TURBO II
copy system

MODEL CS6

Owner's Manual

Congratulations on selecting the Turbo II system to handle your diskette duplication needs. If you're one of the many astute customers who purchased one of ALF's earlier models of disk copiers, you already know what to expect from your new Turbo II system—many of the same features that led you to select an ALF system have of course been included in the Turbo series. But unless your previous system was a Turbo I, get ready for a pleasant surprise. The Turbo series is an elegant new design—incorporating unique fully-digital adjustment-free read and write control circuitry, extensive microcomputer control, and completely new software which makes the Turbo series our easiest to use and most reliable system yet.

If this is your first ALF copying system, you're probably hoping for trouble-free operation. The Turbo series goes beyond that expectation, providing consistently great copies day in and day out—with minimum maintenance.

The Turbo series was designed by experts in duplication technology at ALF. Our designs have to be great, because we use them daily at ALF to handle the needs of our Disk Copying Service customers. We've been constantly improving our equipment over the years—the Turbo II is our 6th generation of copiers. Our extensive experience in actual copying operations—over a million copies produced with Turbo systems, for example—gives us the insight necessary to design a truly productive tool for duplication. And since we maintain our machines and many of our customers' too, we've designed the system for easy maintenance and repair. Yet despite a design which has no corners cut on quality or performance, ALF has managed to create a system with a moderate price.

The Turbo II is a rugged, practical system—without gimmicks and gadgets, or complex mechanisms with countless moving parts that go out of adjustment. Your thoughtfulness in selecting the Turbo II shows that you appreciate its ingenious simplicity and down-to-earth reliability. Again, we at ALF compliment you on your choice, and thank you sincerely.

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Installation

The ALF Turbo II Copy System model CS6 consists of the following equipment:

1. An Apple //e computer with video monitor.
2. One or two Turbo II controller cards.
3. One to four DDU4 Dual Drive Units.

Each Turbo II controller card works with either one or two Dual Drive Units, and is supplied with the appropriate copying programs on several disks.

Setting up the Turbo II system is very easy. Here's how to set up with an Apple //e--if you're using an Apple II+ or other //e-compatible system, setting up is very similar.

1 Select a table or other flat surface to set the Turbo II system on. For a full system, the minimum size is approximately 4' wide and 2 1/2' deep.

2 Set the Apple at the left side of the table, with enough room to set a stack of disks in front of the keyboard, if possible. **BE SURE THE APPLE IS TURNED OFF**, in fact we recommend you remove the power cable from the Apple if one is connected. Then remove the top of the Apple by pulling it up an inch or two at the back and pulling it away from the keyboard as shown below:
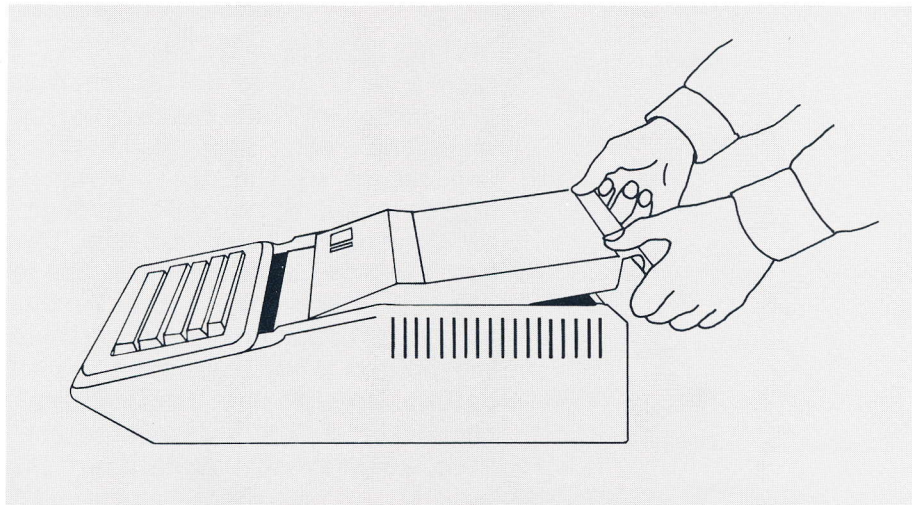
3 Now place the Dual Drive Units to the right of the Apple. If you have two drive units, set them side by side. If you have three drive units, set two side by side to the right of the Apple, and set the remaining unit on top of the drive unit closest to the Apple. With four drive units, set two side by side to the

right of the Apple, and the remaining two on top of
them:
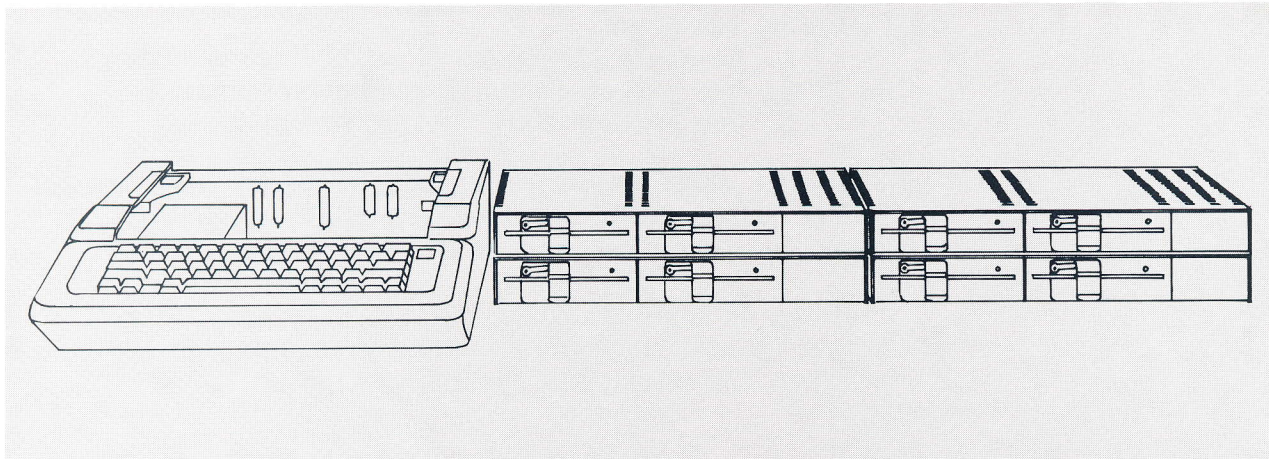
4 Each Dual Drive Unit is supplied with a long cable
(about 4') which has a 37-pin connector on one end
and two 16-pin connectors on the other end. Attach a
cable to each drive unit, noting that the 37-pin
connector is "D" shaped (longer across the top than
across the bottom) so it cannot be inserted upside
down.

5 Remove the cover on one of the DB-25 openings in the
back of the Apple //e (#7, #10, or #11). If you have
two Turbo II controller cards, remove two covers.

6 INSTALLING THE 4TH DRIVE UNIT (if you have fewer
than 4 dual drive units: read this to see how cables
are installed, but resume following instructions only
when you reach step 8). Insert the two 16-pin
connectors of the cable which is plugged into the
bottom right drive unit through the leftmost opening
on the Apple. Note that one 16-pin connector's cable
has a stripe running down the edge and the other
doesn't. Take one of the Turbo II controller cards,
and insert the connector without the edge stripe into
the bottom plug (numbered 3 on the card), as shown
below. Note that a small "bump" on one side of the
connector matches cutout in the box surrounding the
plug, to prevent upside-down insertion.
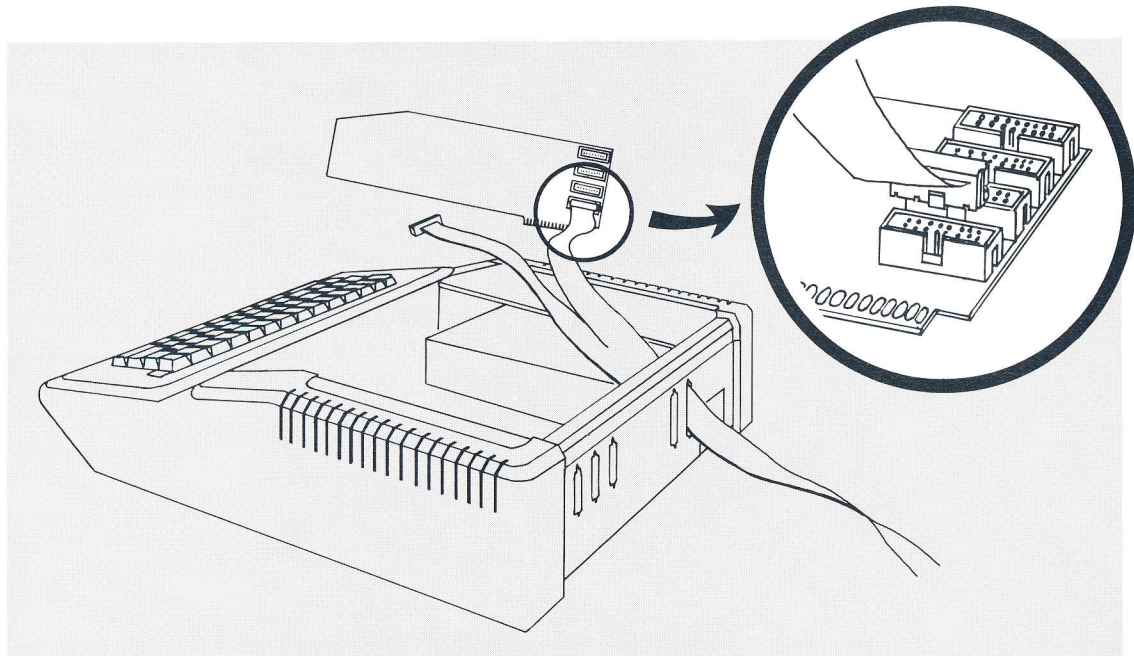
7 Now insert the connector with the edge stripe into the plug numbered 2 (directly above the #3 plug).

8 INSTALLING THE 3RD DRIVE UNIT (if you have fewer than 3 units, skip to step 9). Insert the two 16-pin connectors of the cable plugged into the bottom left drive unit through the same opening in the Apple as in step 6. Insert the connector without the edge stripe into the plug numbered 1 (above the #2 plug) and the connector with the edge stripe into the plug numbered 0 (the top plug). Temporarily set the card down inside the Apple, at the left side of the computer.

9 INSTALLING THE 2ND DRIVE UNIT (if you have only one drive unit, skip to step 10). Insert the two 16-pin connectors of the right drive unit through the opening in the back of the Apple (not the one used in steps 6 or 8). Insert the connector without the edge stripe into the bottom plug (#3) of your second (or only) Turbo II controller card. Now insert the connector with the edge stripe into the next higher plug, labeled 2 on the circuit card.

10 INSTALLING THE 1ST DRIVE UNIT. Insert the two 16-pin connectors of the remaining drive unit (or only drive unit) through the opening in the back of the Apple (the same one as in step 9). Insert the connector without the edge stripe into the plug numbered 1 (above the #2 plug) and the connector with the edge stripe into the plug numbered 0 (the

top plug). Temporarily set the card down inside the Apple, at the right side of the computer.

¶ INSTALLING THE FERRITE BARS. Each cable comes with two bars made of a special--and rather fragile-- metal, which absorb radio frequencies which might otherwise interfere with local radio and television reception. Two small bands are used to hold the bars together, with one bar on each side of each ribbon cable. Hold each pair of bars together and attach one of the bands as shown below:
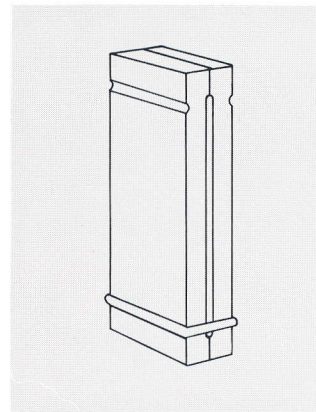
Carefully spread the bars apart slightly at the end away from the band, and slip the ribbon cable in. Attach the other band to hold in place:
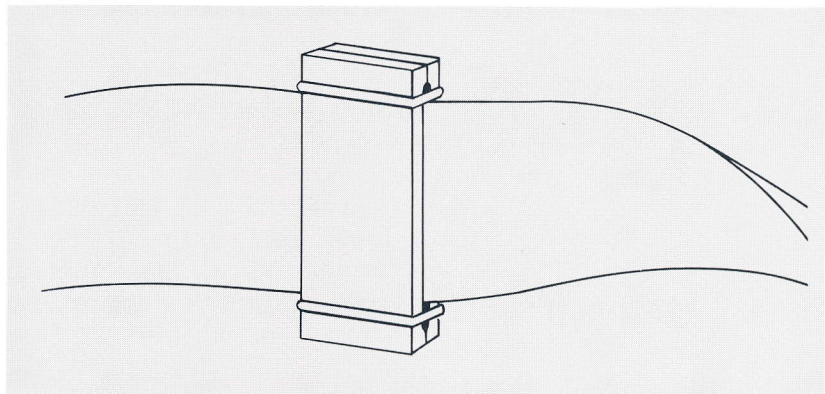
The bars are not particularly conductive, and thus will not "short out" any electrical conductors they might contact. NOTE: Federal regulations prohibit the operation of any device which interferes with radio communications, so it is important that these bars remain correctly installed.

12 Now insert the Turbo II controller card(s) into any of the seven expansion slots (edge connectors) along the back of the Apple. Be sure to plug the card used in steps 6-8 in a slot which is to the left of the card used in steps 9-10. If you plan to use an 80-column card (in the "auxiliary" slot closer to the keyboard), do not plug a Turbo II controller card into the slot numbered 3. Carefully line up the gold plated "fingers" of the circuit card with the edge connector, then push down until the card seats firmly in the connector. Avoid excessive force which may damage the large circuit card in the Apple. Check visually to insure the card is fully inserted in the connector and is not tilted:
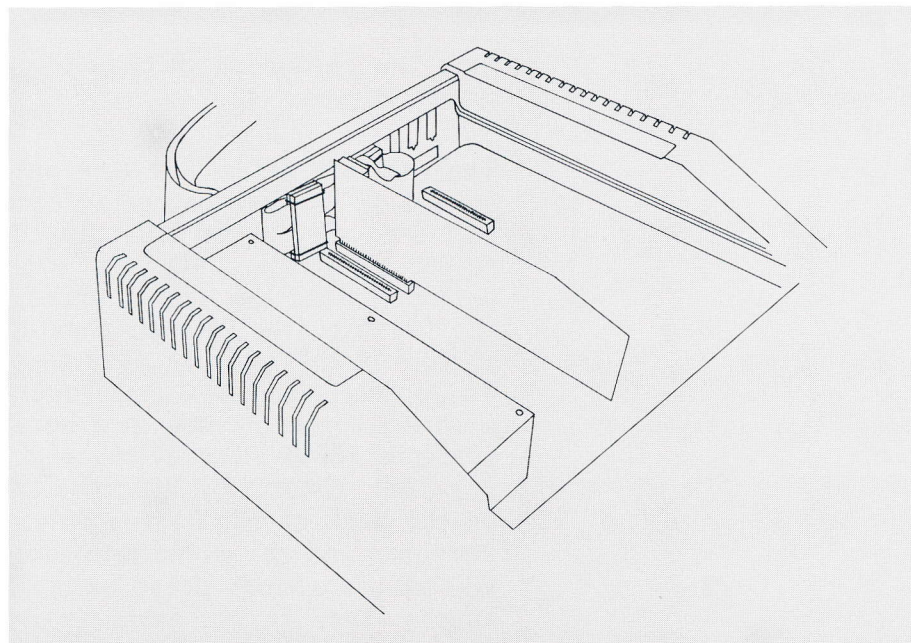
13 Now pop the cover back on the Apple by sliding it carefully under the keyboard until it's properly aligned, then pressing down firmly at the back (both left and right edges). Normally, the video monitor is placed on top of the Apple //e.

14 Be sure the video cable (supplied with the Apple) is plugged into the back of the Apple and into the video monitor.

15 Remove the cardboard shipping material from each disk drive by turning the clamping handle on the front of the drive counter-clockwise 1/4 turn (from vertical to horizontal), then pulling the cardboard gently out:
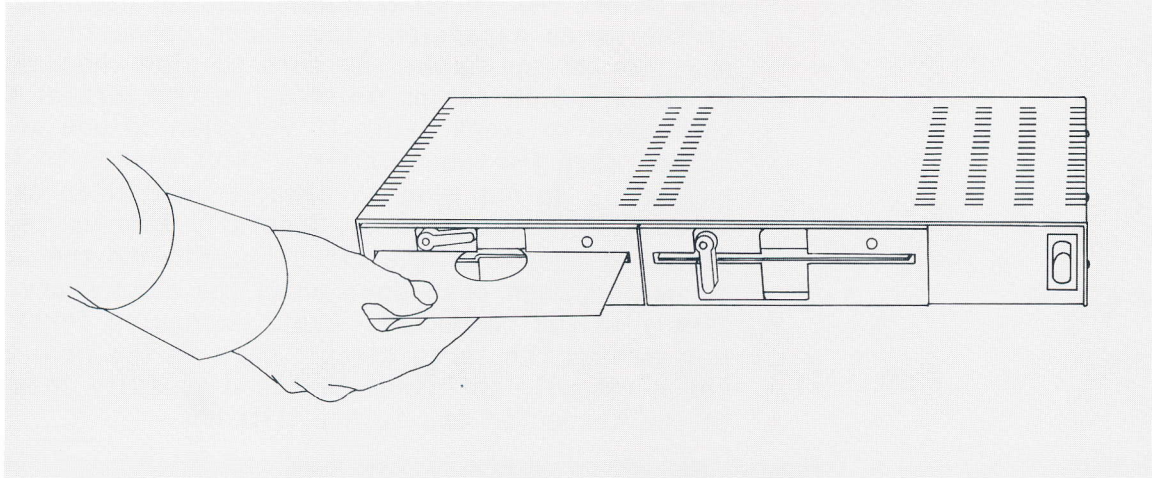
Save the cardboard in case the unit will be shipped in the future.

16 The top left drive unit (the one connected to plugs #0 and #1 of the controller card in the higher numbered slot or of the only controller card) is called the Master Unit (the left drive in the Master Unit is called the Master Drive, because it will hold the "master disk" during copying). Usually, the power switch of this unit is used to control everything. To do this, you need a 3-prong triple outlet adapter with all three outlets in a horizontal row (General Electric #1740-11D, Leviton #800-697, or Radio Shack #61-2705, about $3). Plug the adapter into the outlet on the back of the Master Unit. Now plug the Apple computer and the video monitor into the adapter. If you have a second drive unit, plug it into the adapter too. If you have a third drive unit, plug it into the outlet on the back of the second unit. Finally, the fourth drive unit can be plugged into the third.

17 Set the power switch on the Master Unit to "off" (no red showing). Set the power switches on all other drive units to "on" (red showing). Also turn on the Apple computer and video monitor. If you removed the Apple's power cord in step 2, reconnect it now.

18 Plug the Master Unit's cord into a wall outlet or other 120-volt AC power source. (In countries with 240-volt 50 cycle power, a step-down 240-to-120 volt transformer capable of powering 150 watts must be used to power the drive units.) Installation is now complete.

Precautions

Place the Turbo II system where the ambient temperature is between 50 and 80 degrees Fahrenheit (10 to 26 degrees Celsius) for best results. Care must be taken to avoid blocking any of the vent holes in the Dual Drive Units. Leave about 1 inch of space above the drive units (and on all sides) clear for proper ventilation. Do not place anything under the drive units which would reduce the space formed by the rubber "feet".

NEVER SPILL LIQUIDS INTO THE VENT HOLES, OR INSERT OBJECTS INTO THE VENT HOLES, as damage to the drives or power supply may result. Metal objects inserted into vent holes could create an electrical safety hazard. The Turbo II system is designed for indoor use only.

Use only a properly grounded three-prong outlet. Never use two-conductor (ungrounded) extension cords, or three-to-two-prong adapters.

Don't overload the switched outlet. Total wattage controlled by a Dual Drive Unit's switch should not exceed the maximum wattage printed next to the outlet on the case. A Dual Drive Unit draws about 25 watts, an Apple //e about 60 watts, and an Apple Monitor //e about 36 watts. Overloading the outlet may cause the larger of the two fuses to blow. On Dual Drive Units with fuse openings on the outside, the larger fuse may be replaced with a fuse of the same rating if the outlet is inadvertantly overloaded. Never use a fuse with a higher amperage rating, or a fuse rated at less than 125 volts. NEVER REPLACE THE SMALLER OF THE TWO FUSES. If the fuse with the smaller amperage (A) rating blows, return the unit to ALF for servicing.

Radio/Television Interference

Due to the high speeds at which the Turbo II system's circuits operate, they naturally generate a small amount of radio freqency energy. Shielding in the Apple's case, and the metal case of the Dual Drive Unit, is designed to keep this energy from escaping. Although the Turbo II system has been carefully designed to reduce emission, radio interference might possibly occur in unusual situations. You can determine if the system is the source of interference by turning it on and off and observing whether the interference stops and starts. Reorienting television or radio antennas, or moving the radio or computer to a different location or electrical outlet might solve any interference problem. A booklet "How to Identify

and Resolve Radio-TV Interference Problems", number 004-000-00345-4, is available from the U. S. Government Printing Office, Washington, DC 20402.

A Word From Apple Computer

DOS 3.3 is a copyrighted program of Apple Computer, Inc. licensed to ALF Products Inc. to distribute for use only in combination with the Turbo II. Apple Software shall not be copied onto another diskette (except for archive purposes) or into memory unless as part of the execution of a Turbo II program. When such program has completed execution Apple Software shall not be used by any other program.

APPLE COMPUTER, INC. MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, REGARDING THE ENCLOSED COMPUTER SOFTWARE PACKAGE, ITS MERCHANTABILITY OR ITS FITNESS FOR ANY PARTICULAR PURPOSE. THE EXCLUSION OF IMPLIED WARRANTIES IS NOT PERMITTED BY SOME STATES. THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY PROVIDES YOU WITH SPECIFIC LEGAL RIGHTS. THERE MAY BE OTHER RIGHTS THAT YOU MAY HAVE WHICH VARY FROM STATE TO STATE.

On the other hand, ALF's warranty (a copy is provided with each Turbo II controller card) does cover the enclosed software package, except for DOS 3.3 which was not written by ALF. The above text is required by Apple's license agreement.

A Note For Apple Users

If you'll be using the Turbo's Apple //e for other purposes besides copying, you'll probably have an Apple disk drive controller card plugged in along with the Turbo controller card(s). You'll probably want to have the Apple drive controller card plugged into a higher numbered slot than any of your Turbo cards, so the Apple will normally "boot up" from the Apple drives. A special disk can be made which is placed in the Apple boot-up drive when you wish to use the Turbo. Here's how (the Turbo is not required while making this disk): first, boot your DOS 3.3 system disk. Remove it, and place the Turbo disk containing the Apple mastering program in your Apple drive. Type LOAD STARTUP and press return. Now remove the Turbo disk and put a blank disk in your Apple drive. Type INIT STARTUP and press return. When the formatting is completed, your "Turbo Boot Disk" is complete. When you wish to use the Turbo, put this disk in your Apple drive before booting. Keep the disk in your Apple drive while you use the Turbo.
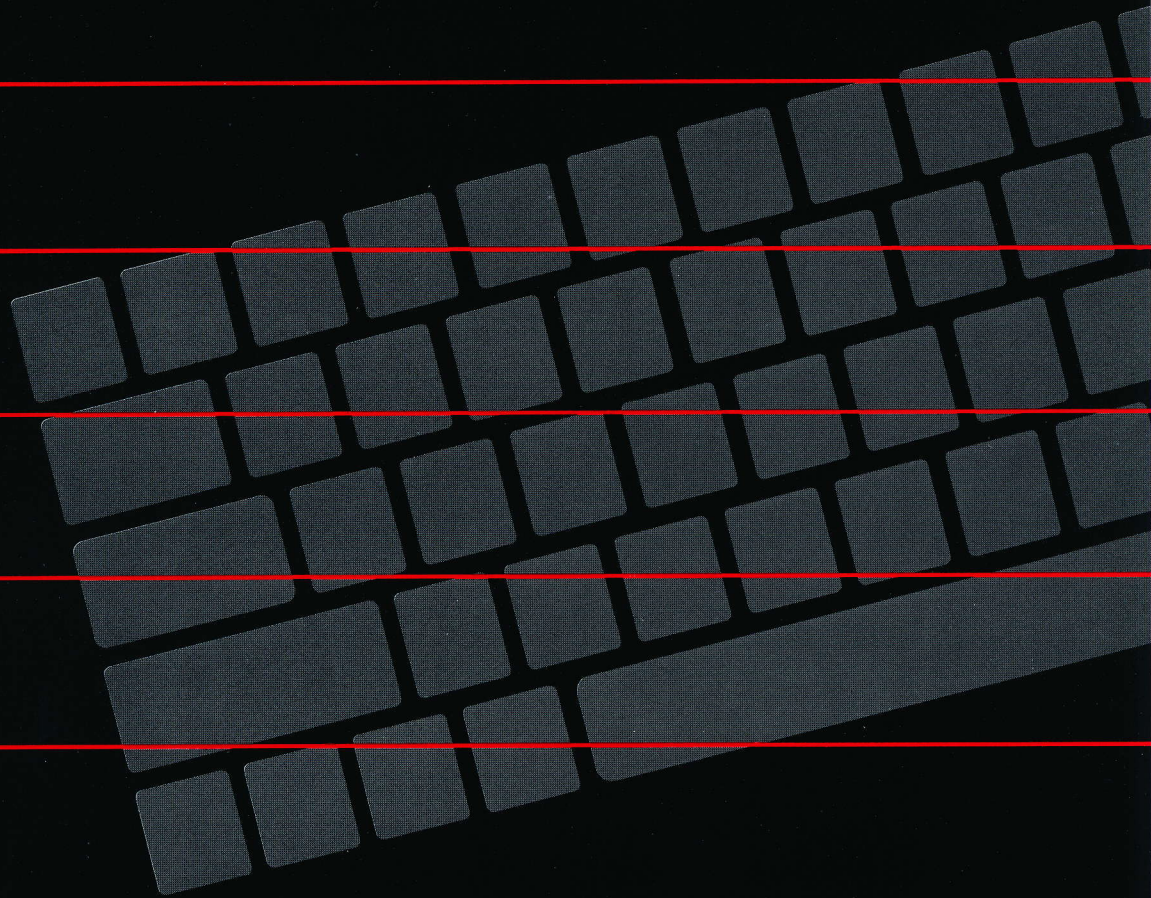
Getting Started

Names

First, let's go through some of the jargon used in this manual. Here's a diagram of a full Turbo II system:

VIDEO DISPLAY
MASTER UNIT
MASTER DRIVE
SET ONE DRIVE 1
SET ONE DRIVE 2
SET ONE DRIVE 3
APPLE COMPUTER
KEYBOARD
SET TWO DRIVE 0
SET TWO DRIVE 1
SET TWO DRIVE 2
SET TWO DRIVE 3
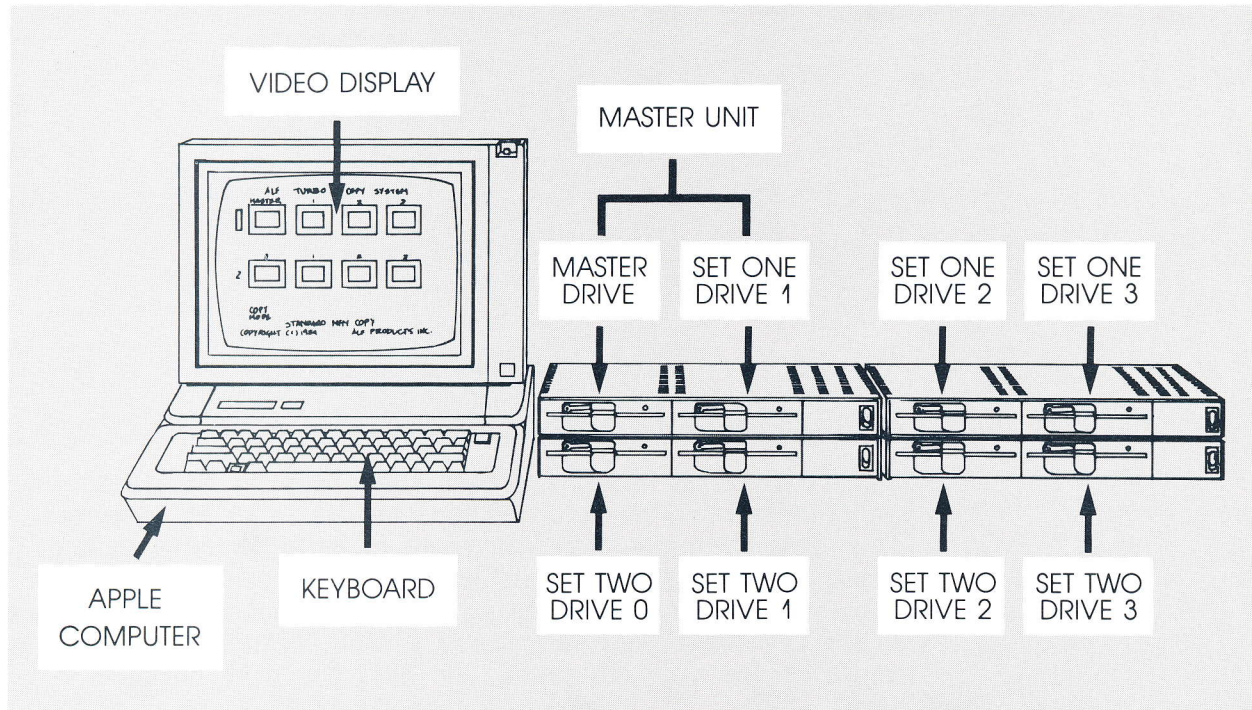
As you can see, the top row of drives includes the Master Drive and all the Set 1 drives, and the bottom row includes all the Set 2 drives. If you have only three Dual Drive Units, you won't have Set 1 Drive 2 or Set 1 Drive 3. If you have only two units, you'll be missing all the Set 2 drives instead. And if you have only one Dual Drive Unit, you'll be missing Set 1 Drive 2, Set 1 Drive 3, and all the Set 2 drives. Now let's take a look at a drive:

CLAMPING HANDLE CLOSED
ACTIVITY LIGHT
CLAMPING HANDLE OPEN
DISK INSIDE
NO DISK INSIDE

INDEX HOLE
TO LEFT OF
HEAD ACCESS
SLOT

HEAD ACCESS SLOT
GOES IN FIRST

SOME DISKS
HAVE A
WRITE-ENABLE
NOTCH
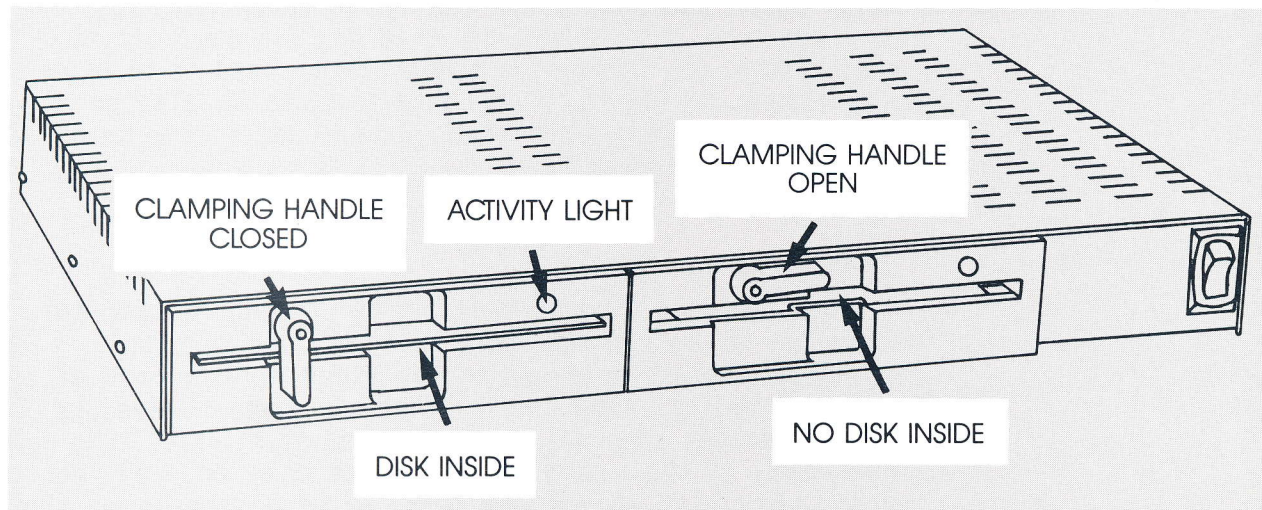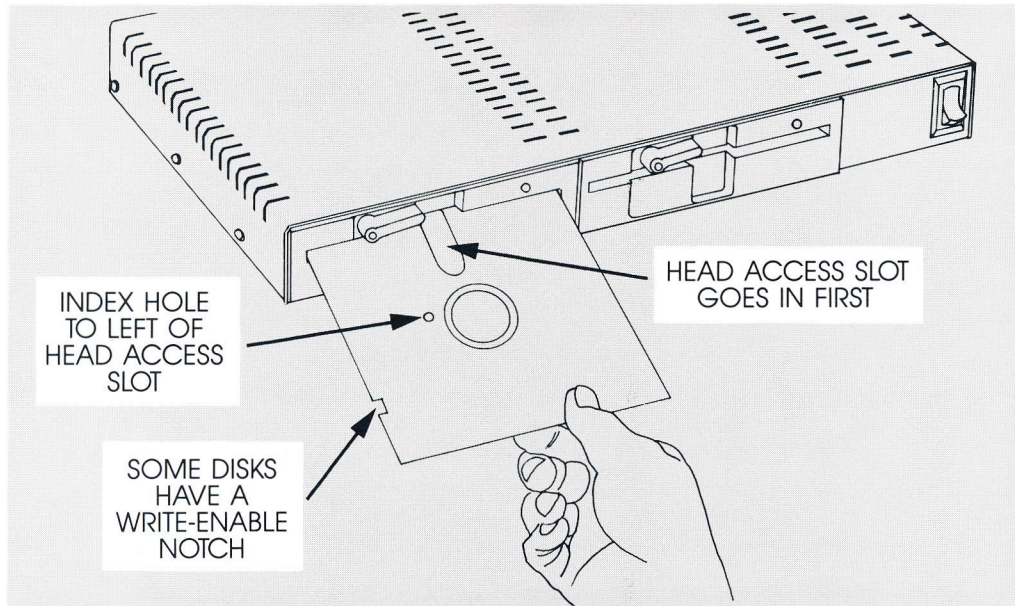
To insert a disk, you turn the clamping handle to the open (horizontal) position. Then the disk can be inserted. After inserting the disk, turn the clamping handle to the closed (vertical) position. To protect the recording heads inside the drive, the clamping handle cannot be closed when no disk is inserted. To remove a disk, return the clamping handle to the open position, and pull the disk out.

PLEASE NOTE: AVOID TURNING THE DUAL DRIVE UNIT ON OR OFF WHILE A DISK IS IN EITHER DRIVE. It is possible that when the power goes on or off, the drive will erase a small area on the disk (even if the disk is write-protected).

The rest of this section and the next section will quickly teach you how to use the Turbo II system. It's easy. But it is VERY IMPORTANT that you sit down at your Turbo system and follow the steps given. Read it through first without trying it, if you like, but please also go through it once with the system. Experience is the best teacher!

Booting Up

Now, let's go through "booting up" the Apple computer. Remove any disks you may have inserted, and turn on everything (the Apple computer, the video monitor, and all Dual Drive Units). You'll notice that the Master Drive and all Set 1 drives turn on, and their activity lights light up. (Don't worry if the wrong drives' lights come on, we'll get to that later.) If you'd had a disk in the Master Drive, the Apple would have run whatever program was on that disk.

The Apple is still waiting patiently for a "boot up" disk (or, in plain English, a start-up disk containing the first program you wish to use). Insert the disk labeled STANDARD COPY PROGRAMS in the Master Drive, and clamp it by turning the clamping handle to the closed position. As you put the disk in, you'll notice the activity light comes on. This light indicates that the spindle in the drive is turning (although sometimes the spindle turns while this light isn't on, too). Once clamped, the spindle causes the disk to rotate so the recording heads can access a complete circle around the disk. If you clamp the disk while the spindle is turning, the drive can center the disk more accurately. So, you should turn the clamping handle to the closed position while the activity light is still on. A smooth action is recommended, don't rush just to get done before the light goes out. If you don't finish before the light goes out, just return the handle to the open position, remove the disk, and try again.

The Menu

Once the STANDARD COPY PROGRAMS disk is clamped, the drive whirs briefly as the start-up program is read from the disk into the Apple's memory, and a "menu" (a list of programs which can be used) appears on the screen. (If it doesn't, you've probably got your cables mixed up. Try putting the disk in any drive whose activity light lit up when you turned the system on, until you find the drive that works.) The menu will look something like this:

```
ALF   TURBO  II   COPY  SYSTEM  CS6
COPYRIGHT <C> 1985 ALF PRODUCTS INC.


PRESS:   TO USE:

    1 --- MFM COPY
    2 --- LONG MFM COPY
    3 --- APPLE-16 COPY
    4 --- COMMODORE COPY
    5 --- ATARI COPY
    6 --- DRIVE CLEANER
```

There may be other choices shown. To select a program, press the number shown in the menu. For example, with the menu shown above you would press the 1 key on the keyboard to select the "MFM COPY" program (a program which copies MFM-format disks). Try it now. After you

press the key, the Master Drive whirs briefly as the program is read into the Apple's memory. Then the program runs and presents it's video display. Note that "MFM / COPY" appears on the screen near the bottom, just above the copyright notice--indicating that MFM COPY was indeed run.

Cable Check

Now let's get the menu display back. With the STANDARD COPY PROGRAMS disk still in the Master Drive, hold down the CONTROL key (labeled CTRL on some Apples) and press the RESET key. The Master Drive whirs again as the menu program is read into memory, then the menu appears again. To learn how to use the available programs, go on to the next section of this manual. But first, if you've just set the system up, let's check the system's cabling.

Press the 1 key to select the MFM COPY program. Once the MFM COPY program is running, press the space bar. The program will attempt to copy the disk in the Master Drive, which isn't an MFM-format disk. Thus, the program will make lots of noises, and light up "BAD" in the four boxes on the screen representing the Master Drive and the three drives of Set 1. (If you have only one drive in Set 1, "X"'s should appear in the boxes of unused drives.) If you have two Turbo II controller cards, press space again to light up "BAD" in the Set 2 drives. Now, you can check the cabling. Just insert a disk in one of the drives, and the word "BAD" will disappear from one of the boxes. It should be the box whose position on the screen corresponds to the position of the drive. (If the wrong box is cleared, your cables are mixed up.) Remove the disk and insert it into each of the remaining drives, to check all cable connections.

Problems where the left and right drives in a drive unit are reversed are caused by plugging the cable with a stripe onto the controller card where the cable without a stripe should be plugged in, and vice versa. To correct these problems, you must turn off everything, open the Apple, and connect the plugs correctly. Problems where entire drive units are swapped can be solved by unplugging the cables from the drive units and switching them, which doesn't require turning the power off. After correcting any cable problems, try the above test again to be sure your changes are right.
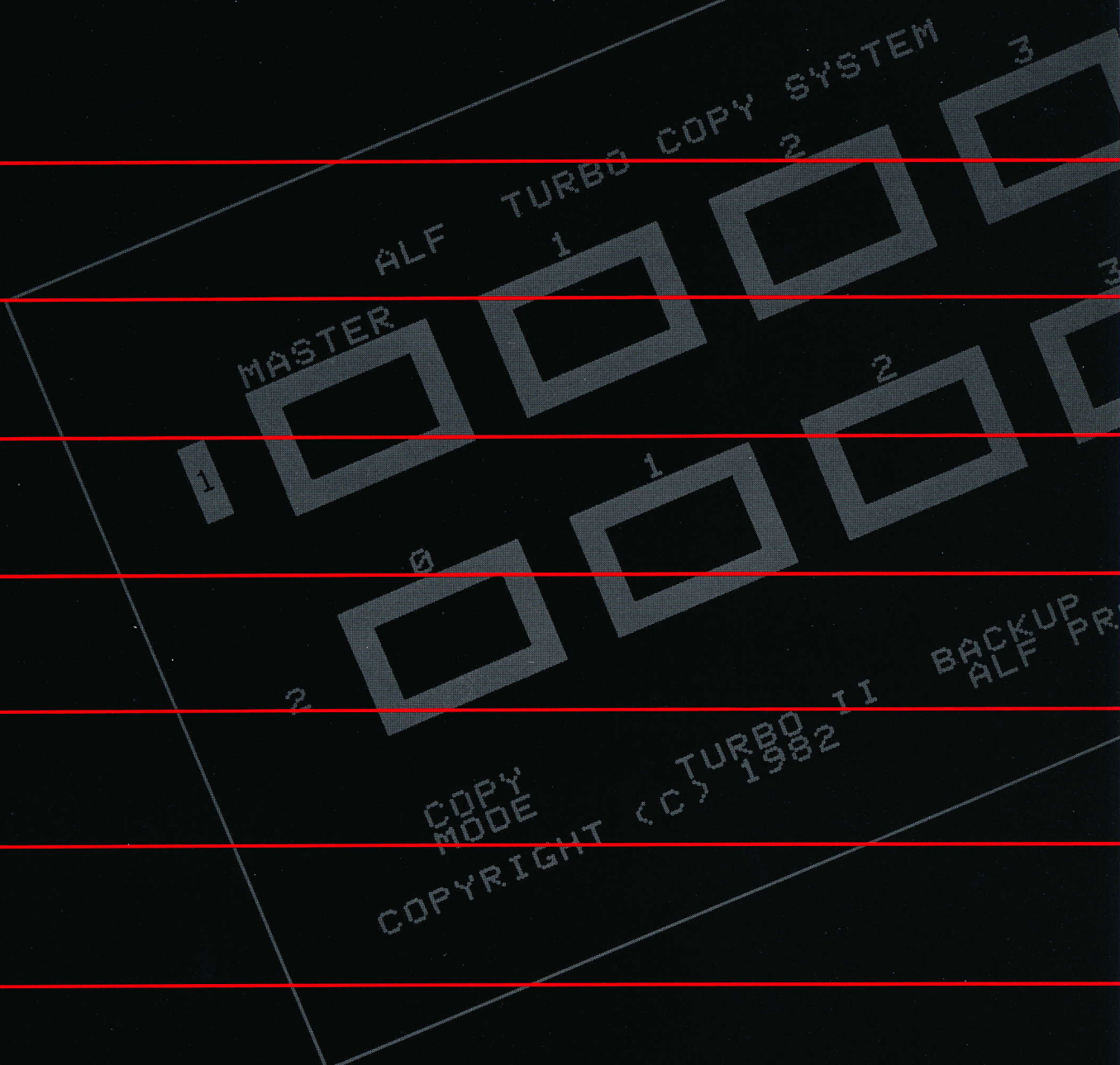
Using the
Copy Programs

The "Backup" Program

First, get the menu for the STANDARD COPY PROGRAMS disk on the video screen by putting the STANDARD COPY PROGRAMS disk in the Master drive and pressing RESET while holding down CONTROL. There's one program that isn't used often, and therefore isn't shown in the menu. Press the O key (the one next to 9, not the one between I and P) to read into memory a program called BACKUP. This program is used to make backup copies of the disks supplied with the Turbo II system, in case the original disks are ever damaged. It is also ideal for learning how to run the Turbo II copy programs. Take a look at the screen:

"NEXT SET" INDICATOR BAR		ALF TURBO II COPY SYSTEM		DRIVE NUMBERS
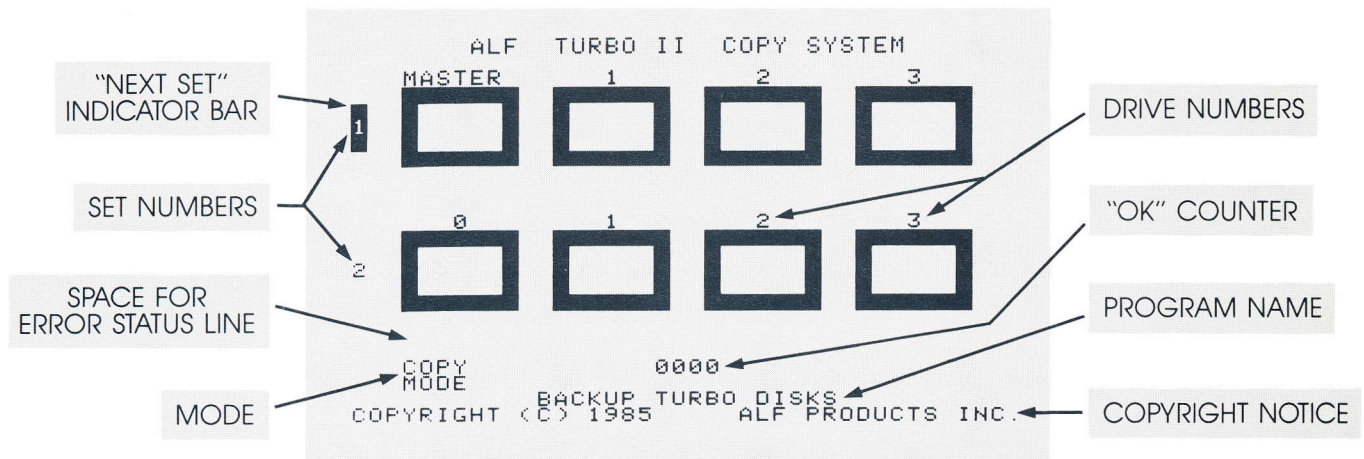
Status in the Box

Leave the STANDARD COPY PROGRAMS disk in the Master Drive, and insert and clamp a blank disk (with enable notch) in Set 1 Drive 1. Press the space bar (that's the long unlabeled key below the C, V, B, N, and M keys). ":22" appears inside the Master Drive's box on the screen, but quickly changes to just "22". The highest track number used on an Apple disk is 34, which in hexadecimal is 22 (track numbers are given in hexadecimal, or "hex", because the DRIVE TESTER program and various disk analyzer programs (sold separately) use hex track numbers). The ":22" means track 22 is currently being read by the Master Drive. It changes to "22" to indicate that track 22 has already been read. You'll notice that an "X" appears in the boxes for Set 1 Drive 2 and Set 1 Drive 3. (If you have only one Turbo II controller card, there will be X's in all Set 2 boxes as well.) This is because the BACKUP program normally only needs two drives, and the X's indicate drives that aren't plugged in or that won't be used.

Almost immediately, ":22" appears in the box on the screen for Set 1 Drive 1. This indicates that track 22 on

the disk in that drive is being verified. Quickly, that
changes to "22" and ":21" appears in the Master Drive's box
as track 21 is read. The Master Drive track number
changes to "21" and, as before, Set 1 Drive 1 shows ":21".
This continues until the last track, at which time the
Master Drive shows ":00", then "00"; Set 1 Drive 1 changes
from "01" to ":00". After track 00 is verified, copying is
completed. The display for the Master Drive is cleared,
and the display for Set 1 Drive 1 changes to a small
square and the word "OK". At the same time, a small
speaker inside the Apple goes "beep".

```
        ALF   TURBO II   COPY SYSTEM
        MASTER      1           2           3

   1    [      ]  [ ■OK  ]  [   X   ]  [   X   ]


        0           1           2           3

   2    [      ]  [      ]  [      ]  [      ]


   COPY                 0001
   MODE
              BACKUP TURBO DISKS
   COPYRIGHT (C) 1985        ALF PRODUCTS INC.
```
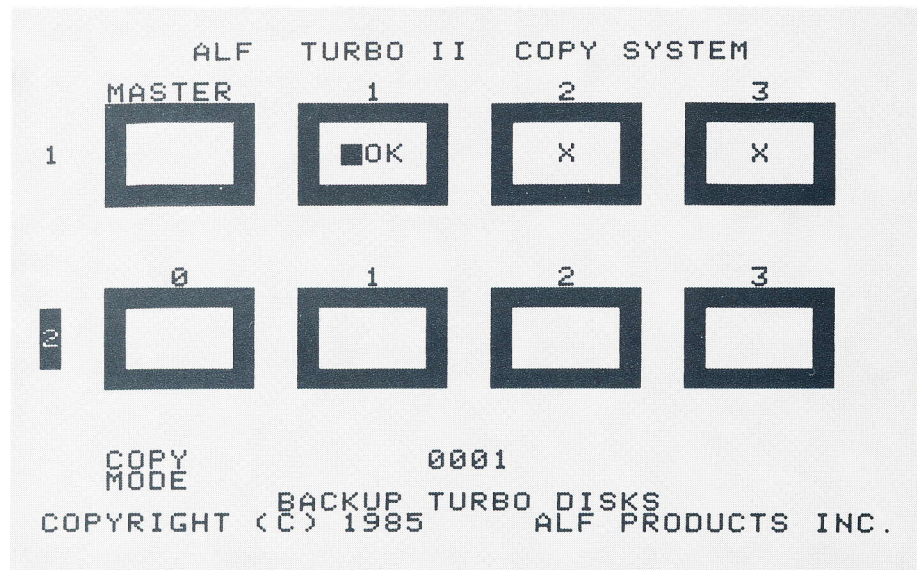
The "OK" in a box always means the disk presently in
the corresponding drive has been copied and no errors
were detected. Now remove the copied disk from Set 1
Drive 1. Notice that the "OK" remains on the screen.
Insert a new disk (or the same one again) and the "OK" is
cleared. An empty box means the disk in the drive hasn't
been copied yet.

The "Next Set" Indicator

If you have two controller cards, the Next Set
indicator bar appears over the Set 2 number when the "OK"
appears. Normally, you would proceed to copy disks using
the Set 2 drives; but as already mentioned the BACKUP
program uses only two drives. Press space, and four X's
appear in the Set 2 boxes to show these drives won't be
used. Now that the drives are "X-ed out", the system won't
even bother to move the Next Set indicator bar to Set 2.

The Error Status Line

   With a blank disk (or the disk you just copied onto)
clamped in Set 1 Drive 1, and the Next Set indicator bar on
Set 1, press space to begin copying again. Now, while the
system is copying, move the clamping handle on Set 1 Drive
1 to the open position and remove the disk. After a slight
pause, a video-game noise comes out of the Apple's speaker
and "BAD" appears in the Set 1 Drive 1 box on the screen.
Between the boxes for Set 2 and the mode indicator,
numbers like "19:0123456789ABCDEF" appear. This is called
the "error status line", and it gives some technical details
about the most recent problem. Unless you are really into
the deepest secrets of disk production, you won't really
care what the numbers mean. However, the number to the
left of the : is the track number where a problem was
detected, and the digits to the right of the : are the
numbers of all sectors with a problem. For this example,
track 19 (hex) is indicated and all sectors (0 through F)
were bad because there was no disk in the drive to copy
the sectors onto.

```
          ALF   TURBO II   COPY SYSTEM
          MASTER       1         2         3
      ┌─────────┐ ┌─────────┐ ┌─────────┐ ┌─────────┐
  [1] │         │ │   BAD   │ │    X    │ │    X    │
      └─────────┘ └─────────┘ └─────────┘ └─────────┘

              0         1         2         3
      ┌─────────┐ ┌─────────┐ ┌─────────┐ ┌─────────┐
   2  │    X    │ │    X    │ │    X    │ │    X    │
      └─────────┘ └─────────┘ └─────────┘ └─────────┘

      19:0123456789ABCDEF

      COPY                  0001
      MODE
                 BACKUP TURBO DISKS
      COPYRIGHT (C) 1985        ALF PRODUCTS INC.
```
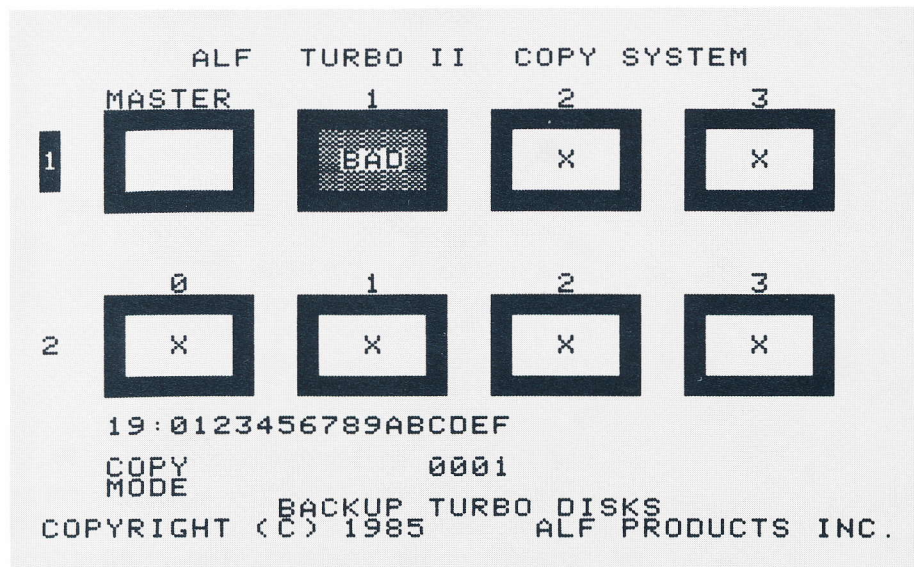
   Insert and clamp the Set 1 Drive 1 disk again. Notice
the "BAD" display clears. To clear the error status line,
press the RETURN key. Now press space to begin copying
again. This time, remove the disk from the Master Drive
while the system is copying. Note that "BAD" appears in
both the Master Drive's box and the Set 1 Drive 1 box.
Obviously, if the system can't read the master disk, all
copies being produced must be bad. Insert the master disk,
and press space to begin copying. Notice that the "BAD" in
the Master Drive box clears as you insert the master disk,
and the "BAD" in the Set 1 Drive 1 box clears when you
press space.

The "No Disk" Indicator Bar

Now let's try simulating another problem. Remove the Set 1 Drive 1 disk, then press space to begin copying. ":22" in the Set 1 Drive 1 box is replaced by a horizontal bar (the "No Disk indicator bar") and furious beeping screeches out the Apple's speaker. There are three things you can do now. Let's try each of them.

```
        ALF    TURBO II   COPY SYSTEM
        MASTER     1         2         3
   1    [ 22  ]  [ ▬  ]   [  X  ]   [  X  ]

          0          1         2         3
   2    [  X  ]  [  X  ]   [  X  ]   [  X  ]

        COPY              0002
        MODE
               BACKUP TURBO DISKS
        COPYRIGHT (C) 1985      ALF PRODUCTS INC.
```
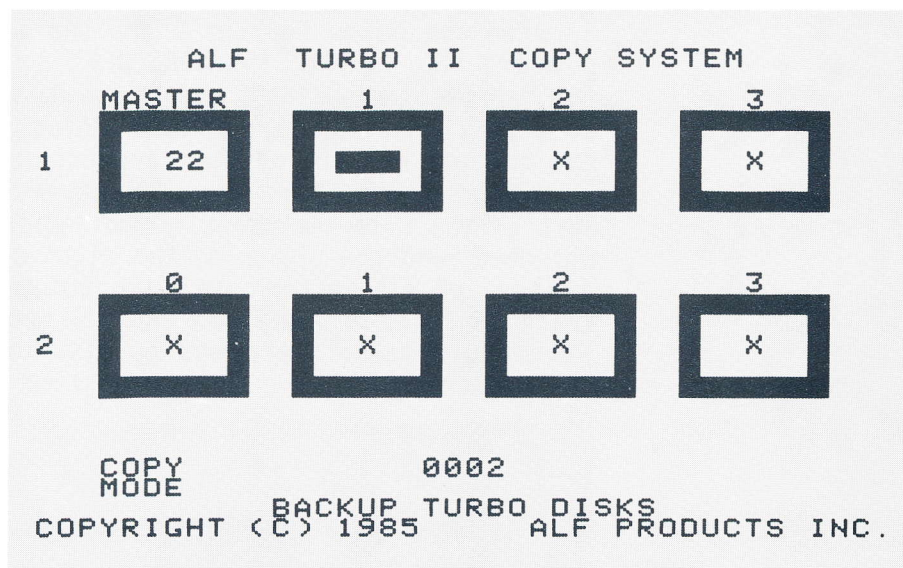
First, you could insert a disk and clamp it. After giving the drive about a second to get the newly clamped disk up to the correct speed, press the space bar. Notice that copying continues normally. Pressing space when the No Disk indicator bar appears signals the system to try again.

Remove the Set 1 Drive 1 disk and press space to get the No Disk indicator bar again. This time, press the right-arrow key (the key with an arrow pointing to the right). "BAD" appears in the Set 1 Disk 1 box with the word "EMPTY" under it. Pressing right-arrow when the No Disk indicator bar appears signals the system to skip the drive this time. It is usually used when you want to go ahead and copy the other disks in the set, but skip one or more drives in a set. You can also press the > key or the period key to do the same thing.

Press space to get the No Disk indicator bar again. This time, press the X key. Again, "BAD" appears in the Set 1 Disk 1 box, but the word "EMPTY" does not appear. Press space again, and an X appears in the Set 1 Disk 1 box. Pressing X (or x) when the No Disk indicator bar appears signals the system to stop using the drive. When using the BACKUP program, the system has been programmed as if the X key had been pressed for all drives except the Master

Drive (which can't be X-ed out) and Set 1 Drive 1. Now you've X-ed out Set 1 Drive 1, so there are no drives left to copy with.
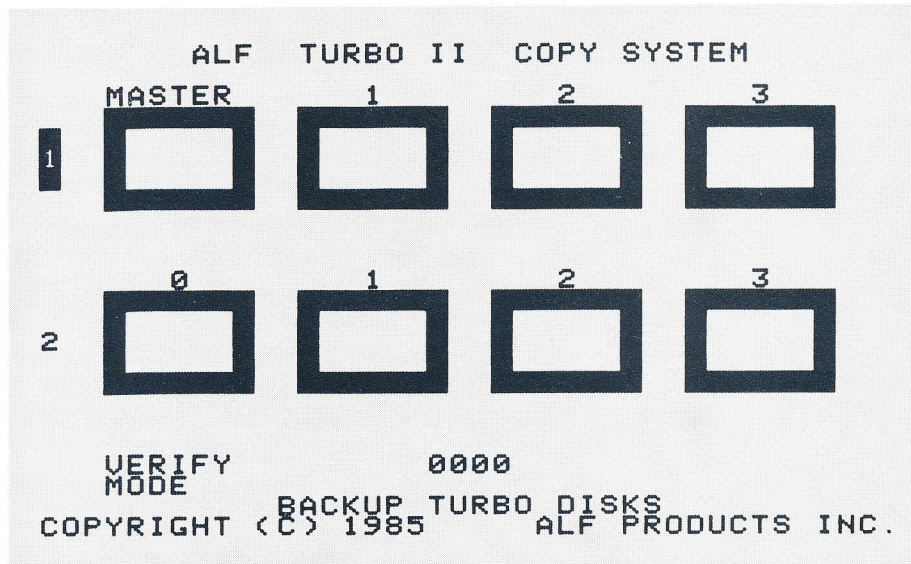
Control-X

Now let's learn some of the more esoteric commands. These commands aren't used very often. First of all, let's remove the X's. Hold down the CONTROL key and press the X key. All the activity lights come on, just like when you first select a program. In fact, pressing control-X (X while holding down CONTROL) restarts the program from the beginning, and causes all X-ed out drives to be restored. Of course, if you have only one controller card, Set 2 will remain X-ed out. And, as you begin copying, any missing drives will be X-ed out as well.

Now that you have all drives activated, you can try normal copying. Put blank disks in all drives except the Master Drive. The Next Set indicator bar shows which set will be copied if you press space. You can change that by pressing 1 (to move the Next Set indicator bar to Set 1) or 2 (to move it to Set 2). Press space, and you'll see the difference between making one disk at a time and making three or four at a time (unless you have only one Dual Drive Unit). If you have two controller cards, you can press space to copy the other set when the set being copied is finished ("OK" lights up on the screen in the boxes of all the set's drives).

Verify-Only Mode

With copied disks in all drives, you can try the verify-only feature. Hold down the CONTROL key and press the V key (this is called pressing control-V). Notice that "COPY MODE" changes to "VERIFY MODE" on the screen. Press the space bar, and the system appears to copy disks, but at a slightly faster rate. In verify mode, the system doesn't write on the disks, but it still reads them and compares the data with data read from the master disk. If any difference is found between the master and a copy, BAD appears for that copy. (If no sectors match on the first attempted track, the No Disk indicator bar appears instead of BAD. You can try again by pressing the space bar, or skip the drive using right arrow or X as before.) To go back to the normal mode, where the system both copies and verifies, press control-C.

```
          ALF   TURBO II   COPY SYSTEM
       MASTER        1          2          3
   ┌─┐ ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
   │1│ │      │  │      │  │      │  │      │
   └─┘ └──────┘  └──────┘  └──────┘  └──────┘

          0          1          2          3
       ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
   2   │      │  │      │  │      │  │      │
       └──────┘  └──────┘  └──────┘  └──────┘

       VERIFY             0000
       MODE
                  BACKUP TURBO DISKS
    COPYRIGHT <C> 1985        ALF PRODUCTS INC.
```

No-Notch Mode

```
          ALF   TURBO II   COPY SYSTEM
       MASTER        1          2          3
   ┌─┐ ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
   │1│ │      │  │      │  │      │  │      │
   └─┘ └──────┘  └──────┘  └──────┘  └──────┘

          0          1          2          3
       ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
   2   │      │  │      │  │      │  │      │
       └──────┘  └──────┘  └──────┘  └──────┘

       COPY               0000          NONOTCH
       MODE
                  BACKUP TURBO DISKS
    COPYRIGHT <C> 1985        ALF PRODUCTS INC.
```
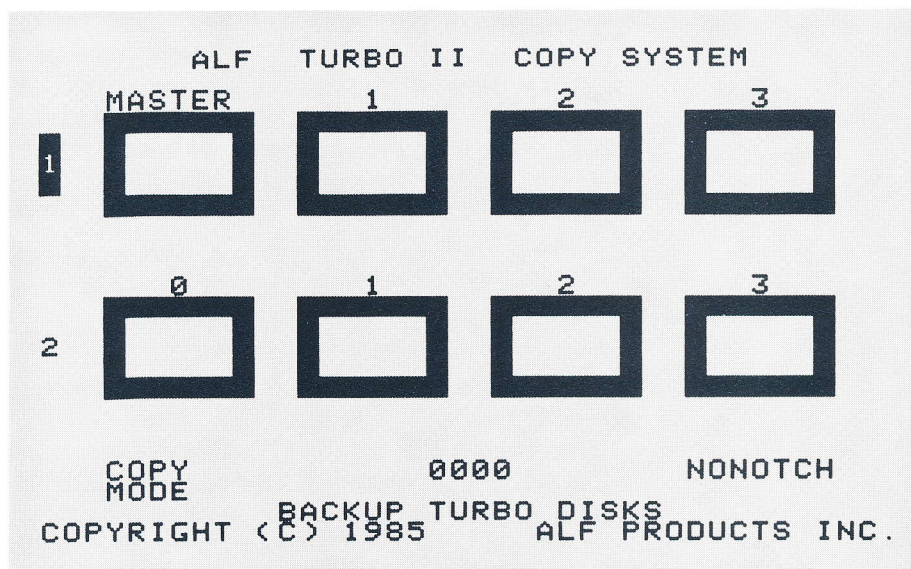
Now press control-N. NONOTCH appears on the screen. Try copying onto a brand new disk, one which has never been formatted. You'll notice the system responds as if the drive containing the new disk was empty. This is because in no-notch mode, the system can only write on disks with no write-enable notch. Put a write-protect tab over the new disk's write-enable notch and try copying it again. This time it works normally. You may also notice that the system appears to copy any disk with a write-enable notch provided that disk has already been copied. The reason is important to remember: the Turbo II system does not check whether or not a disk is protected, it simply attempts to write on it anyway. Circuitry in the drives prevents the

system from writing on a disk without an enable notch when NONOTCH is not on the screen, or on a disk with an enable notch when NONOTCH is shown. So, attempting to copy onto a protected disk is the same as using verify-only mode on that disk. The system "writes" the appropriate data on a track, although if the disk is protected circuity in the drive prevents the track from being changed, then the system reads the track's data to verify it against the data read from the master disk. If they match, the system proceeds normally. If a disk is protected but all tracks match the master, the system will still indicate an "OK" copy even though it didn't actually write onto the disk. This is not a problem, of course: the disk does contain the desired data. However, trying to copy a protected disk which doesn't match the master disk can be perplexing because errors will consistantly be reported at the first track that doesn't match. So, also remember that a "protected disk" is a disk that doesn't have a write-enable notch--unless NONOTCH is shown on the screen, in which case a "protected disk" is one that does have a write-enable notch. Now, to turn off no-notch mode, press control-N again.

No-notch mode allows you to copy onto factory write-protected disks (disks with no write-enable notches). It also allows you to copy onto a disk which has a write-protect tab covering the write-enable notch. However, this must be done with care. Be sure the write-protect tabs are firmly attached and do not stick out from the disk. Otherwise, they may peel off inside the drive and cause problems.
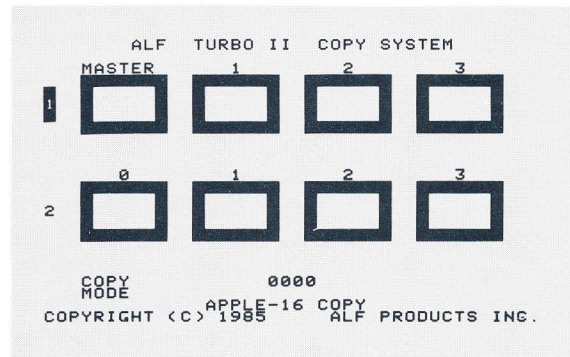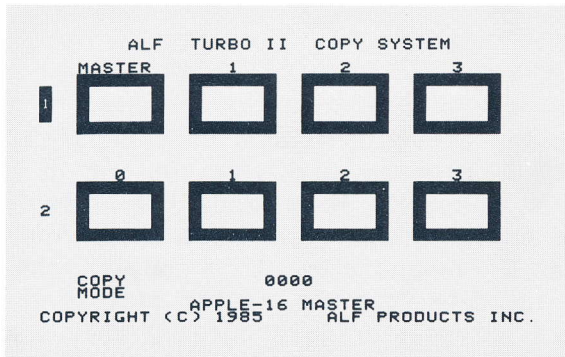
Master Disks

When you're using a regular Turbo copy program, rather than the BACKUP program, the disk you put in the Master Drive must be specially formatted. For example, if you put a standard Apple-format disk--made in an Apple drive--in the Master Drive and attempt to copy it, the Turbo system will indicate that the master disk is "BAD". Special programs called "mastering programs" that operate just like the BACKUP program are used to create the specially formatted disks--called "master disks". For example, the APPLE-16 MASTER program can read a standard Apple-format disk--made in an Apple drive--and produce a "master disk" which can be used (with APPLE-16 COPY) to produce as many copies as you like. Further, the copies produced are "master disks" themselves, and can be used to create more copies. The BACKUP program you've been using is a mastering program, sort of, which brings us to:

About the "Backup" Program

You might have wondered why a special "BACKUP" program is needed to copy the disks supplied with the Turbo II system. Are they copy-protected? No. They are in standard Apple format--although they won't "boot up" on an Apple that doesn't have a Turbo controller card. Unlike the other Turbo programs which all create "master disks" (disks which can be used in the Master Drive with a copy program), BACKUP is specially written to produce disks which aren't master disks. Here's why: let's say you put in the STANDARD COPY PROGRAMS disk, either the one supplied with the Turbo or a copy made with the BACKUP program, and select APPLE-16 COPY. Now, you would normally remove the STANDARD COPY PROGRAMS disk from the Master Drive and insert the (master) disk you wish to make copies of--but you forget, and try to make copies of the STANDARD COPY PROGRAMS disk! Since it isn't in standard master-disk format, the system indicates a "BAD" master--thus saving you from accidentally creating thousands of copies of the COPY PROGRAMS disk.

Of course, you could use the APPLE-16 MASTER program to create a copy of the COPY PROGRAMS disk which does let you accidentally create copies of that disk. But that might not be particularly wise.

Mastering and Copying Programs

As just mentioned, there are "mastering" programs and "copying" programs supplied with the Turbo II system. Mastering programs read standard-format disks and create specially-formatted disks, or "master disks". Copying programs read those master disks and create as many copies as you wish. Master disks contain all the data of the original disk, plus some special checkwords used by the Turbo system. Thus, master disks can be used (a) as a copy of the original disk, using the appropriate computer system, or (b) in the Master Drive, along with the appropriate Turbo copy program, to make more copies. And

as already mentioned, all copies produced by the Turbo system are suitable for use as master disks--except those made by the BACKUP program.

Let's continue now with instructions on using these programs. The instructions apply both to mastering and copying programs. The only obvious difference in the way these programs operate is that mastering programs start up with all drives X-ed out except the Master Drive and Set 1 Drive 1.

"Clicks"

When a mastering or copying program detects a minor error, it causes the speaker inside the Apple to click once. Then, the program tries copying the track over again (sometimes several times) to see if that corrects the problem. Sometimes a program clicks the speaker very rapidly, causing a low-pitched "buzzing" sound--especially if the master disk is not in the correct format. An occasional "click" is normal, but frequent clicks may indicate a problem. If clicks occur when one particular drive is being used (when the : is in a particular box on the screen), there may be a problem with that drive. If clicks occur on all or most drives, there's probably a problem with the blank disks.

Wrong Master Format

If the master disk is the wrong format--say it's an IBM PC disk, which is MFM format, and you're using APPLE-16 COPY--the word "BAD" will appear in the Master Drive box and in the boxes for the whole set. When using MFM COPY and LONG MFM COPY, the "message" FF:0 appears in the error status line on the screen. This means the program could not read a special marker on track 0 which tells it how many cylinders and sides to copy. When using APPLE-16 COPY, 22:0123456789ABCDEF appears in the error status line because it couldn't read any of the 16 sectors on the first track it tried to copy (track 22 hex).

Continuous Copying: Using a Key in Advance

If you have two controller cards, you can have the Turbo II system copy continuously, by using the "one key in advance" feature. Begin by selecting the appropriate copy program, putting the master disk you wish to copy in the Master Drive, and loading blank disks in the Set 1 drives. (Incidentally, when we say "blank disks" we really mean any disk you wish to copy on--it doesn't have to be "blank".

You can copy over disks that have already been copied, even thousands of times.) Press the 1 key if the Next Set indicator bar isn't on set 1. Now press the space bar to begin copying. As Set 1 is copied, load blank disks into the Set 2 drives; then press the space bar. When Set 1 is finished, the Turbo system will notice that you've pressed space again, so it will begin copying Set 2. You can then remove the disks from Set 1, load blank disks into Set 1, and press space. The system will operate continuously.

Here's the process again, assuming you've already started. (1) when a set finishes, remove the copied disks (after the activity lights go out), (2) insert blank disks in that set, and (3) press the space bar. When the next set finishes, repeat.

Copying speed can be increased slightly using the above technique if space is pressed early enough in the copying cycle. When a set is nearly finished, the system will check to see if space has been pressed. If it has, the system will turn on the drives of the next set, so they will be running at the proper speed by the time the current set is finished. This eliminates a brief wait that would otherwise be necessary while the drives' speeds stabilize. Note that this function does not occur the first time each set is used after a new copy program is selected or after control-X is used. This is because various checks need to be performed on the first use and these checks are too complex to do while copying.

Remember to wait until the activity light goes out on each drive before removing a disk. And of course, remember to clamp the new disk while the activity light is on. Additionally, do not press space until all disks in the set have been fully clamped--otherwise the drive speed may not be stabilized when copying begins. Also, remember to avoid turning the system on or off while a disk is in one or more of the drives.

Space is not the only key that can be pressed while copying is being done. The system has a one-key "memory", so it can remember the most recent key you've pressed while it was busy copying. For example, if you press control-V while the system is copying, copying will continue normally until the set is finished. Then the Turbo system will notice that the most recent key was control-V, and switch to verify-only mode. Since only the most recent key is used, an undesired key can be cancelled. For example, if you press control-V while the system is copying, then decide you don't want to switch to verify-only mode at the end of this set, you can press Z (or some other invalid key). When the set is finished, the Turbo system will accept the Z key--and "beep" because Z

isn't a valid key to press. The program will stay in COPY MODE, because the control-V was forgetten when the Z key was pressed. The one-key memory is available only on systems with two Turbo controller cards. Also, if a significant error occurs (the master disk is BAD, for example) the one-key memory will be cleared to prevent an undesired operation in light of the error.

Occasional "Beeping"

As just mentioned, the Turbo system "beeps" when an improper key is pressed. It also beeps every few seconds (using the speaker in the Apple, of course) when copying is finished and the system is idle. This will hopefully attract the attention of someone who will give it more disks to copy. The beeping stops after about two minutes, or if RETURN is pressed.

Step-by-Step Procedure

Now let's go through the whole procedure of making several copies of a disk, step by step. We assume the system has been set up and the cabling checked as already discussed. For simplicity, this example will be for an Apple format disk. To copy any other format, read that format's section in this manual, and use the appropriate programs instead of APPLE-16 MASTER and APPLE-16 COPY.

■ First step: turn the power on. Turn on all Dual Drive Units, the video monitor, and the Apple computer.

■ We begin by making a "master disk". Since we're copying an Apple-format disk, we need to use the APPLE-16 MASTER program. So, insert the disk labeled IBM & APPLE MASTER in the Master Drive, and clamp it.

MASTER UNIT

MASTER DRIVE   SET ONE DRIVE 1
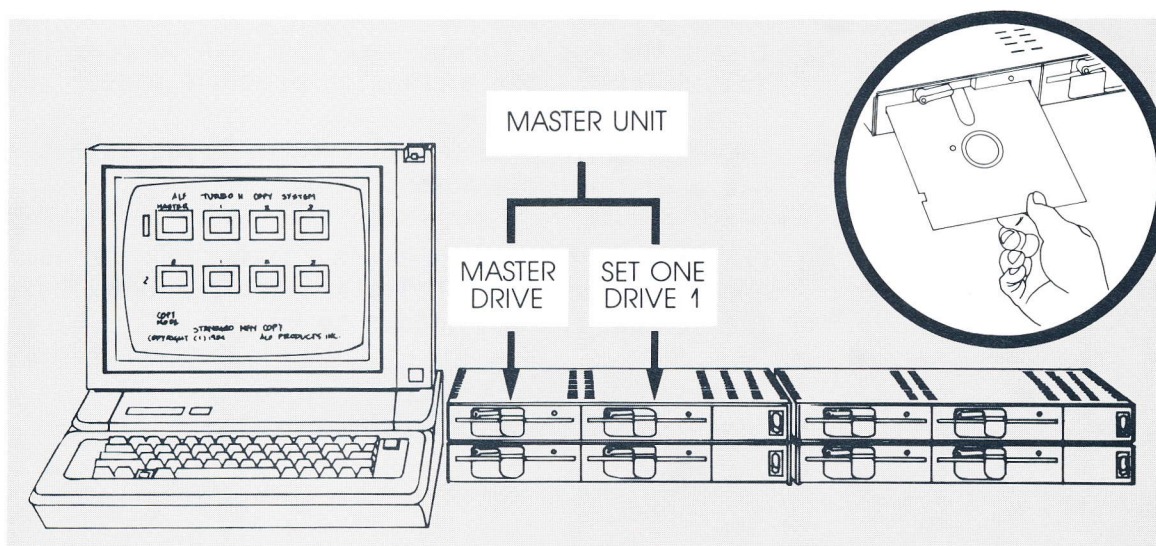
■ The menu appears (if it doesn't, press RESET while holding down CONTROL). Press the 5 key to select APPLE-16 MASTER.

```
        ALF  TURBO II  COPY SYSTEM CS6
     COPYRIGHT (C) 1985 ALF PRODUCTS INC.


        PRESS:   TO USE:

        1 --- IBM 9/2 MASTER
        2 --- IBM 9/1 MASTER
        3 --- IBM 8/2 MASTER
        4 --- IBM 8/1 MASTER
        5 --- APPLE-16 MASTER
```

■ The APPLE-16 MASTER screen display appears. Remove the IBM & APPLE MASTER disk.

```
            ALF  TURBO II  COPY SYSTEM
        MASTER       1          2          3

    1   [     ]   [     ]   [     ]   [     ]


            0          1          2          3

    2   [     ]   [     ]   [     ]   [     ]


        COPY              0000
        MODE
                    APPLE-16 MASTER
        COPYRIGHT (C) 1985      ALF PRODUCTS INC.
```

■ Insert the Apple-format disk you wish to copy into the Master Drive. (See picture on previous page.)

■ Insert a blank disk in Set 1 Drive 1. Be sure the disk has a write-enable notch.

■ Press the space bar to begin copying. Track numbers appear in the Master Drive and Set 1 Drive 1 boxes on the screen, and count down to 00.

■ OK appears in the Set 1 Drive 1 box. The disk in that drive is now a "master disk" copy of your Apple disk. (So, if you only want one copy, you're finished. If you need several copies, you'll want to use this "master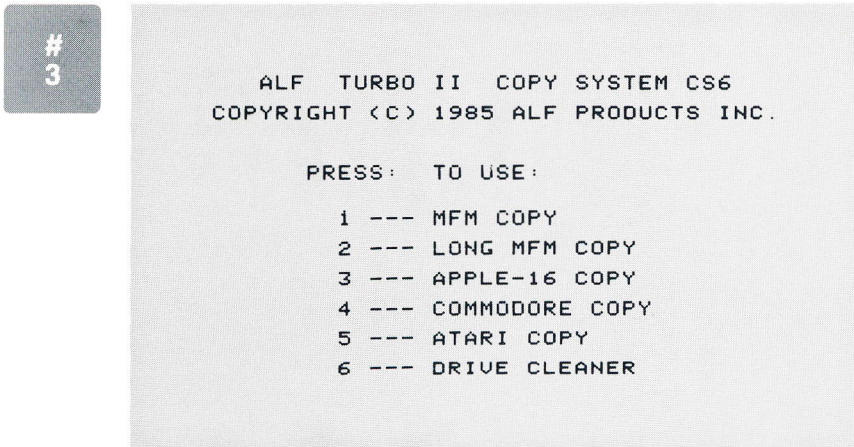 disk" and the APPLE-16 COPY program. You could keep making copies one at a time with the APPLE-16 MASTER program, but as you'll see the APPLE-16 COPY program is faster.)

```
            ALF  TURBO II  COPY SYSTEM
        MASTER      1          2          3
   1    ┌────┐   ┌────┐    ┌────┐    ┌────┐
        │    │   │■OK │    │  X │    │  X │
        └────┘   └────┘    └────┘    └────┘

            0          1          2          3
   2    ┌────┐   ┌────┐    ┌────┐    ┌────┐
        │    │   │    │    │    │    │    │
        └────┘   └────┘    └────┘    └────┘

        COPY              0001
        MODE         APPLE-16 MASTER
        COPYRIGHT (C) 1985      ALF PRODUCTS INC.
```
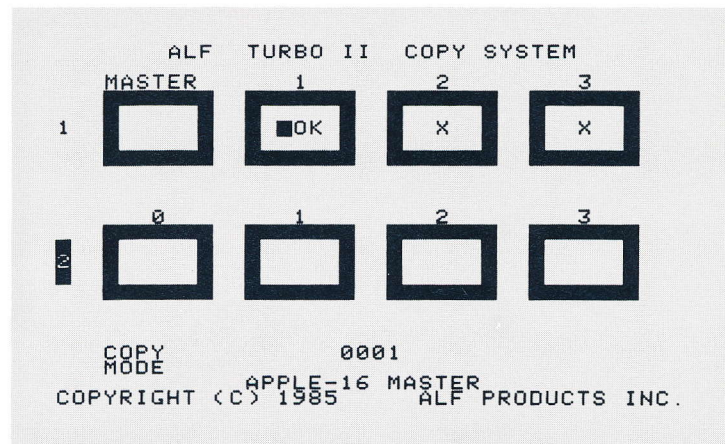
■ Remove the Apple-format disk and the newly created master disk.

■ Label the newly created disk so you'll know it's a master disk.

■ Insert the STANDARD COPY PROGRAMS disk in the Master Drive. (See picture on page 3-11).

■ Hold down the CONTROL key, press and release the RESET key, then release the CONTROL key. (This is called "pressing control-RESET".)

```
┌──────────┐  ┌────────┐
│ CONTROL  │  │ RESET  │
└──────────┘  └────────┘
```

■ The menu appears. Press 3 to select APPLE-16 COPY.

```
   #
   3
              ALF   TURBO II  COPY SYSTEM CS6
          COPYRIGHT <C> 1985 ALF PRODUCTS INC.

              PRESS:  TO USE:

                 1 --- MFM COPY
                 2 --- LONG MFM COPY
                 3 --- APPLE-16 COPY
                 4 --- COMMODORE COPY
                 5 --- ATARI COPY
                 6 --- DRIVE CLEANER
```

■ The APPLE-16 COPY screen display appears. Remove the STANDARD COPY PROGRAMS disk.

```
              ALF   TURBO II  COPY SYSTEM
          MASTER        1         2         3

      1   [    ]    [    ]    [    ]    [    ]

                 0         1         2         3

      2   [    ]    [    ]    [    ]    [    ]

          COPY              0000
          MODE
                          APPLE-16 COPY
          COPYRIGHT <C> 1985      ALF PRODUCTS INC.
```
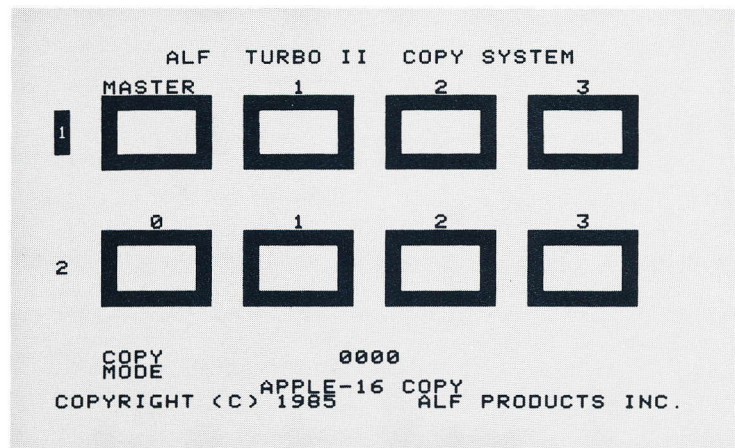
■ Insert the master disk you've just created into the Master Drive.

■ Insert blank disks in all Set 1 drives. Again, be sure they have write-enable notches.
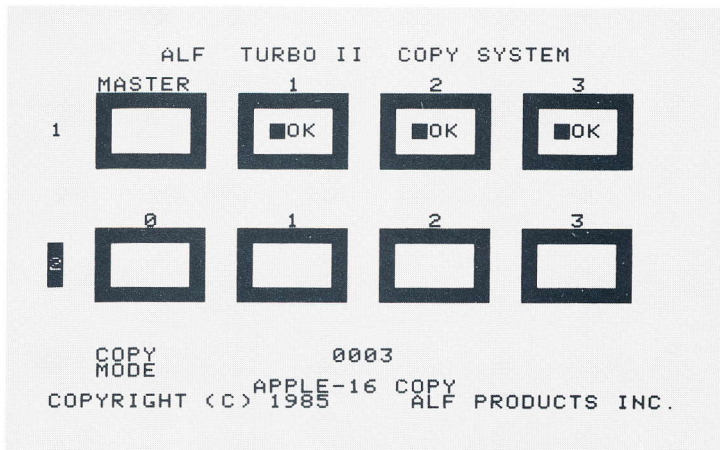

MASTER UNIT

MASTER DRIVE | SET ONE DRIVE 1 | SET ONE DRIVE 2 | SET ONE DRIVE 3

SET TWO DRIVE 0 | SET TWO DRIVE 1 | SET TWO DRIVE 2 | SET TWO DRIVE 3
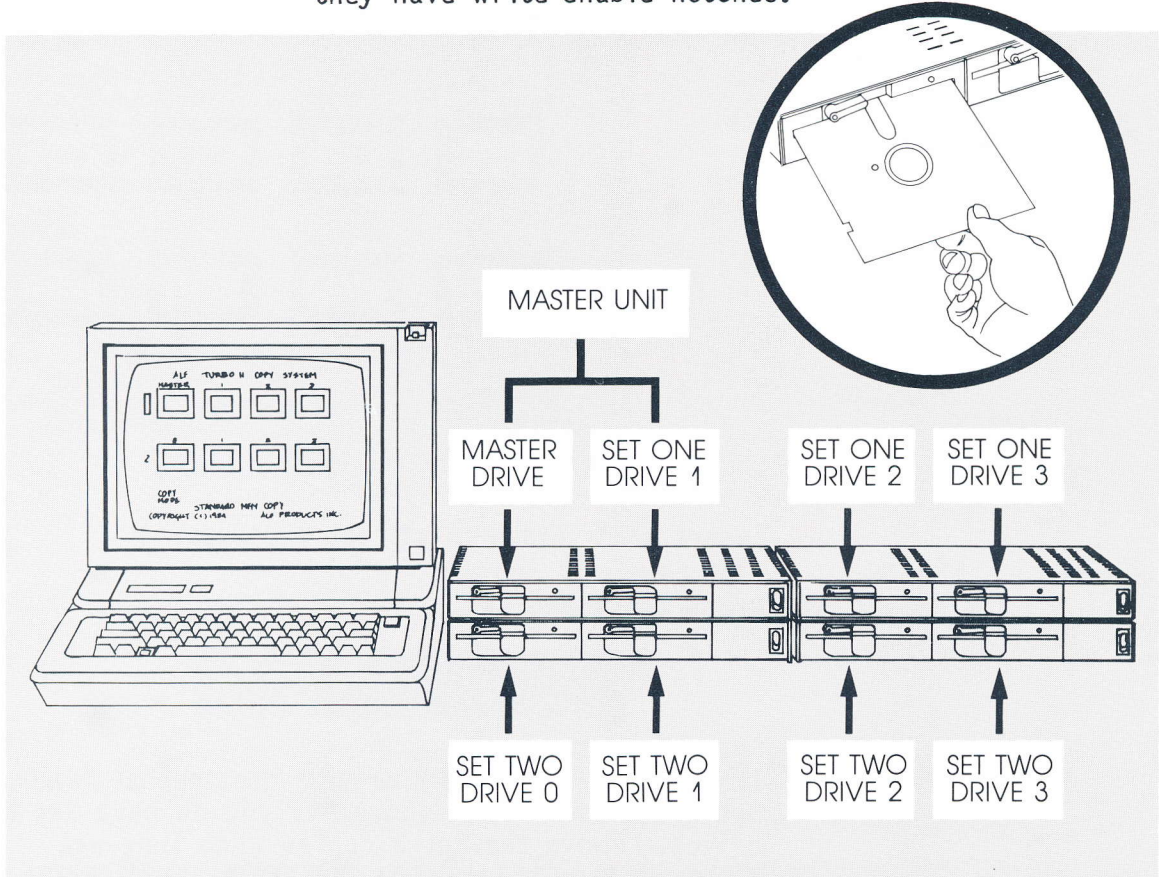
■ Press the space bar.

■ Insert blank disks in all Set 2 drives [skip if you don't have Set 2 drives].

■ Press the space bar [skip if you don't have Set 2 drives].

■ When the Set 1 copies finish ("OK" appears in the Set 1 boxes), remove them.

```
            ALF  TURBO  II  COPY SYSTEM
      MASTER         1           2           3
   1  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
      │      │  │■OK   │  │■OK   │  │■OK   │
      └──────┘  └──────┘  └──────┘  └──────┘

            0           1           2           3
   2  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐
      │      │  │      │  │      │  │      │
      └──────┘  └──────┘  └──────┘  └──────┘

      COPY                 0003
      MODE
                    APPLE-16 COPY
      COPYRIGHT (C) 1985     ALF PRODUCTS INC.
```

■ Insert blank disks in all Set 1 drives.

■ Press the space bar.

■ If you don't have Set 2 drives, continue at "When the Set 1 copies finish", above. If you do have Set 2 drives, remove the Set 2 copies when they are finished; then continue at "insert blank disks in all Set 2 drives" above.

■ Once you have the desired number of copies, stop inserting blank disks and pressing space. Remove the finished copies as "OK" appears. If you'll be needing additional copies later, file the "master disk" so next time you can skip using the APPLE-16 MASTER program.
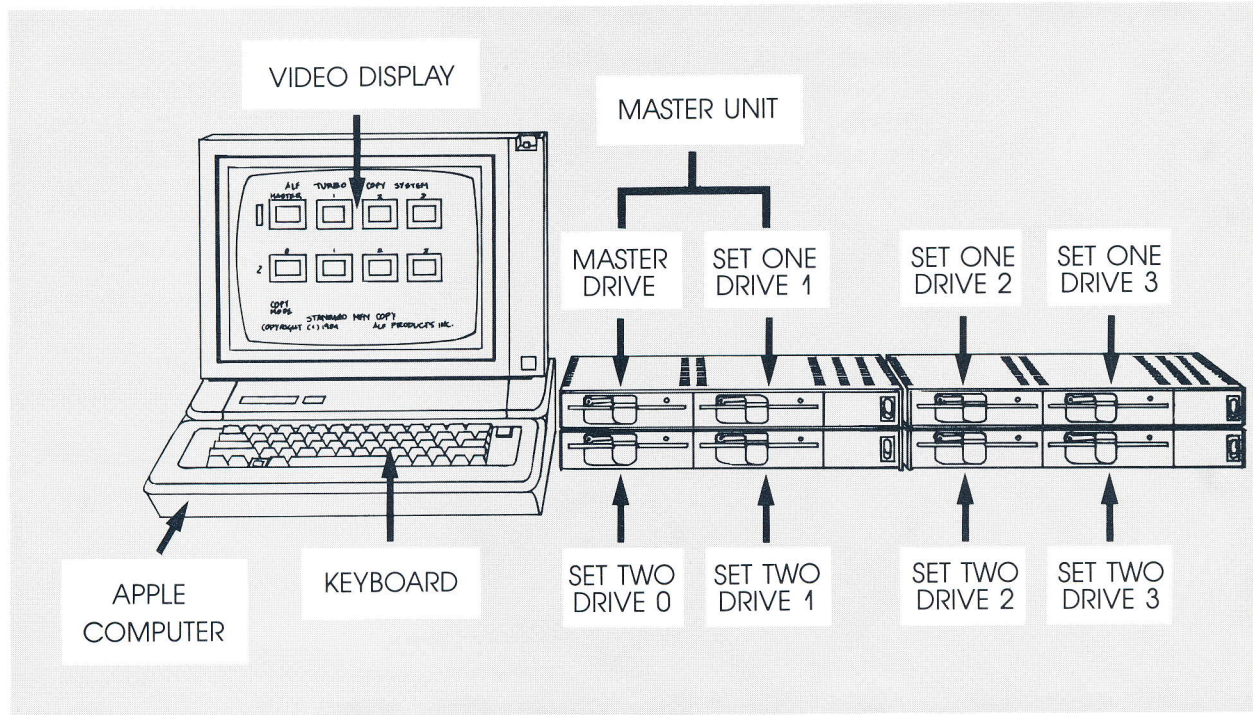
Finis

You're now an expert on running the Turbo II system. In the following sections, additional information for each particular format is given. But first, let's have a quick review of the major functions.
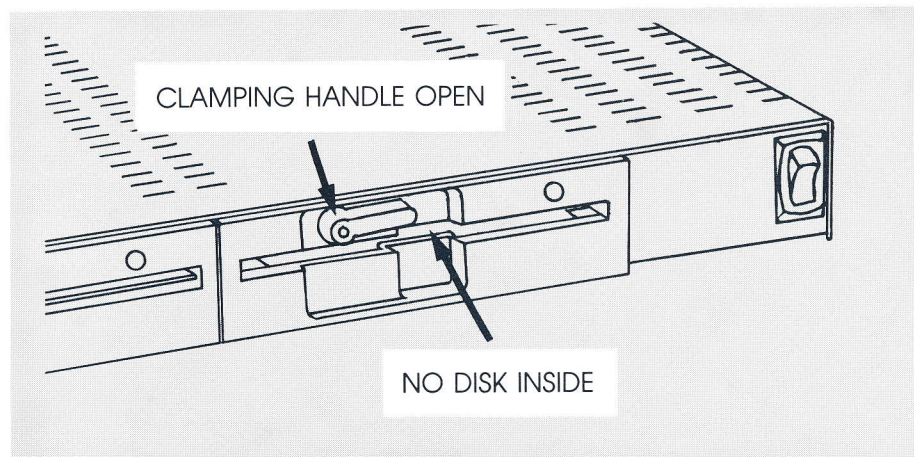
# Quick Reference

Turbo System Names

Clamping Handle Open

Horizontal position of clamping handle allows the disk to be removed.

Clamping Handle Closed

After inserting a disk, move the clamping handle to the closed (vertical) position. Clamping mechanism is engaged, allowing the drive's spindle to rotate the diskette media. Closing the clamping handle while the activity light is on insures that clamping occurs while the spindle is rotating (for a more positive clamping action).

CLAMPING HANDLE CLOSED   ACTIVITY LIGHT

DISK INSIDE
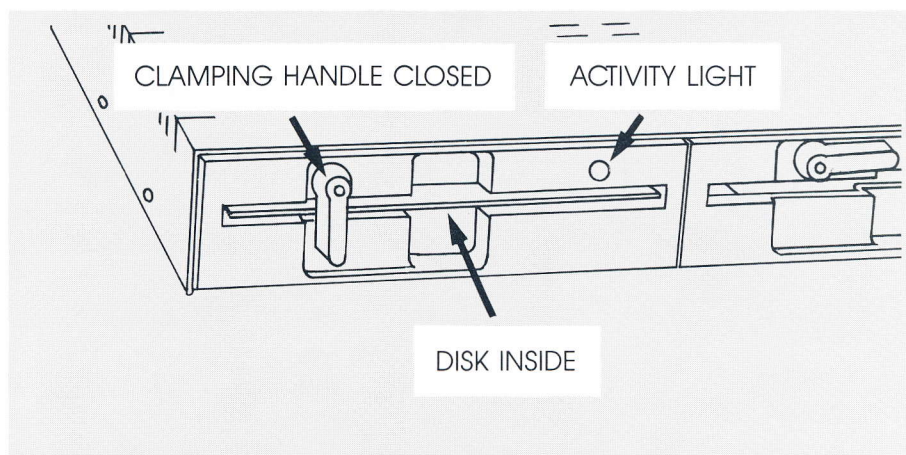
To "Boot Up"

Insert one of the disks supplied with the Turbo II system and turn on the Apple computer, video monitor, and all Dual Drive Units. If the system is already on, press control-RESET to cause the system to boot up ("reboot"). When the system "boots up" a menu will be displayed so you can select one of the programs on the disk. Exception: the DRIVE TESTER disk immediately runs the Drive Tester program without showing a menu; to boot up after using Drive Tester turn the system off and back on or (with an Apple //e only) press RESET while holding down CONTROL and the Apple-outline key.
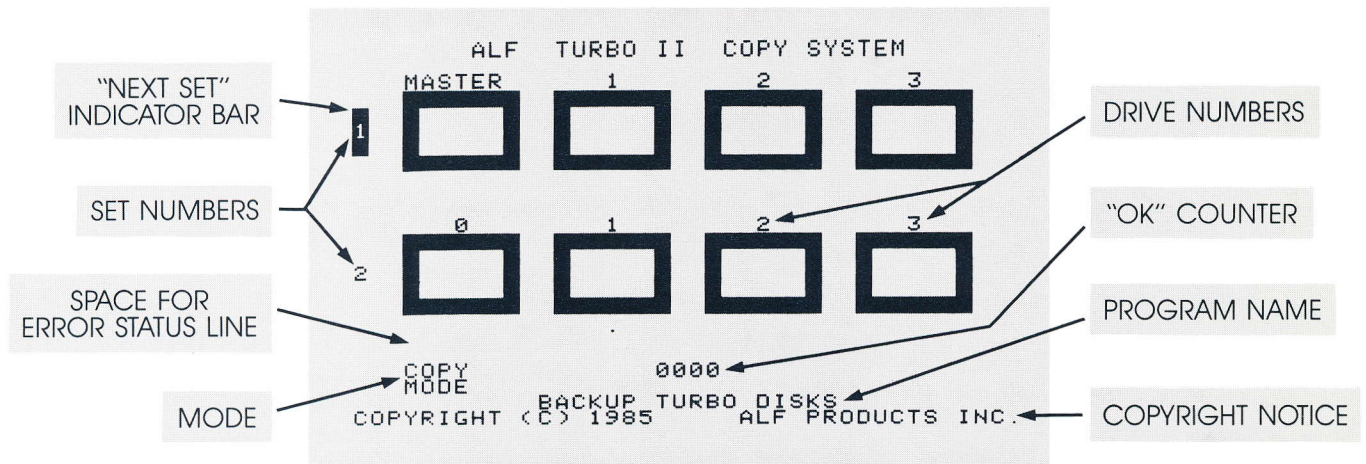
```
      ALF   TURBO  II   COPY  SYSTEM  CS6
  COPYRIGHT  (C)  1985  ALF  PRODUCTS  INC.

       PRESS:  TO USE:

         1 --- MFM COPY
         2 --- LONG MFM COPY
         3 --- APPLE-16 COPY
         4 --- COMMODORE COPY
         5 --- ATARI COPY
         6 --- DRIVE CLEANER
```

The Menu

The menu shows when a disk is "booted up". To select a program, press the corresponding key. If another Turbo disk has been inserted since the menu was shown, press any number shown and the correct menu (from the new disk) will be displayed--or press control-RESET to reboot. With the STANDARD COPY PROGRAMS disk, the zero key can also be pressed to select the BACKUP program.

"NEXT SET" INDICATOR BAR

SET NUMBERS

SPACE FOR ERROR STATUS LINE

MODE

```
        ALF   TURBO II   COPY SYSTEM
     MASTER        1          2          3

  1  [      ]   [      ]   [      ]   [      ]

  2  [      ]   [      ]   [      ]   [      ]
        0          1          2          3

     COPY              0000
     MODE
              BACKUP TURBO DISKS
     COPYRIGHT (C) 1985    ALF PRODUCTS INC.
```

DRIVE NUMBERS

"OK" COUNTER

PROGRAM NAME

COPYRIGHT NOTICE

Master/Copy Program Screen Display

Status within any of the eight boxes is as follows:
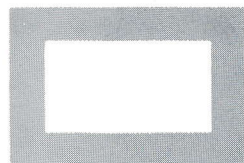
**EMPTY BOX:** indicates an empty drive or a drive containing a disk which hasn't been copied yet.

NUMBER IN BOX: indicates a drive containing a disk which has been copied from the highest numbered track to the track number shown in the box.
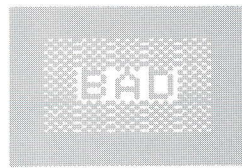
22

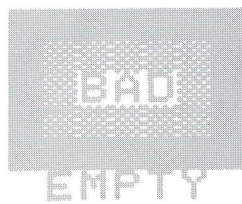**:NUMBER IN BOX:** indicates a drive containing a disk which is currently being written or read.

:22
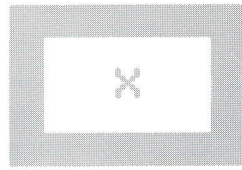
**X IN BOX:** indicates a drive not currently being used.
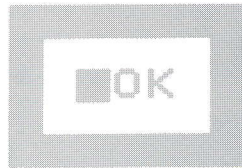
OK IN BOX: indicates a drive containing a good, copied disk.

BAD IN BOX: indicates a drive containing a disk which does not match the master disk, usually because of a physical defect; or in the Master Drive position a bad master disk or a master disk of the wrong format.

BAD IN BOX & EMPTY: indicates a drive containing no disk, or a drive containing a disk that couldn't be copied/verified and which you have decided to skip using the right-arrow key.
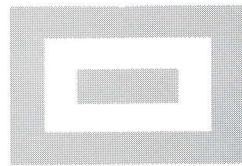
NO DISK INDICATOR: indicates a drive containing no disk, a protected disk, or a disk which can't be copied/verified.

Keys to Control Master/Copy Programs

SPACE begins copying (or verifying, in verify-only mode). The Master Drive must contain an appropriate master disk (or, when using a mastering program, an ordinary disk of the appropriate format). Before space is pressed, the Next Set indicator shows which set of drives will be copied onto. Space should not be pressed until all disks in these drives have been fully clamped. Each disk may be removed when the activity light of the drive containing the disk goes out--the corresponding box in the screen display indicates whether the disk removed is a good copy or not (see above).

1 switches the Next Set indicator to set 1.

2 switches the Next Set indicator to set 2.

3 allows a new master number to be typed in. Allowed only on certain mastering programs, see following sections for details.

CONTROL is used like a shift key to activate certain functions, like control-X below. The control key is required on functions which should not be selected accidentally. Do not press the control key and the desired function key simultaneously--for example to type control-X: hold down the CONTROL key, press the X key, then release the CONTROL key.

CONTROL-X resets the program and restores any drives you've disabled by pressing the X key (see No Disk indicator, above).

CONTROL-V sets the system to verify-only mode. When space is pressed, disks will be compared with the master disk. No disks are written on when the system is in verify-only mode. Verify-only mode is especially useful for checking disk interchangeability: copy disks, then set the system to verify-only mode, and put each copied disk into a different drive than the one that created it. This assures that more than one drive can read the disk.

CONTROL-C returns the system to copy mode after control-V has been used.

CONTROL-N switches back and forth between no-notch mode (indicated by NONOTCH on the screen between the Set 2 Drive 3 box and the copyright notice) and normal mode. In normal mode, the system cannot write on a disk unless it has a write-enable notch. In no-notch mode, the system cannot write on a disk which has a write-enable notch (unless it is covered by an opaque write-protect tab). The system does not give any indication when an attempt is made to write on a protected disk; thus copy mode functions like verify-only mode for each drive containing a protected disk.

RETURN clears the error status line. Also stops periodic "beeping" which occurs for the first two minutes after copying if the system is left idle.

CONTROL-RESET causes the system to "reboot". Before using, insert one of the disks supplied with the Turbo system in the Master Drive.

Keys to Use When the "No Disk" Indicator Appears

SPACE is used to try again, usually after inserting and clamping a new disk. Check the disk to make sure a write-enable notch is present. (When using no-notch mode, be sure a write-enable notch is not present.)
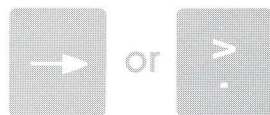
RIGHT-ARROW is used to skip the drive this time. BAD appears in the drive's box on the screen to remind you that the disk wasn't copied.

X is used, like right-arrow, to skip the drive. The drive will also be skipped in the future, until control-X is used or a new program is selected.

The Error Status Line

The ERROR STATUS LINE shows the details of the most recent verify error or bad master disk. The number to the left of the : is the track number in hexidecimal, or FF if the system is trying to read the cylinder/sides marker present on some master disks. With non-indexed formats, the number(s) to the right of the : are the bad sector number(s), with sectors 0 through 9 represented by 0 through 9 and sectors 10 up represented by the letters from A on. With indexed formats, the number to the right of the : is the side number (0 or 1). The cylinder/sides marker is shown as FF:0.

The Following Errors Can Appear When Using Certain Mastering Programs

FE NOT FOUND means that within an appropriate amount of time the start-of-sector marker (called the ID Address Mark, and represented by an FE byte on the disk) was not found. Usually indicates a blank side, a blank disk, or a disk which is not in the appropriate format.

WRONG TRACK means the track number read from the disk does not match the track number the recording heads should presently be at.

WRONG SIDE means the side number read from the disk does not match the side number presently being used.

BAD SECTOR # means the sector number read from the disk is 0 when the sector numbers start with 1, or is greater than the maximum sector number used.

SECTOR ABSENT means one or more sectors were not found. A list of sector numbers not found remains to the right of the message.

BAD SIZE means the sector size code read from the disk is incorrect.

BAD CRC CODE means the CRC (cyclic redundancy check) error detection code read from the disk was incorrect. Typically, this indicates a marginal or defective disk (or perhaps a marginal or defective drive).

FB NOT FOUND means that within an appropriate amount of time after the start-of-sector marker, the start-of-data marker (called the Data Address Mark, and represented by an FB byte on the disk) was not found. Typically, this is caused by the same problems as for BAD CRC CODE, above, or by copy-protected disks.

Apple-16
Format

13/16 Sector Formats

For a few years Apple used a 13-sector format on the Apple II and Apple II+, along with the DOS 3.1 and DOS 3.2 operating systems. Since this format is now considered obsolete, a 13-sector mastering program is not included with the Turbo II. Contact ALF if you need to copy these disks.

Now, the various Apple II computers (II, II+, //e, and //c) and the Apple /// use a 16-sector format. A wide variety of operating systems (DOS 3.3, ProDOS, UCSD P-System, CP/M) are used.

Copy Program

Disks created by APPLE-16 MASTER can be copied using the APPLE-16 COPY program. Note that if you write on a disk using an Apple computer, the Apple will erase the Turbo check words, and the disk will have to be remastered before copies can be made with APPLE-16 COPY.

About the Format

The Apple format is a non-indexed format. (That is, the standard Apple drives do not have an index hole sensor; so the disk is written without regard to index alignment.) This means the Turbo system can copy Apple format disks rapidly, by writing a track to all Set 1 or Set 2 drives simultaneously (regardless of their current index hole positions). It also means you can use either soft-sector or hard-sectored disks when using this format.

The Apple format is a GCR (Group Code Recording) single-sided format. Some people copy one side of a disk, then flip it over and copy the other side to achieve double-sided operation. This can be done with the Turbo, but you must of course remember to use no-notch mode when copying the back side unless the disk has a write-enable notch on both (left and right) sides. An index jacket hole on both sides is not necessary.

Features

No special features are available with the Apple mastering and copying programs.

IBM PC
Format

8/9 Sector Formats, Single/Double Side

When the IBM PC was first introduced, IBM used an 8-sector format, along with DOS 1.0. The newer operating systems (starting with DOS 2.0) use a 9-sector format. (Also, a 9-sector disk can be used as if it were an 8-sector disk; the operating system just ignores the 9th sector in this case. As far as the Turbo system is concerned, these are 9-sector disks.)

The IBM PC, PC Jr, and PC XT all use the same disk formats. The PC AT can read this format, and can also use a 96-track-per-inch 360 RPM high-density format (which the Turbo system doesn't copy).

IBM also allows either single- or double-sided disks to be used. The Turbo II is supplied with four mastering programs: IBM 8/1, IBM 8/2, IBM 9/1, and IBM 9/2. "8" and "9" indicate the number of sectors; "/1" and "/2" indicate the number of sides. Care should be taken to use the appropriate mastering program. Particularly, using a "/1" program on a double-sided format must be avoided, as only one of the two sides would be copied.

To select a mastering program when the format is unknown, begin with IBM 9/2. The message SECTOR ABSENT appears if the disk is an 8-sector disk: try IBM 8/2. With either "/2" program, if the message FE NOT FOUND appears, the disk is probably single-sided: try the appropriate /1 program (IBM 9/1 or IBM 8/1).

If for some reason you try to use IBM 8/2 or IBM 8/1 with a 9-sector disk, the message BAD SECTOR # will appear. If you try to use a "/1" program with a double-sided disk, no message will appear and only side 0 (not side 1 also) will be copied. No error is reported since it is sometimes necessary to use a "/1" program with a double-sided disk. For example, if you format a disk double-sided, then later reformat it single-sided, the "/2" programs would give no error since both sides contain a valid format. However, for speed reasons, you may wish to copy only side 0 and not side 1 which is no longer being used. In this case, use the appropriate "/1" program.

Copy Program

Disks created by IBM 8/1, IBM 8/2, IBM 9/1, or IBM 9/2 mastering programs can be copied using the MFM COPY program. The MFM COPY program reads a special marker to determine the number of cylinders (head positions) and the number of sides to be copied. (The marker is written very

close to the index position and thus does not interfere with the IBM computers.) Note that if you write on a disk using an IBM computer, the IBM will erase the Turbo check words and possibly the cylinder/sides marker, and the disk will have to be remastered before copies can be made with MFM COPY.

About the Format

These formats are indexed, so soft-sector disks must be used for copying. HARD-SECTORED DISKS MUST NOT BE USED as the copies would not be readable on the IBM systems. The formats are double-density ("System 34"-type) and either single- or double-sided.

Features

Unlike the APPLE-16 MASTER program, the IBM mastering programs show the sector number currently being processed. As each track is read, all the sector numbers will appear at the right of the screen near the bottom. As each sector is processed, its number is blanked out. When using a "/2" program, the sector numbers appear twice: once for each side. If a problem is encountered, the mastering program may start over, thus redisplaying the sector numbers. Sometimes an error message such as BAD CRC CODE (see the Quick Reference for details) may appear on the error status line during the first attempt, and then the second attempt may succeed; leaving the error message on the screen. This warns you that an error did occur, but since BAD is not displayed it did not reoccur when tried again.

Also unlike APPLE-16 MASTER and APPLE-16 COPY, the IBM mastering programs and MFM COPY do not display sector numbers in the usual error status line. Instead of track:sector(s), they display track:side.

One special feature of the IBM mastering programs is the ability to record a six-digit "master number" directly on the master disk. To use this feature, press # on the keyboard (SHIFT isn't needed, you can press just 3). A cursor appears over the word MASTER, and you can type in a six-digit number. This number will be encoded on all copies made while it is displayed on the screen. To change the number, press # again. The number 000000 is used to go back to producing disks with no master number. While copying, the word MASTER on the screen will automatically be replaced with the six-digit master number. All copies produced have the six-digit number as well. (It can be read by inserting the copy in the master drive and making a copy using MFM COPY.) The number is encoded, along with

the number of cylinders and sides, in an area of the disk
which is not normally used, so it doesn't interfere with
conventional use of the disks.
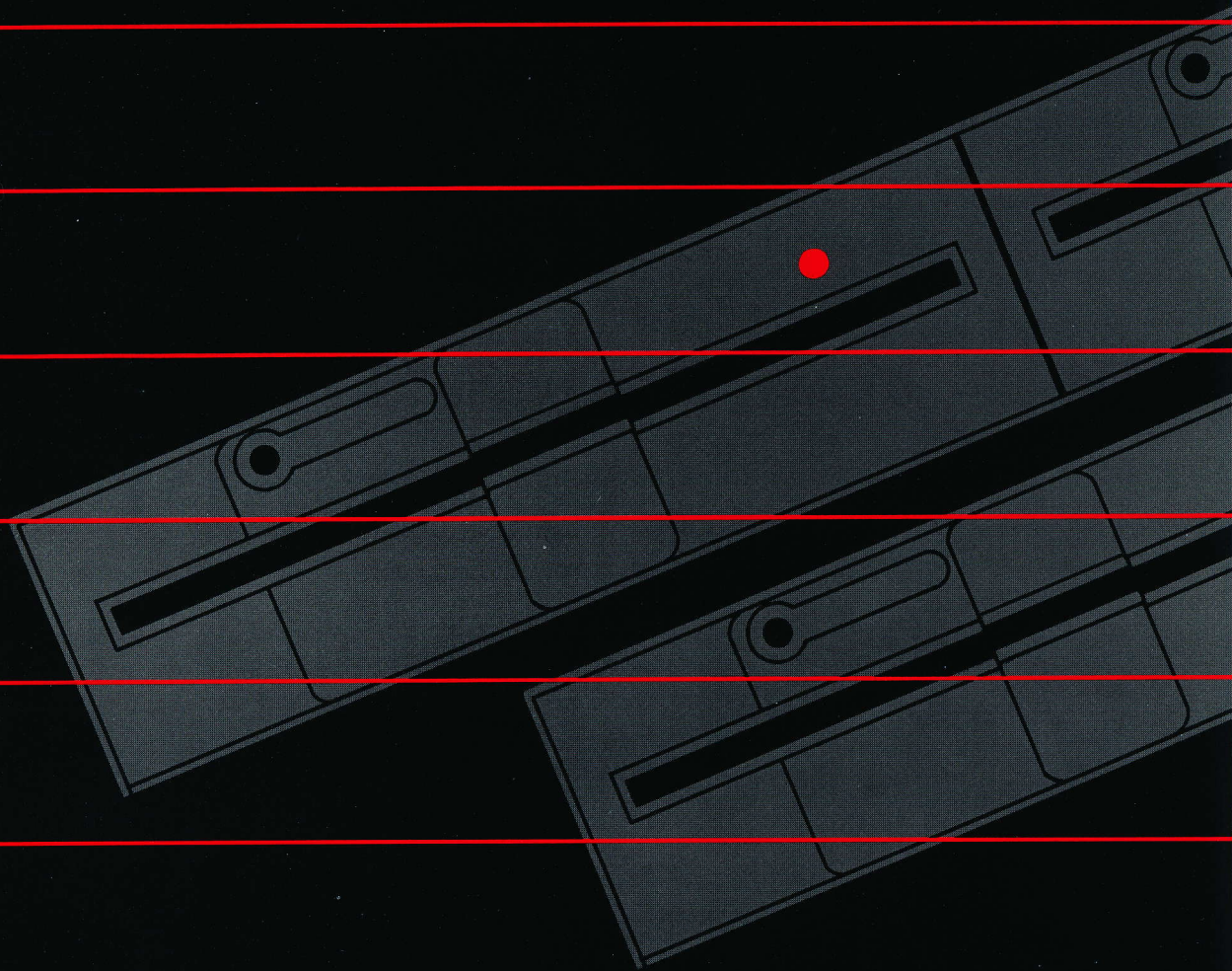
Drive Cleaner

Periodic Cleaning

The recording heads inside the disk drives accumulate debris from contact with the diskette, and thus must periodically be cleaned. With heavy use (8 hours per day), the heads should be cleaned frequently--perhaps once each week. A variety of head cleaning diskettes are available from several manufacturers. Be sure to pick a reputable supplier, and to use cleaning diskettes designed for dual sided drives.

The drive cleaner program, on the "Standard Copy Programs" disk, is designed for use with the 3M Scotch #7440 Head Cleaning Diskettes, or any similar product. BE SURE TO REMOVE THE PERFORATED TAB at the head opening on the labeled side of the cleaning diskette. Follow the instructions provided by 3M. In general: select the cleaner program, and wait until the program appears on the screen. Remove the "Standard Copy Programs" disk. Apply cleaning solution to the cleaning disk (as instructed by 3M), insert in one of the drives, and clamp. You'll notice the red light comes on, and the track number for that drive shown on the screen slowly goes up and back down. When the red light goes out, remove the cleaning disk. Repeat for all drives. If you have several cleaning disks, more than one drive can be cleaned at once. Allow the drives to sit for two or three minutes after cleaning before inserting disks.

Because there's no liner in the cleaning diskette, it will make a disconcerting "scratchy" sound while it is spinning. Some users may fear that the cleaning diskette is grinding down the drive's recording heads, but this is not the case. 3M's cleaning diskette is less abrasive than a regular diskette, when used according to 3M's instructions.

Drive Tester

Drive Maintenance

THE DRIVE TESTER PROGRAM IS NOT FOR MOST USERS. It is included only for those who wish to perform their own drive maintenance/repair and have the necessary equipment, knowledge, and experience. Panasonic's Reference Manual for the JU-455 (order #MSD850200800) is required. If you don't understand the Maintenance section of the manual, the drive tester program is not for you.

The Drive Tester program is designed to be used in place of Panasonic's "Exerciser PCB" (Panasonic FDD-EXT-5). The Drive Tester program also features a few additional functions.

The Drive Tester Program

The Drive Tester program is selected by inserting the "Drive Tester" disk, and turning the Apple on (or pressing RESET while holding CONTROL). Unlike the other programs supplied with the Turbo II system, the Drive Tester program does not "reboot" (show the menu of the disk in the master drive) when RESET is pressed. When using the Drive Tester program, it is necessary to hold down both CONTROL and the "apple" key to the left of the space bar and press RESET in order to reboot. (On older Apples without an apple key, you must turn the Apple off and back on to reboot.)

First, the Drive Tester program shows a menu of commands at the bottom of the screen, with a cursor (square block) between "S" and "D" at the left. You begin by typing the slot number of the Turbo II controller card you wish to use. Then, blocks appear over the "S" and "D", indicating you must now press either S or D. Press S if you typed an incorrect slot number; the cursor appears between S and D as before. Press D to specify which drive (0 through 3) you wish to use. The cursor appears to the right of the D, and you press the drive number. Now, blocks appear over the first letter of each command which can be used. Flashing blocks appear over commands that would erase the disk in the drive being used. Except for the flashing commands, you use a command simply by typing its first letter. Here's what each command does:

S is used to change the slot number of the Turbo II controller card being used. This is useful for changing back and forth between two controllers. Note that the Drive Tester program does not check to be sure a Turbo II controller is actually installed in the slot specified--this allows controller cards with defective ROMs or other problems to be used so the problems can be tracked down.

D is used to change which drive you're using. If an
inoperative or missing drive is selected, only
commands to change which drive is being used will be
accepted until a valid drive is selected. (This will
be indicated by the blocks on the first letter of the
valid commands.)

MOTOR normally shows "off". Pressing M will cause the
motor to be "on", that is, the drive's spindle motor
will run continuously. Pressing M again returns the
motor status to normal. Note that if you switch to
another drive (using the S or D commands) while the
motor is on, it will remain on. To turn the motor off
in this case, it is necessary to use the S and/or D
commands to select the drive again, then use M.

TRACK shows the drive's current head (cylinder) position in
hexadecimal. Pressing the right or left arrows moves
the head by one track. Pressing T allows the desired
track number to be input (as two hexadecimal digits).

HEAD shows which head (head=0 is the lower head, used on
both single and double sided disks, and head=1 is the
upper head, used only on double sided disks) is
currently selected. Pressing H switches the head
number between 0 and 1.

FP shows the currently selected flux change period for use
with the WRITE command. Pressing F cycles the
setting from 4 uS (microseconds) to 8 uS to 12 uS to
16 uS and back to 4 uS. The 4 uS setting is
equivalent to the "2F" or "125 kHz" signal referred to
in the drive service manual. 8 uS corresponds to the
"1F" or "62.5 kHz" signal. 12 uS is a frequency used
only on Apple format disks, and 16 uS is not used in
any current format (but is interesting for evaluating
the performance of the read circuits).

NOTCH switches to NONOTCH when N is pressed, and back to
NOTCH if N is pressed again. The controller is set to
notch (normal) or no-notch mode, as appropriate.

RECAL causes the drive to step toward track 00 until the
track 0 switch is activated. The drive heads then
return to the currently selected track number.

SPEED is requested by pressing S while holding down the
CONTROL or CTRL key. Before using the SPEED
command, insert a blank disk in the drive being used.
It is recommended that the SPEED command be used
with the heads positioned at track 00, note that the
track will be erased. The top portion of the screen
will show the current speed directly above the word

NOW. As the speed is recomputed, the old speed will move up one line and the new speed will appear directly above NOW. The number above NOW indicates how far the speed is from nominal (200,000 uS period, or 300 revolutions per minute) in 32 uS units. For example, 062 indicates the period is short by 62 times 32 uS, or 1,984 uS which means the drive is about 1% fast. Increasing the period by 1,984 uS (decreasing the drive speed 1%) would correct the speed. Likewise, -062 would indicate a drive 1% slow, requiring a -62 times 32 uS adjustment in the rotation period. Also shown is the minimum speed number so far, above MIN, and the maximum, above MAX. The difference between MIN and MAX is shown above VAR (variance). Press SPACE to reset MIN, MAX, and VAR after the motor speed stabilizes after motor-on or after readjusting the motor speed. For best performace, MIN should be greater than -010 and MAX less than 010. VAR numbers greater than 010 indicate possible problems with the motor speed control circuit. To exit the speed test function, press RETURN (or press the key for the command you wish to do next). Note that the disk in the drive being used must be write enabled (see "." and "*" under WRITE, below).

WRITE is requested by pressing W while holding down the CONTROL or CTRL key. Note: this command erases a track on the disk in the drive being used. A track consisting of flux changes at the interval selected by the FP command is written. With FP set to 4 uS, this command is used to write the "2F" pattern used in the Head Amplitude Check and other checks. Note that the pattern can be written only if writing is enabled, as indicated by a "." in front of SPEED and WRITE. An "*" instead of a "." indicates write protection.

ZERO causes the drive's heads to move rapidly between the current track position and the next higher numbered track. This is used for the Track Zero Detector Assembly Adjustment. For example, to seek alternately between tracks 01 and 02, type T01 to move the heads to track 01, then press the Z key. To stop, press RETURN (or press the key for the command you wish to do next).

Instructions on the actual tests and adjustments used in drive maintenance can be found in the Panasonic service manual.

The following table shows track numbers in
hexadecimal and the equivalent numbers in decimal. Decimal
track numbers are used in the drive manual.

HEX	DECIMAL	HEX	DECIMAL
00	0	14	20
01	1	15	21
02	2	16	22
03	3	17	23
04	4	18	24
05	5	19	25
06	6	1A	26
07	7	1B	27
08	8	1C	28
09	9	1D	29
0A	10	1E	30
0B	11	1F	31
0C	12	20	32
0D	13	21	33
0E	14	22	34
0F	15	23	35
10	16	24	36
11	17	25	37
12	18	26	38
13	19	27	39