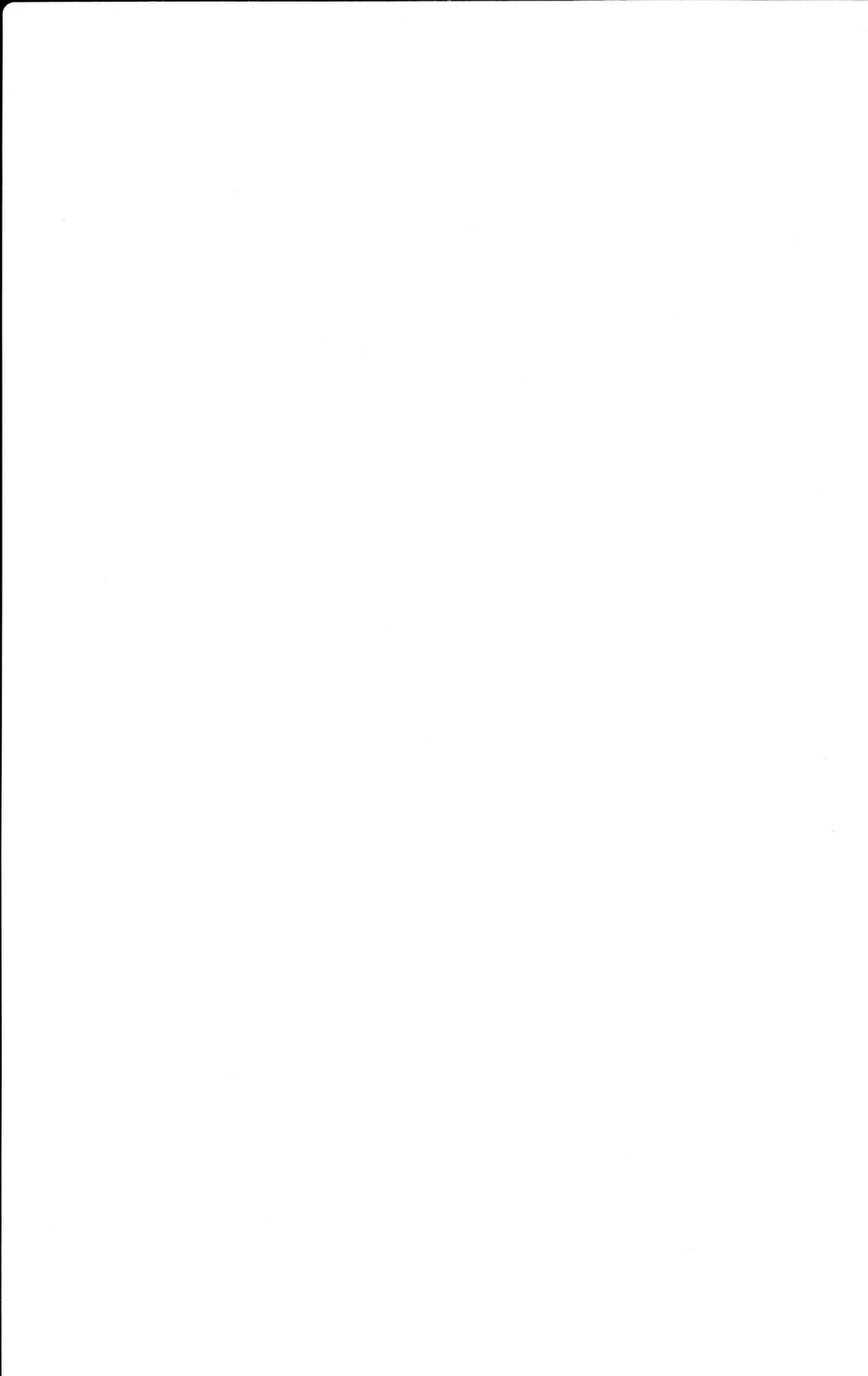


**TOTAL ACCURACY**  
COPY PROGRAM

***ALF***

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# TOTAL ACCURACY

## COPY PROGRAM

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**ALF PRODUCTS INC.**

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Part number: 11-1-4B

The "Total Accuracy" Copy Program draws on ALF's years of experience in disk copying to give you an accurate copying program with many advanced features.

1 You'll find Total Accuracy is fast and easy to use (especially if you have two or more disk drives). Each copy is automatically verified to check for bad media or other problems. And the "verify" option lets you check the copy on another drive, for extra confidence.

When you purchased Total Accuracy, you really purchased this extra confidence. The next time you accidentally lose a file, there's no need for that awful feeling deep in the pit of your stomach. Why, you'll probably smile as you reach for your backup disk to restore your damaged file. No backup disk? You'll find that Total Accuracy is so fast, and so easy to use, you'll be making backups more often. And spending less time re-entering lost files.

Total Accuracy does not copy "protected" disks. It is used only for making very reliable copies of standard, unprotected disks.

To use the Total Accuracy Copy Program, you need an Apple II compatible computer (an Apple IIe, a Franklin Ace, or a 48K or 64K Apple II or Apple II+) with Applesoft BASIC, one or more Apple Disk II drives with controller (or exact equivalents), and a video monitor (or television set with modulator).

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**PROGRAM CONFIGURATION**

To use the Total Accuracy Copy Program, you must first configure it for your particular system set-up. It's easy. First, "boot" the disk (Total Accuracy is supplied on a DOS 3.3 disk). A menu is displayed:

TOTAL ACCURACY COPY PROGRAM.

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ALF PRODUCTS INC.

1. BRUN COPY
2. CONFIGURE COPY
3. CHECK DRIVE SPEED
4. EXIT TO BASIC
- ?

To select "configure copy", type 2 and press RETURN. The configuration program shows:

MASTER 0 S6D1  
SLAVE 1 S6D2

(10 TO STOP) MASTER/SLAVE NUMBER?

When copying a disk, you'll place the disk to be copied in the "master" drive and the disk you want to copy onto in the "slave" drive. If you wish to make several copies of the same disk, you can set the program to use several slave drives (assuming you have several drives). The setting shown above has S6D1 (the drive

plugged into the "drive 1" connector of a controller plugged into slot 6) as the master drive and S6D2 (the drive plugged into the "drive 2" connector of the same controller card) as the slave drive. This is the most common configuration. If you wish to use this setting, type 10 and press RETURN to go on to the next question.

Another common configuration would be a one drive system with the controller card in slot 6. As above, the master drive would be S6D1. Since there is only one drive on the system, the slave drive must be removed. You type 1 and press RETURN (to select SLAVE 1 for modification). The screen shows:

(0 TO REMOVE) SLOT NUMBER?

Since you wish to remove SLAVE 1, you would type 0 and press return. The screen would be updated to show:

MASTER 0 S6D1

(10 TO STOP) MASTER/SLAVE NUMBER?

This indicates SLAVE 1 has been removed. Now type 10 and press RETURN to go on to the next question.

Other set-ups are discussed in the Configuration section later on. After answering 10 (as in 10 TO STOP), the program asks:

ERASE DOS?

Usually, you'll want to type NO and press return. (NOTE: if you're using an Apple IIe, a Franklin Ace, or any other system with lower case letters, be sure

CAPS LOCK is ON.) If you type YES, the program will erase the DOS system in memory (not on the disks being copied) when it is run. This allows the program to use more memory and thus copy faster. However, if you type YES, you'll have to reboot when you're finished copying. The next question is:

DESTROY POWER SUPPLY?

Type NO and press RETURN. See the Configuration section for details. The next question is:

INITIAL FORMAT (13/16)?

Answer 13 if you'll normally be copying 13-sector disks or 16 if you'll normally be copying 16-sector disks. (You'll still be able to copy either, this just selects which mode the program assumes when you run it.) If you answer 13, the next question is:

INITIALLY SET WITH \*?

Type NO. This option will be explained later. This question is not asked if you answered 16 to "INITIAL FORMAT (13/16)?". Next,

INITIALLY SET WITH -?

is asked. Type NO. This option will also be explained later. This sounds mysterious, but don't worry; it isn't important. The next question is:

INITIALLY COPY OR VERIFY?

Probably, you'll want to answer COPY. When you press RETURN after answering COPY (or VERIFY), the configuration program will store a revised version of the program on disk. If you've write-protected the



Total Accuracy disk, you'll have to unprotect it so the new version can be saved.

A more complete explanation of the options just glossed over is given in the Configuration section. But now you'll want to go on to:

## DRIVE SPEED ADJUSTMENT

The Total Accuracy Copy Program is probably unlike other copy programs you may have used. Since it is designed for speedy operation, it doesn't check the drive speed for every copy. After all, the drive speed doesn't vary much over time, and keeping your drive speed accurate is a good idea anyway. Before using the copy program, you should check your drives' speeds to make sure they're within the tolerances required by the Total Accuracy Copy Program. You'll need a blank disk and a slight fondness for endless columns of numbers.

First, reboot the disk or type RUN HELLO to get back to the menu. Then select option 3 (CHECK DRIVE SPEED). The screen shows:

```
COPYRIGHT (C) 1981 ALF PRODUCTS INC.  
S D SPEED WRITE READ HOME TRACK ØØ
```

There will be a solid block "cursor" between the S and the D to indicate you must type the slot number of the drive to be adjusted. If your drive(s) are plugged into slot 6, press 6. (Do not press RETURN. The RETURN key is not used while using the speed adjustment program.) Now the cursor moves to after the D, indicating you should type the drive number. To test drive 1, press 1. Blocks light up on the S, W, R, H, and T to indicate these commands may now be used. (These commands are described in the Maintenance

section.) To use the SPEED command, you must remove the Total Accuracy disk (or whatever disk is in the drive), and insert a disk that will be erased. Select a disk in good condition, of the brand you usually use. For safety, commands which write on the disk can be activated only while the control key is held down. Hold down the control key and press S.

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The command display changes to NOW MIN MAX VAR, and columns of numbers appear above each label. The copyright notice drifts slowly up into the sunset. The numbers above NOW indicate the current drive speed, the number closest to the word NOW (the bottom number) being the most recent. Normal drive speed is 300 RPM, which is a rotation period of 0.2 seconds. The number shown is how much the period is different than 0.2 seconds, in 40 microsecond units (accuracy is about plus or minus 4 units). - numbers indicate a slow motor speed, while + numbers indicate a motor speed which is too fast. A "beep" sound indicates the speed cannot be computed (probably the disk is write protected).

The MIN column shows the slowest speed so far, and the MAX column shows the fastest. The VAR column shows MAX-MIN, or the speed variance. You'll notice that the drive speed changes as the drive warms up. Starting from a completely cool drive (at normal room temperatures), you should let the speed command run for about 30 seconds. Ideally, MIN and MAX should now be about equal but opposite in sign (MIN -008 and MAX +007, for example). The Total Accuracy Copy Program will function with MIN down to -050 and MAX up to +050. If your drive speed isn't getting close to these extremes, there's no need for readjustment (skip to NEXT DRIVE below). Note that if after 30 seconds the VAR number is large (say, greater than 25) your drive probably needs repair.

If you need to adjust your drive's speed, just follow this simple procedure. You'll need a Phillip's screwdriver and a small regular slotted screwdriver. Note that opening your disk drive may void its warranty. First, be sure the "IN USE" light is off (press SPACE to stop the speed test). Remove the cover by removing the four screws on the bottom, and sliding the cover off away from the front of the drive. Inside are two circuit cards, a large one covering most of the top of the drive and mounted horizontally, and a small one at the rear mounted vertically. Don't change anything on the large card. The speed adjustment is on the small card, at the far right of the card, and is slotted for turning with a small screwdriver.

Turning this adjustment will change the drive speed. After pressing control-S to begin the speed test, watch the NOW column to see the effect as you turn the adjustment slightly. Try to get the NOW column going slightly - and slightly +. After each adjustment of the speed control, press a key (most any key except space) to reset MIN, MAX, and VAR. Verify that MIN and MAX are about equal (as described above). When you're satisfied, press SPACE to turn off the motor, let the drive cool for a couple of minutes, and press control-S to start the test again. After about 30 seconds, MIN and MAX should be roughly equal but opposite in sign. If not, repeat the adjustment procedure.

Now, be sure "IN USE" is off (press SPACE to stop the speed test). Make sure the ribbon cable is connected firmly onto the large circuit card. Slide the cover on (from the back, sliding toward the front), watching to make sure the paper "vent hole" cover isn't catching on the back of the case. Replace the four bottom screws.

**Next drive:** repeat the speed test procedure for all drives. After pressing SPACE to stop the speed test, press the slot number of the drive to be tested (for example, press 6 if your next drive is connected to slot 6). Then press the drive number (1 or 2). Now insert the disk to be erased by the speed test into the selected drive, and press control-S to begin the speed test as usual. To exit the testing program, press control-RESET, then type FP (return).

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Accurate speed adjustment is one factor in reliable drive operation. You should check your drives' speeds again regularly. Test them once a month to begin with. If no adjustment is needed, test them less often.

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Using the Total Accuracy Copy Program is easy. Unlike most previous copying programs, it doesn't have to "format" or "initialize" the disk prior to copying data onto it. The writing of both format information and data is done simultaneously in one step. Also unlike most copying programs, Total Accuracy then reads the format information and data from the copied disk and compares it with the format and data read from the disk being copied. This helps assure that the copy is correct, and also serves to help find disks with physical defects.

### THE USUAL PROCEDURE

**3** Most systems have two drives, and the simplified configuration procedure given in the Setting Up section is sufficient to set up the COPY program. (For non-standard systems, it is important to read the Configuration section.) To copy a disk, use option 1 (BRUN COPY) from the menu, or just insert a disk containing a configured COPY program and type BRUN COPY. In a typical set-up, the screen shows:

16 SECTOR.

MASTER 0 S6D1

SLAVE 1 S6D2

COPYRIGHT (C) 1981 ALF PRODUCTS INC.  
PRESS SPACE TO  
COPY

The "master" disk is the disk to be copied. The "slave" disk is a blank disk (or a disk whose previous contents are no longer needed) which the master disk's

contents will be written onto.

Copying is as easy as the screen makes it look. Insert the disk to be copied in the drive identified as the "MASTER Ø" drive (in this example, drive 1 of a controller card plugged into slot 6: S6D1). Then insert the disk to be copied onto in the drive identified as the "SLAVE 1" drive (here, S6D2). Now just press the SPACE bar to begin copying. "PRESS SPACE TO COPY" is replaced by 8 COPY (or 6 COPY if you said YES to ERASE DOS?). The copy program begins by reading 4 tracks of the master disk (5 tracks with the ERASE DOS? option). It then writes those 4 (or 5) tracks onto the slave disk, reading each track after it is written to insure accuracy.

The copy program then decrements the "countdown number" on the screen (8 COPY to 7 COPY or 6 COPY to 5 COPY), and reads more tracks of the master. Again, these are written onto the slave. In all, 35 tracks must be copied in this fashion. When the countdown number decrements from 1 to Ø, a small "bip" of the Apple's speaker indicates the last few tracks are being copied. After the last tracks are written onto the slave, a louder "beep" occurs, and Ø COPY is replaced with PRESS SPACE TO COPY. This indicates copying is finished and the copy is good.

If you wish to make another copy of the same master, remove the slave disk and insert another blank disk. If you wish to make a copy of a different disk, insert a new master and slave disk. In either case, simply press the SPACE bar to begin copying again. If you wish to exit the COPY program, press control-RESET, then type FP (return).

## USING A ONE-DRIVE SYSTEM

If your system only has one drive, copying is still done much like it is done on a two-drive system (above). The screen should show MASTER Ø, but no slave drives should be shown. When you press SPACE to begin copying, the screen will show INSERT MASTER. Any time INSERT MASTER is shown, you place the master disk (the disk to be copied) into your disk drive and press SPACE. After a few tracks are read, the screen will show INSERT SLAVE. Likewise, any time INSERT SLAVE is shown, you place the slave disk (the disk to be copied onto) into your drive and press SPACE.

**Caution:** it is fairly easy to get confused, so it is best to write-protect your master disk. Then if you inadvertently insert the master disk when INSERT SLAVE is shown, a "double-beep" will sound through the Apple's speaker, prompting you to insert the slave disk instead and press space. Care must still be taken to avoid inserting the slave disk when INSERT MASTER is shown.

## ERROR MESSAGES

There are two ways problems found during copying are indicated. Simple problems are indicated by a double-beep sound. Serious problems are indicated by words or a string of numbers next to the S6D1, S6D2, or other drive specification. For example:

### NO MASTER DISK

If there is no disk in the master drive, the copy program will show:

```
MASTER Ø      S6D1      ØØ:Ø123456789ABCDEF
```

(plus the rest of the normal screen). It will also beep continuously until you press a key (but not SPACE) to make it stop.



This strange line of numbers is also used to indicate bad copies. The  $\emptyset\emptyset$ : means the problem was found on track  $\emptyset$ . Tracks are numbered, in hexadecimal, from  $\emptyset\emptyset$  to 22. These convert to decimal as follows:  $\emptyset\emptyset=0$ ,  $\emptyset1=1$ ,  $\emptyset2=2$ ,  $\emptyset3=3$ ,  $\emptyset4=4$ ,  $\emptyset5=5$ ,  $\emptyset6=6$ ,  $\emptyset7=7$ ,  $\emptyset8=8$ ,  $\emptyset9=9$ ,  $\emptysetA=10$ ,  $\emptysetB=11$ ,  $\emptysetC=12$ ,  $\emptysetD=13$ ,  $\emptysetE=14$ ,  $\emptysetF=15$ ,  $1\emptyset=16$ ,  $11=17$ ,  $12=18$ ,  $13=19$ ,  $14=20$ ,  $15=21$ ,  $16=22$ ,  $17=23$ ,  $18=24$ ,  $19=25$ ,  $1A=26$ ,  $1B=27$ ,  $1C=28$ ,  $1D=29$ ,  $1E=30$ ,  $1F=31$ ,  $2\emptyset=32$ ,  $21=33$ , and  $22=34$ . Since the COPY program works from track  $\emptyset\emptyset$  to 22, it isn't surprising that a problem was found at track  $\emptyset\emptyset$  when no disk was available to read. The numbers to the right of the : indicate which sector or sectors have a problem. Sectors are numbered from  $\emptyset$  to F, in hexadecimal, which corresponds to  $\emptyset$  to 15 in decimal in the same fashion as with track numbers. All sectors with problems are listed. On a 16-sector disk there are, of course, 16 sectors on each track. Since no sector could be read (with no disk inserted), all 16 sectors are listed as "bad" to the right of the :.

If only sectors 2 and B, for example, were bad when reading track  $\emptyset\emptyset$  of the master (that is, sectors 2 and B could not properly be read), the message to the right of MASTER  $\emptyset$  S6D1 would be  $\emptyset\emptyset:2B$ . Note that the sector numbers are the "physical" sector numbers written on the disk. When using DOS 3.3's "RWTS" routine, "logical" sector numbers are used. They correspond as follows:  $\emptyset=0$ ,  $1=7$ ,  $2=E$ ,  $3=6$ ,  $4=D$ ,  $5=5$ ,  $6=D$ ,  $7=4$ ,  $8=B$ ,  $9=3$ ,  $A=A$ ,  $B=2$ ,  $C=9$ ,  $D=1$ ,  $E=8$ , and  $F=F$ ; that is, if the COPY program says sector 1 is bad, that would be sector 7 when using RWTS. (When using DOS 3.2 and 13-sector disks, "physical" and "logical" sector numbers are the same.)

## NO SLAVE DISK

When no slave disk has been inserted, the COPY program will make a double-beep sound. You should then insert the slave disk and press the SPACE bar. If you do not wish to copy, simply press a non-SPACE key (RETURN, for example, not keys like CONTROL, SHIFT, or RESET).

## WRITE-PROTECTED SLAVE DISK

If the slave disk is write-protected, the indication is the same as for "no slave disk" (above).

## 3 ALL SECTORS BAD ON TRACK 00

If all sectors are "bad" on track 00 of a slave disk, the COPY program assumes there is no disk inserted. See "no slave disk" above.

## BAD MASTER DISK

If during copying it is determined that the master is bad, copying will stop. A string of numbers, as described above, will be displayed after MASTER 0 S6D1. The COPY program will beep continuously until a non-space key is pressed. You should notice that the string of numbers appears on the MASTER 0 line, indicating a bad master. (A string of numbers on the SLAVE 1 line indicates a bad slave.) Since copying stops when a bad master is detected, the slave disk does not contain a complete copy of the master.

When using only one drive, errors for the master appear on the MASTER 0 line. Errors for the slave appear further down the screen.

## BAD SLAVE DISK

If during copying a bad sector is found on the slave disk, copying will stop. A string of numbers, as described above, will be displayed after SLAVE 1 S6D2. The COPY program will beep continuously until a non-space key is pressed. The remainder of the disk is not copied.

## COPYING 13-SECTOR DISKS

As "initialized" by DOS 3.2 (or DOS 3.2.1), 13-sector disks contain uninitialized sectors. These are a major source of bad copies which are not detectable by normal check-word checks, since it is impossible to tell the difference between an uninitialized sector and a read error. The Total Accuracy Copy Program (COPY) is designed so no copy contains uninitialized sectors. Processing of 13-sector disks is controlled by the star (\*) option. Normally, \* is off, and reading of uninitialized sectors is prohibited. To insure accuracy while copying 13-sector disks which have no uninitialized sectors, both read errors and uninitialized sectors are shown as "bad" when \* mode is off.

When \* mode is on, indicated by a \* in front of 13 SECTOR, uninitialized sectors on the master disk can be read. As they are read, they are replaced with "initialized" sectors to prevent future problems. Copying with \* mode on should be used only to convert standard DOS 3.2 disks (with uninitialized sectors) to fully initialized disks.

If you attempt to copy a 13-sector disk that contains uninitialized sectors without \* mode on, most likely the message 02:9ABC will appear on the MASTER 0 line. Depending on the type of disk, other numbers

may appear on the MASTER Ø line.

## USING VERIFY

The "copy" part of the copying process can be turned off by selecting verify-only mode. (This is done by pressing control-V.) Then, COPY will compare the master and slave disks, as it always does when copying. It will not attempt to write on the slave disk, however. This function is very useful as a final check on your most valued disks. After you copy a disk, switch the master and slave disks (that is, place the disk you just copied onto in the master drive and the disk originally in the master drive in the slave drive). Now press control-V (hold down the control key while pressing V) to select verify-only mode. PRESS SPACE TO COPY changes to PRESS SPACE TO VERIFY. Press space, and COPY will compare the two disks. You may wonder what good this procedure is, since it has already been done during copying. First of all, it checks for centering problems. If the slave was off center during copying, the COPY program would not be able to detect that as an error (since the disk would still read back correctly). Unless the disk is off center exactly the same when inserted into the master drive, the problem will probably show up when COPY tries to read it. Second, this step checks to see if the disk written by the slave drive can be read by the master drive. This could detect an alignment problem in either drive, which might otherwise go unnoticed until a serious problem occurs.

The comparison made by the verify-only mode is very complete. Bits which are not even used by DOS 3.3, for example, are compared. Therefore, only an exact copy, made by the Total Accuracy Copy Program, should be expected to verify. Two disks which seem the same when using DOS 3.3, or which were copied by

another program, may not be indicated as identical when using verify.

If an error is indicated by a string of numbers on the MASTER  $\emptyset$  line, this means the master could not be read properly. If an error is indicated on any other line, it means either the slave could not be read or the two disks do not match exactly.

## SEEK ERRORS

A special procedure is done at the very end of copying which helps detect a failing stepping motor in the disk drive's read/write head positioning mechanism. Head repositioning is called "seeking", and if any problem is detected the message SEEK ERROR will be displayed. One or two seek errors could be due simply to a difficult to read disk, or an improperly formatted disk. Repeated seek errors on a drive may indicate failure of the stepping motor. Another sign of failing stepping motors can be repeated "home" (or recalibrate) occurrences. "Home" is a method of positioning the read/write head to track  $\emptyset\emptyset$  when its current position is unknown, and it results in the familiar "buzzing" noise heard when booting up. The COPY program does a home the first time it uses a drive after being run. If a home occurs at any other time, it is because a track number read from a disk did not match the track number expected. This could also indicate an off center disk, because adjacent tracks can be read if a disk is sufficiently off center (tracks are spaced only 1/48" apart). (Note: a SEEK ERROR will be displayed if a disk is removed before copying is complete, but after track 22 has been verified.)

## WHEN FINISHED COPYING

To exit the copy program, press control-RESET. If you plan to run an Applesoft program next, type FP (return) after pressing control-RESET.

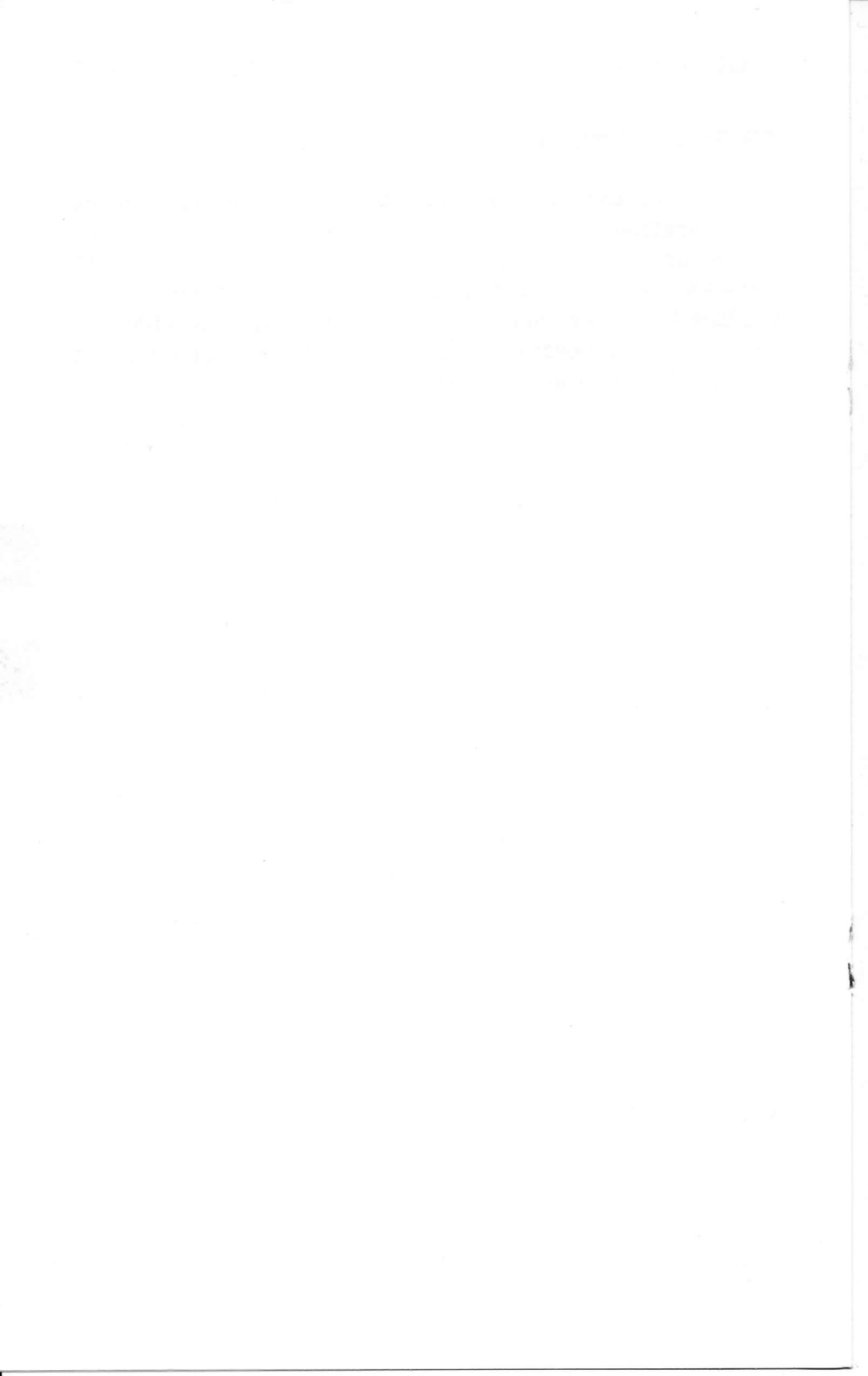
## CLEANING DRIVES

All disk drives should be cleaned periodically. Since the recommended procedure varies depending on the brand of drive used, you should follow the drive manufacturer's recommendations. We have found the 3M #7440 "head cleaning diskettes" to be effective. Simply follow the directions supplied by 3M. To turn a drive's motor on for about 30 seconds, as directed by 3M, you can use the program CLEANER. Run the program, and input the slot and drive number to be activated (6,1 for example). After about 30 seconds of running, SLOT,DRIVE? is asked so you can clean the next drive. Use RESET or control-C to exit the CLEANER program.

A drive which makes small circular scratches on every disk inserted should have been cleaned long ago. [If cleaning doesn't solve the scratching problem, the "load button" needs to be cleaned or replaced. This is a job for a qualified technician. On Apple and Shugart drives, the load button touches the top side of the disk (the side the label is on) and the read/write head touches the bottom side.] How often you should clean your read/write head depends on how much you use your drives. For our high-speed disk copying machines, we recommend cleaning after every 5 to 10 hours of use. Since you probably won't be copying all day every day, you'll need to estimate how many hours the red "in use" light has been on.

**MOVING THE COPY PROGRAM**

To move the COPY program to another disk, use the Configuration option of the boot-up menu, or the COPY MOVER program (see the Configuration section). If necessary, the COPY program can be moved using BLOAD/BSAVE (see your Apple DOS manual). **CAUTION:** do not BSAVE the COPY program after it has been run; it will no longer function properly.





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The Total Accuracy Copy Program has a number of options which can be selected with the configuration program. You can run this program either by selecting option 2 (CONFIGURE COPY) from the boot-up menu, or by running the program COPY MOVER. The first thing the configuration program does is read the COPY program into memory. Then, through a series of questions, the COPY program is configured, and written back to disk. The questions are as follows:

### ADD/REMOVE DRIVES

First, the current drive configuration is shown, for example:

```
MASTER 0 S6D1  
SLAVE 1 S6D2
```

4 The number between MASTER (or SLAVE) and S6D1 (or other slot/drive numbers) is the master/slave number. 0 indicates the master drive, and 1 through 9 indicate slave drives. On a one drive system, only MASTER 0 should appear. On a two drive system, MASTER 0 and SLAVE 1 should be present. Likewise, on a system with four disk drives, MASTER 0, SLAVE 1, SLAVE 2, and SLAVE 3 could appear. The number of slave drives determines the number of copies normally made at a time. With one slave drive, one copy is made. With two slave drives, two copies of a disk can be made at once. Unless you normally make several copies of every disk you copy, you'll probably want to list only MASTER 0 and SLAVE 1 even if you have more than two disk drives. Note that the Total Accuracy Copy Program can be used only with Apple Disk II drives or exact equivalents.

The program asks (10 TO STOP) MASTER/SLAVE NUMBER?. Answering 10 allows you to go on to the next

question (ERASE DOS?), otherwise you should type the master/slave number of the drive to be added, removed, or changed. When you answer  $\emptyset$  (for MASTER  $\emptyset$ ), you can change the slot/drive numbers of the master drive, but you cannot remove the master drive. When you answer with a slave number (1 to 9), the question ( $\emptyset$  TO REMOVE) SLOT NUMBER? appears, and you can input the slot number of the slave drive to be added (or the new slot number of an existing slave drive) or  $\emptyset$  to remove the drive.

Normally, slave drives are added beginning with SLAVE 1, then SLAVE 2, SLAVE 3, and so on. You should take care to avoid listing the same drive at more than one position (for example, having S6D1 appear on more than one line). If you use more than one slave drive, read the Multiple Slaves section.

This procedure sets the initial drive configuration. It can be changed while the COPY program is running.

### ERASE DOS?

The usual answer to this question is NO. (If your computer has lower case letters, be sure caps lock is on.) This allows the copy program to read four 16-sector tracks (or five 13-sector tracks) at a time, meaning 9 cycles (of reading and writing) are required to copy a disk (7 cycles for 13-sector disks). If you answer YES, the operating system (DOS) in memory will be erased when the COPY program is run, allowing more memory for copying. When DOS is erased, five 16-sector tracks (or six 13-sector tracks) can be read at a time, so 7 cycles are required to copy a disk (6 cycles for a 13-sector disk).

Erasing the DOS in memory does not change the

copies being made. If DOS exists on the disk being copied, it will be reproduced onto each copy made. Erasing DOS in memory only makes more memory available to the COPY program when it is run, thus allowing faster copying. However, when you press control-RESET to exit the COPY program, the system will re-boot. (You should have a suitable disk already inserted in your boot-up drive before pressing control-RESET.)

### **DESTROY POWER SUPPLY?**

Generally, type NO (again, caps lock must be on). This option is useful only on systems with more than two drives. See the Multiple Slaves section for more information.

## **4**

### **INITIAL FORMAT**

The next question is INITIAL FORMAT (13/16)? which allows you to select whether the COPY program will initially be set for 13-sector disks or 16-sector disks. Like other "initial" settings, the format is still selectable once the COPY program is run; the answer to this question merely selects the format which will be assumed when the program first begins running.

#### **\* MODE**

If you've selected 13 for the initial format, the next question is INITIALLY SET WITH \*?. The normal answer is NO (again, caps lock must be on). When \* mode is not on, only fully-initialized 13-sector disks can be copied. When \* mode is on, both fully-initialized and standard 13-sector disks can be copied (however, verify cannot be used with a non-fully-initialized slave disk).

Copying with \* mode on results in a greater chance of incorrect copies. You may wish to convert all your 13-sector disks to fully-initialized disks (by copying them with \* mode on). Fully-initialized disks can be copied with no decrease in reliability by having \* mode off. If you do not wish to convert your 13-sector disks to fully-initialized disks, you should answer YES to INITIALLY SET WITH \*? so \* mode will normally be on. Fully-initialized disks can always be used in place of standard disks.

### - MODE

The next question is INITIALLY SET WITH -?, and the usual answer is NO. When - mode is on (as indicated by a - between MASTER and Ø on the screen), the master disk is verified after it is read. If a sector is misread and Apple's check word fails to detect the error, a second read might find it.

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### COPY OR VERIFY

INITIALLY COPY OR VERIFY? is the next question. Answer COPY if you will usually use the program for copying, or VERIFY if you will usually be verifying. (Remember, caps lock must be on.)

### WRITING THE CONFIGURED COPY

After you answer COPY or VERIFY, the configured version of COPY will be written on the disk. To move the COPY program to another disk, insert the disk you wish to have COPY written on before answering this question. Note that you must put the notice "Copyright © 1981 ALF Products Inc." on any disk you put the COPY program on. Giving or selling someone a copy of any program supplied, or a copy of this manual, is a crime under Federal law.



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Some configuration changes can be made during copying. Here's how:

### **ADD/REMOVE DRIVES**

This is done in much the same way as it is when using the configuration option of the boot-up menu (see the Configuration section). Begin by pressing the digit key corresponding to the master/slave number to be added, removed, or changed. For example, to change the slot or drive number of the master drive, begin by pressing the  $\emptyset$  key. A cursor appears to the right of the S, and you can type the appropriate slot number for the master drive. Then, the cursor moves to the right of the D so you can type the drive number. When you press any other digit (1 through 9), the cursor appears on the corresponding slave line. For slave drives, you can also use a slot number of  $\emptyset$  to remove the drive.

### **13/16 FORMAT**

Pressing control-S (hold down the control key while pressing S) sets the COPY program to 16-sector mode ("S" for "sixteen"). Pressing control-T ("T" for "thirteen") sets the program to 13-sector mode.

### **\* MODE**

Pressing \* (or :) turns \* mode on or off. A \* appears in front of 13 SECTOR when \* mode is on. Turning on \* mode while in 16-sector mode causes the program to change to 13-sector mode as well. (16-sector disks do not have uninitialized sectors.)



**- MODE**

Pressing - turns - mode on or off. A - appears between MASTER and Ø when - mode is on. Note that - mode should not be used when \* mode is on.

**COPY OR VERIFY**

Pressing control-C sets the COPY program to copy mode. Pressing control-V sets it to verify-only mode.



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Several copies of the same disk can be made more quickly by using more than one slave drive. (For large volume disk duplication, you should consider purchasing one of ALF's high-speed disk duplication systems.)

When more than one slave drive is used, the COPY program will access each slave drive in sequence. For example, when using four drives, the COPY program will read a few tracks from the MASTER  $\emptyset$  disk, write those tracks to the SLAVE 1 disk, then write them to the SLAVE 2 disk, and finally write them to the SLAVE 3 disk. Then the COPY program repeats this cycle until all tracks have been copied. Of course each track on a slave disk is read to verify accuracy after it is written.

If an error occurs on a slave drive, a "boop" sound is made and the error message (or string of numbers) appears on that slave's display line. Copying continues unless all slaves have an error. (Copying stops, as usual, if there is an error on the master drive. In this case, all slave drives contain incomplete copies.) If the master or all slaves have an error, copying stops and the "beep" sound occurs continuously until a non-space key is pressed. Similarly, when copying is completed and one or more slave drives have had an error, the "beep" occurs continuously. Which disks are bad should be determined by looking at the messages on the screen.

The "bip" sound (when the 1 on the screen changes to a  $\emptyset$ ) alerts you that this is the last cycle. As each slave's motor turns off during the last cycle, the disk can be removed (and replaced with a blank disk if additional copies will be needed). As always, the screen should be checked for error messages which would indicate which disks are bad. Continuous

copying can be achieved by pressing SPACE again any time after the "bip", and carefully replacing each copied disk with a blank disk as the "in use" light goes out on each slave drive during the last cycle. (Keys pressed before the "bip" are ignored. When copying is complete, the last key pressed after the "bip" will be processed unless an error has occurred.)

When using more than one controller card, the DESTROY POWER SUPPLY? option can be used to turn on two drives at a time. Many people have had success with running two drives simultaneously from an Apple with no other peripherals plugged in. If you wish to do this, type YES to DESTROY POWER SUPPLY?. ALF will not be responsible for damage to your Apple power supply or other parts of your system.



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Periodic cleaning is all that's needed to keep drives in good shape for many months of normal use (see "cleaning drives" in the Copying section). Eventually, most drives will need a new load button, realignment, or other servicing. Most users will want to take their drives to a qualified technician to have this servicing done. However, if you're mechanically and electronically inclined, understand the internal operations of disk drives, and have the appropriate equipment, this section may help you do your own servicing.

**Caution:** this section is for use only by skilled technicians. ALF assumes no responsibility for any damage which may occur when attempting to use the procedures explained in this section.

To do drive maintenance, you need the usual tools plus a two-channel oscilloscope with differential mode (add and invert) and sweep times down to 1 microsecond per division. You'll probably also need the Shugart Associates SA400 Service Manual (#54096) and Alignment Diskette (#SA 124). These can be ordered from Shugart Associates, 435 Oakmead Parkway, Sunnyvale, CA 94086 or (408) 733-0100.

A supply of replacement parts is also useful. The most likely part to need is a Load Button, Shugart Associates #54145. When doing a lot of copying: Collet Hub (hub clamp) #54066, Hub Collar #54131, Clamp Spring #54132, and E-ring #11305 are handy to have.

Many Apple drives consist of a Shugart SA390 drive (which is an SA400 drive with the track 0 switch, index hole sensor, head load assembly, and top circuit card removed) with Apple's own top circuit card. Apple also uses a drive not manufactured by Shugart, but which is very similar. Since some parts are left out,



and Apple's circuit design is different than Shugart's, some changes are necessary to Shugart's service manual:

## CHANGES TO SHUGART MANUAL

Hub Frame Assembly Installation and Adjustment: Apple format is "soft sectored", so ignore the index timing adjustment used only on "hard-sectored" formats.

Index Detector Assembly Removal, Index LED Removal, and Track Zero Switch Removal: ignore, since these parts are not normally included in Apple drives.

Head Amplitude Check: use internal trigger (sync) rather than external since there is no equivalent to TP7 on Apple's circuit card. Set all coupling to DC. TP1 and TP2 are TP8 and TP9 on the Apple card, use TP2 and TP4 for ground connections. Add and invert mode is differential mode on some 'scopes. 80 millivolts minimum amplitude does not apply to Apple's circuit. Set both 'scope channels to 0.2 volts/division and time base to 5  $\mu$ S/division, expect a signal greater than 1 division at track 22 hex (34 decimal); track 0 amplitude will be much larger (3 or more).

Motor Speed Adjustment: do not use the strobe pattern. Use the speed adjustment procedure given in the Setting Up section.

Read/Write Head Load Button Adjustment: connect 'scope as described for Head Amplitude Check.

Track Zero Switch Adjustment: ignore.

Carriage Limiter: adjust so gap between sheet metal stop (on head carriage) and stepper cam is small when at track 0 (i.e., gap should be small in relation to

the increase in gap size between track 0 position and track 1 position).

Index/Sector Timing Adjustment: ignore.

Head/Radial Alignment: Shugart's alignment disk must be used, but remember Shugart's track 16 (decimal) will show as track 10 (hex) when using the DRIVE TESTER program. Set 'scope as recommended except with time base set to 50 milliseconds/division. If a storage 'scope is not available, intensity must be set to maximum, eyes set for maximum image retention (some practice may be required to visualize the image). Since there is no equivalent to TP7 on Apple's card, use internal trigger. It will not be possible to know which lobe is the "left" or "right" lobe, and many lobes will be displayed. Estimation of 70% is difficult, take extra care since the head position adjustment is crucial for interchanging disks between drives. Using the DRIVE TESTER, seek to track 0F and use the right arrow key to go to track 10. Use the arrow keys to seek to 10 from 0F and 11 alternately while observing the display.

Head Load Bail Adjustment: ignore.

### USING THE DRIVE TESTER PROGRAM

7 The DRIVE TESTER program is used in place of disk "exercising" equipment. When first run, the slot and drive number of the drive to be tested must be typed (see "Drive Speed Adjustment" in the Setting Up section). Then the following commands can be used:

CONTROL-S is used to run the speed test. This is explained under "Drive Speed Adjustment" in the Setting Up section. Pressing SPACE ends the speed test.

CONTROL-W is used to write a track of all 1's in FM format (4 uS intervals between flux changes). This must be done before checking the amplitude when doing the Head Amplitude Check. CAUTION: a track of the disk is erased.

R is pressed to begin "read" mode. All other commands also begin "read" mode, in which the drive motor is on and read data can be observed at test points 8 and 9 (a differential signal). Pressing SPACE ends read mode.

H is pressed to "home" (step toward track 0 several times) then seek back to the currently selected track. This is required any time the head position has been manually changed or a new drive connected. A "home" is automatically done the first time a drive is accessed.

T is pressed, followed by two hex digits, to seek to any desired track (00 to 22).

Right arrow is pressed to seek to the next higher numbered track.

Left arrow is pressed to seek to the next lower numbered track.

Control-RESET is pressed to exit the DRIVE TESTER program. If you plan to run an Applesoft program next, type FP (return) after pressing control-RESET.

To move DRIVE TESTER to another disk, run the TESTER MOVER program. When it asks STANDARD CLOCK? remove the Total Accuracy disk and insert the disk DRIVE TESTER is to be written on. Then type YES and press return (or type NO if will have a clock modifier installed).

## R28 ADJUSTMENT

R28 adjustment is tricky, and is best left as a last resort to solve problems with the read circuit. It is helpful to stabilize the Apple clock by installing a clock modifier (ALF #10-1-3) or removing IC B2 (a 74S86), bending pin 5 out, and reinserting. (Note: this cannot be done on an Apple IIe since its circuit is considerably different.) Then, connect the 'scope to Apple's TP7 (using TP2 or TP4 as ground). Set for 2 volts/division and 2 uS/division. Be sure you're seeing the far left side of the trace (by adjusting the horizontal position). Use the WRITE command to write a test pattern. Note that some pulses show two images, due to a different positive-going setting than negative-going setting. Optimum adjustment has only one image, but probably cannot be obtained on all tracks with any given R28 setting. Ignore large-scale stretching/shrinking which is due to disk "wobble" or speed changes. Since most reading difficulty occurs near track 22, it is probably best to adjust R28 while at track 22. Note that adjusting hold off (a delay between the end of sweep and enabling the next trigger) may help visualization if your 'scope is so equipped. Pressing control-W occasionally to refresh the test pattern may also help. Take care to remove any slime painted on R28 before adjusting, otherwise the top may break off. (You may wish to reslime after adjustment is finished.) Note that single turn potentiometers tend to be temperature sensitive, so adjust while the drive is at normal temperature.

## CHECKING THE HUB CLAMP

If pressure required to close door (with typical disk inserted) is abnormally slight, replace hub and spring. Otherwise, with 'scope set as for Head Amplitude Check, seek to track 22 and write a test

pattern (control-W), then open and close door. If excessive "wobbling" (stretching/shrinking) is noted on the 'scope, replace hub and spring. (Open and close door several times while watching 'scope to be sure wobbling never occurs.) Repeat this test while at track 0.

## TIPS

Keep your alignment diskette in a safe place, away from vast temperature changes. Never write on the alignment diskette (remember, your write-protect switch may be broken or misadjusted).

Remember that most difficulties are due to problems in reading disks. This is annoying, but not as serious as problems which affect writing disks. (Head alignment, load button quality/adjustment, motor speed, head wear, hub adjustment/centering, carriage limiter, restricted head cable, and so forth.) Disks which are improperly written may never be readable, whereas problems in reading disks are solved once the drive is repaired.

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