 -- 22 : 1 7
 RINGSIDE SEAT 0 -- 22 : 1 4 7
 SARGON III 0 -- 22 : 1 4 7 0C=20 1B=40 1B=02 1C=ED 1D=AA
 S.C.I.M.M.A.R.S. 0 -- 22 : 1 7
 SEA FOX (see choplifter)
 SEA DRAGON 0 -- 21 : 1 7
 22 : 1 5 7
 SEUIS 0 -- 22 : 1 4 7
 SERPENTINE (see choplifter)
 SERPENT'S STAR 0 -- 2 : 2 4 5
 3 -- 22 : 2 4
 SHATTERED ALLIANCE 0 -- 22 : 1 4 7
 SHERWOOD FOREST 0 -- 22 : 1 4 7 :0C=01
 SINGLE'S NIGHT AT MOLLY'S 0 -- 22 : 1 7 *

SNACK ATTACK 0 -- 11 : 1 7
 sect. mod (dos 3.2)
 0/3 46=18 47=60 A9=18 AA=60
 SNAKE BYTE 0 : 1 4 6 7
 1.5 -- F.5 : 1 4 7
 SNEAKERS 0 : 1 4 6 7
 1.5 -- F.5 : 1 4 7
 SNOGLE 0 -- D : 1 7
 SOFT PORN 0 -- 22 : 1 7 (if copy fails erase track 3)
 SORCEROR see SUSPENDED
 SOUTHERN COMMAND 0 -- 22 : 1 4 7
 SPACE QUARKS 0 -- 3 : 1 7
 3.5 -- 5.5 : 1 7
 7 : 1 7
 A.5 -- B.5 : 1 7
 D -- 15 : 1 7
 SPACE VIKINGS 0 -- 22 : 1 4 7
 SPY'S DEMISE 0 -- 11 : 1 7
 STANDING STONES 0 -- 21 : 1 7
 sect mod 11/3 05=18 06=60
 STAR BLAZER (see Choplifter)
 STARGATE 0 -- 22 : 1 7 (ignore error on 22)
 STAR THIEF 0 -- 13 : 1 7
 22 : 1 5 7
 STARCROSS 0 -- 22 : 1 7
 SUPER STELLER TREK 0 -- 22 : 1 7
 SUSPENDED 0 -- 22 : 1 7
 or 0 -- 22 : 2 6 7 : S
 SWASHBUCKLER : 0 -- 22 : 1 7
 T.A.C. 0 -- 22 : 1 7 *
 TEMPLE OF APSHAI 0 -- 22 : 1 7
 THIEF 0 -- 22 : 1 4 7
 THRESHOLD 0 -- 22 : 1 7 (if copy fails erase track 3)

TIGERS IN THE SNOW 0 -- 22 : 1 4 7
 TIME ZONE 0 -- 22 : 2 4 6 7 (disk 1 -- all others use given copy prog)
 TRANSYLVANIA 0 -- 22 : 1 7
 TWERPS 0 : 1 4 7
 1.5 -- E.5 : 1 4 7
 ULTIMA I 0 -- 22 : 1 7
 ULTIMA II 1 -- 22 : 2 6 7 S
 0 : 1 7 : 00=C9
 ULTIMA III (side 1) 0 -- 10 : 1 7
 or 0 -- 10 : 2 7 : S : 27=01
 (side 2) 0 -- 22 : 1 7
 ULYSIS AND THE GLODEN FLEECE 0 -- 22 : 1 7
 (if copy fails erase track 3)
 WARP FACTOR 0 -- 22 : 1 4 7
 WITNESS see SUSPENDED
 WIZMAKER 0 -- 22 : 1 7
 WIZZARD AND THE PRINCESS 0 -- 22 : 1 7
 WIZZARDRY 0 -- 22 : 1 4 7 (both sides) WP program side
 WIZZARDRY III (both sides) 0 : 1 5 7
 1 -- 21 : 1 4 7
 22 : 1 4 7 : 0B=04 16=10 17=00
 XYPHUS 0 -- 22 0 -- 11 : 2 7 : S : 27=01
 ZAXXON 0 -- 13/13 : 2 5 7 : S : 27=01
 1 -- 12 : 2 7
 14 -- 16 : 2 7 (later versions only)
 ZENITH same as Choplifter
 ZORK I, II, & III copy like SUSPENDED

*** EDUCATIONAL ***

ALGEBRA I
 0 : 1 7
 3 -- 22 : 1 7 ignore errors on innermost tracks
 spiraling parms -- erase tracks 1 & 2
 1 : 1 4 : (D5 AA 96 AA AA AA AA AF AF AF AF) 0E=20 0F=08
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)

2 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF)
 BANK STREET WRITER (see business)
 BIG MATH ATTACK
 0 : 1 7
 3 -- 7 : 1 7 ignore errors on innermost tracks
 spiraling parms -- erase tracks 1 & 2
 1 : 1 4 : (D5 AA 96 AA AA AA AA AF AF AF AF) 0E=20 0F=08
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)
 2 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF)

BOP-A-BET see SCREENWRITER II

BUMBLE GAMES
 0 -- 2 : 1 7
 5 -- 1A : 1 7
 spiraling parms -- erase tracks 3 & 4
 3 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 3.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 4 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)

BUMBLE PLOT
 0 -- 2 : 1 7
 5 -- 1E : 1 7
 spiraling parms -- erase tracks 3 & 4
 3 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 3.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 4 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)

CONGLOMERATES COLLIDE
 0 : 1 7
 3 -- 1B : 1 7 ignore errors on innermost tracks
 spiraling parms -- erase tracks 1 & 2
 1 : 1 4 : (D5 AA 96 AA AA AA AA AF AF AF AF) 0E=20 0F=08
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)
 2 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF)

CRICKET IN TIMES SQUARE 0 -- 22 : 1 7 *

CROSSWORD MAGIC (OLD VERSION) 0 -- 22 : 2 4 6 7 : 0C = 01
 (both sides) SECT. MOD. 0/9 0E=4C 0F=17 10=BF

CROSSWORD MAGIC (NEW VERSION) (player side) 0 -- 22 : 1 4 7
 (maker side) 0 : 1 4 7
 3 -- 22 : 1 4 7

SPIRALING PARMS : erase tracks 1 -- 2
 1 : 1 4 (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 1.5 : 1 4 (D5 AA 96 AA AA AA AA AB AE AB AE)
 2.0 : 1 4 (D5 AA 96 AA AA AA AA AF AB AF AB)

DELTA DRAWING (will be one of the following
 0 -- 22 : 1 7 (no data on 1 track copy drive must
 have D-speed set to 0)
 or 0 -- 22 : 1 7 (recopy track 0 until it boots or

sector mod 0/5 CA=EA)
 or 0 -- 22 : 1 7 0C=02 18=40 1B=02 1C=ED 1D=AA

DRAGON'S KEEP see Screenwriter II

EDUWARE (all products) 0 -- 22 : 1 4 7

EARLY GAMES 0 -- 22 : 1 7

ERNIES QUIZ 0 -- 22 : 1 7

FACEMAKER see DELTA DRAWING

FRACTION FEAVER same as DELTA DRAWING

FRACTIONS
 0 : 1 7
 3 -- 22 : 1 7 ignore errors on innermost tracks
 spiraling parms -- erase tracks 1 & 2
 1 : 1 4 : (D5 AA 96 AA AA AA AA AF AF AF AF) 0E=20 0F=08
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)
 2 : 1 4 : (D5 AA 96 AA AA AA AA AA AF AA AF)

FRY READABILITY PROGRAM 0 -- 22 : 1 7

GUINNESS BOOK OF RECORDS FRACTIONS 0 -- 22 : 2 4 6 7 *

GERTRUDES PUZZLES 0 -- 22 : 1 7 *

HEY DIDDLE see DELTA DRAWING

HODGE PODGE 0 -- 22 : 1 7

HUMAN BODY 0 -- 22 : 2 4 6 7 *

IN SEARCH OF THE MOST AMAZING THING (same as DELTA DRAWING)

INSTANT ZOO 0 -- 22 : 1 7

ISLAND OF THE BLUE DOLPHIN 0 -- 22 : 1 7 *

JIGSAW 0 -- 22 : 2 4 6 7 *

KINDER COMP (same as DELTA DRAWING)

LITTLE COUNTER
 0 : 1 7
 3 -- 17 : 1 7 ignore errors on innermost tracks
 spiraling parms -- erase tracks 1 & 2
 1 : 1 4 : (D5 AA 96 AA AA AA AA AF AF AF AF) 0E=20 0F=08
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)
 2 : 1 4 : (D5 AA 96 AA AA AA AA AA AF AA AF)

LITTLE SPELLER 0 : 1 7
 0 : 1 7

3 -- 1E : 1 7 ignore errors on innermost tracks
 spiraling parms -- erase tracks 1 & 2
 1 : 1 4 : (D5 AA 96 AA AA AA AA AF AF AF AF) 0E=20 0F=08
 1.5 : 1 4 : (D5 AA 96 AA AA AA AA AF AA AF AA)
 2 : 1 4 : (D5 AA 96 AA AA AA AA AA AF AA AF)

LOGO 0 -- 22 : 1 7
 1 : 1 5 7 (AA D6 EE)

LOGO (KRELL) 0 : 1 5 7
 1 -- 22 : 1 7 (ignore 'no data' on 1 track)

MATH MACHINE 0 -- 22 : 1 7 *

MATH STRATEGY 0 -- 22 : 1 7

MILLIONAIRE 0 -- 22 : 2 5 7 (disk speed critical) *

MIX AND MATCH 0 -- 22 : 1 7

MOPTOWN 0 -- 22 : 1 7

MOPTOWN HOTEL
 0 -- 2 : 1 7
 5 -- 1E : 1 7
 spiraling parms -- erase tracks 3 & 4
 3 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 3.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 4 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)

MOPTOWN PARADE
 0 -- 2 : 1 7
 5 -- 1A : 1 7
 spiraling parms -- erase tracks 3 & 4
 3 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 3.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 4 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)

NUMBER STUMPER see alternate SCHOLASTIC BANK STREET WRITER

PARENT REPORT 0 -- 22 : 1 4 7 *

PILOT (APPLE'S) 0 -- 22 : 1 7

PILOT (MUSE) 0 -- 22 : 1 7

ROCKY'S BOOTS
 0 -- 2 : 1 7
 5 -- 21 : 1 7
 spiraling parms -- erase tracks 3 & 4
 3 : 1 4 : (D5 AA 96 AA AA AA AA AB AA AB) 0E=20 0F=08
 3.5 : 1 4 : (D5 AA 96 AA AA AA AA AB AE AB AE)
 4 : 1 4 : (D5 AA 96 AA AA AA AA AF AB AF AB)

SAMMY LIGHTFOOT 0 -- 22 : 1 4 7

SAT (BARRON'S) 0 : 1 5
1 -- 22 : 1 7

SAT ENGLISH new versio (both sides) 0 -- 22 : 1 4 7

SAT (HARCOURT, BRACE, JOVANOVICH) 0 -- 22 : 1 7
recopy track 0 until copy boots or sector mod 0/5 CA=EA

SNOOPERS TROOPERS see DELTA DRAWING

SPEED READER 0 -- 22 : 2 4 5 7 (copy again if it doesn't boot) *

SPELLING STRATEGY 0 -- 22 : 1 7

SPOTLIGHT 0 -- 22 : 1 7

STORY MACHINE see DELTA DRAWING

SUMMER OF THE SWANS 0 -- 22 : 1 7 *

SUPER MAP (old version) 0 -- 22 : 2 4 6 7 *

SUPER PILOT 0 -- 22 : 1 7

THE NEW STEP BY STEP 0 -- 22 : 1 4 7

TROLL'S TAIL see Screenwriter II

WHOLE BRAIN SPELLING 0 -- 11 : 2 4 7 *

THE WORD 0 -- 22 : 2 4 6 7

WORD CHALLENGE set drive speed to +10
0 -- 22 : 2 7 : 10=04

WORD MASTER 0 -- 22 : 2 4 7 *

WORD SPINNER see BANK STREET WRITER alternate SCHOLASTIC VERSION

NOTE: A '*' MEANS BACK UP INSTRUCTIONS SUPPLIED BY THE BACK IT UP
USER'S GROUP