

Mr. Moeb
884-8400

COPY II[®] PC OPTION BOARD

Serial # 020

Central Point
Software
INCORPORATED

9700 SW Capitol Hwy. #100 / Portland, OR 97219 / 503/244-5782

Table of Contents

Introduction	1
A Note About Updates.....	3
Installing the Copy II PC Option Board	4
Overview	4
Installation into a PC or PC/XT.....	5
Opening the IBM PC, IBM PC/XT	5
Installing the Option Board.....	7
Putting the PC Back Together	10
Installation in a Compaq Portable	10
Installation in an IBM PC/AT.....	14
Installation into Other Computers	18
Jumper Block Positions	19
PC/XT-AT/Compaq jumpers.....	19
DMA Jumpers.....	19
Making Backups with TC	24
Using the Menu Mode of TC	27
Hard Disk Buffering	28
The TC Track Status Line	29
Making Backups of Non-IBM Disks	30
What if the Backups Don't Work?	31
Using the Option Board Editor	34
Format of IBM PC Diskettes.....	37
What if the Board Doesn't Work?	41
Repair of the Option Board	42
The Enhanced Option Board	43
Introduction	43
Making the Backup.....	44
Using the Backup (manual method).....	46
Using the Backup (batch file method)	47
Using an Autoloader	50
Other Products	54
GhostWriter.....	54
Index	57

Introduction

Thank you for purchasing the Copy II PC Option Board! Contained in this package is almost everything you will need to use your IBM PC, IBM PC/XT, IBM PC/AT, IBM PS/2 Model 30, Compaq, Zenith 150, Leading Edge model D or M, NCR PC 4, HP Vectra, and most other IBM compatible computers to make archival backups of virtually all IBM PC software.

The Option Board and software will give your computer the same type of disk duplication technology used by many software duplication firms (who put the copy protection on software in the first place). Why is it necessary to add a board to your computer? The answer is a bit technical but simplified greatly, most copy protection schemes rely on quirks of the floppy disk controller board in your PC. Because software-only backup programs (such as Copy II PC) must use this floppy disk controller, they are not able to make backups of some newer protection schemes. The Copy II PC Option Board, however, contains its own disk hardware and doesn't use the normal floppy disk controller at all! It simply transfers every bit of data from your original diskette onto the backup.

(We will continue to support Copy II PC and send you notification of improvements. Copy II PC has several advantages, such as being able to be run on PC's without extra hardware and the ability to run many popular programs from a hard disk without inserting the original floppy.)

You may notice as you use the Option Board Software that it doesn't fit as many tracks into memory as Copy II PC. This happens even though it uses all available memory in your computer. Why? The Option Board Software doesn't just read the data, as does Copy II PC, it also reads (and stores) all the stuff between data fields. This "stuff" is often called "sector IDs", "gaps", "sync bytes", "address marks", and "clock bits". You won't need to worry about all this, but this is partially why the Option Board can easily handle many new protection schemes.

The Copy II PC Option Board also contains a "Track Editor". This will allow those of you with the urge (and the appropriate technical

knowledge!) to take a real look at protection schemes the chance to do so. The standard floppy disk controller is actually a simple computer on its own. When the PC wants some information from the diskette, it asks the floppy disk controller's "computer" to get it. Because of this, the PC has no way to look at the raw data on the diskette. Using the Option Board Editor, this limitation is bypassed, and the entire track will be visible to you.

In order to install the option board, all you will need is:

1. A standard screwdriver. (Other tools may be required for the Compaq Portable.)
2. About 30 minutes to read this manual and install the board.

Before you start, take a quick moment to verify that your Copy II PC Option Board package is complete. You should find:

1. This manual.
2. A diskette labeled "Copy II PC Option Board Software".
3. The Copy II PC Option Board and cable.
4. A postage-prepaid Product Questionnaire
5. An extra drive cable (Compaq Portable, Tandy 1000, HP Vectra and IBM PS/2 Model 30 computers only), when purchased separately.

Please take a moment to fill out and return the postage-prepaid product questionnaire and registration card. When product enhancements become available, this is the only way we have to notify you of these improvements.

When this is done, you are ready to start! We suggest that you take a few moments to read this entire manual before starting the installation. You can then refer to the appropriate sections to guide you through installing and using the Copy II PC Option Board.

A Note About Updates

While the Option Board includes some pretty impressive hardware capabilities, it is possible to come up with a protection scheme that the current SOFTWARE shipped with the board cannot handle. In fact, we have anticipated this and have therefore deliberately not included the capability to copy anything we can imagine. Instead, we include only enough "smarts" to duplicate software currently on the market. Why did we not include everything from the beginning? Simply because doing so would quickly accelerate the advance of copy-protection. When software protection firm X buys one of our boards and attempts to come up with a protection scheme to defeat it, we are able to ship you an update much sooner if what they come up with is something we have already anticipated (this has actually already happened several times). On the other hand, had we put everything we knew into the first release of the product, software protection companies would much sooner develop ever nastier schemes that keep you from making all-important backups.

In other words, we do not wish to encourage the creation of newer protection schemes that make using your computer more difficult. Rather, we will continue to respond to the current market, always giving you the capability to backup new software. In so doing, we will contribute as minimally as possible to the "software arms race".

Updates to the Option Board software are priced at \$15 and we will notify you of any major improvements (if you return the enclosed questionnaire/registration form).

Installing the Copy II PC Option Board

IMPORTANT NOTICE: The Option Board has been designed to work with the IBM PC, IBM PC/XT, IBM PC/AT (units with at least one 360KB disk drive), Compaq portable and Deskpro computers, Zenith 150, Leading Edge Model D and M, Magnum PC, NCR PC 4, Tandy 1000, and HP Vectra. Note that it has not been tested with other brands and while it may work with other computers, no installation instructions are provided and we cannot guarantee its use with other brands.

Also note that while installation into an IBM PC and PC/XT is straightforward, installation into the Compaq portable, IBM PC/AT, and some other compatibles is more involved and we recommend that you have your dealer do it for you unless you are very comfortable with opening your computer and moving boards and cables.

WARNING: Before going any further, turn off all power to the PC and disconnect any attached power cables. Installing the Copy II PC Option Board with the PC's power on could result in damage to the PC, Option Board, or you! Turn off the power and disconnect the AC power cord NOW.

Overview

This section describes installing the Option Board in the IBM PC or PC/XT. If you have a different computer, the steps may be slightly different. Detailed installation sections are provided later in the manual for the Compaq Portable and the IBM AT computers. There is also a section entitled "Installation into Other Computers" which includes installation tips for other machines.

If you have an IBM PC or XT, here is a summary of the installation steps:

1. Remove the cover of the PC.
2. Disconnect the cable from the drives at the floppy disk controller (FDC).
3. Move the FDC one slot to the left.
4. Insert the Option Board into the slot previously occupied by the FDC.
5. Connect the cable from the drives to the Option Board.
6. Connect the Option Board's cable to the FDC.
7. Replace the PC's cover.

We recommend that you follow the installation steps as shown below rather than attempting to install the Option Board from the above overview.

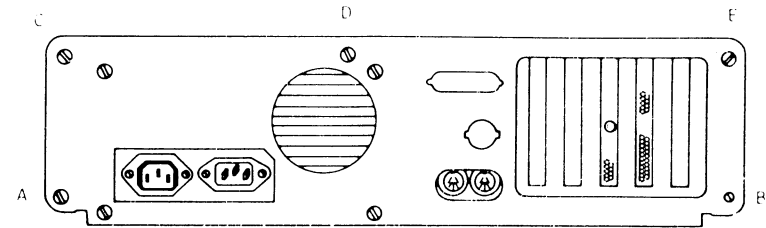
Also, please note that there are several different "versions" of the Option Board. The only difference between these various boards is the size of the board and the placement of some of the chips. All Option Boards, regardless of size, however, are identical as far as their capability to make backups is concerned. Throughout the rest of the manual, there are various diagrams. Due to the variations in Option Boards, some of the jumpers that are described may be in different places. On all boards, these jumpers are clearly labeled so you can easily find them. The purpose of this note is to let you know not to worry if your board is different from the diagrams.

Installation into a PC or PC/XT

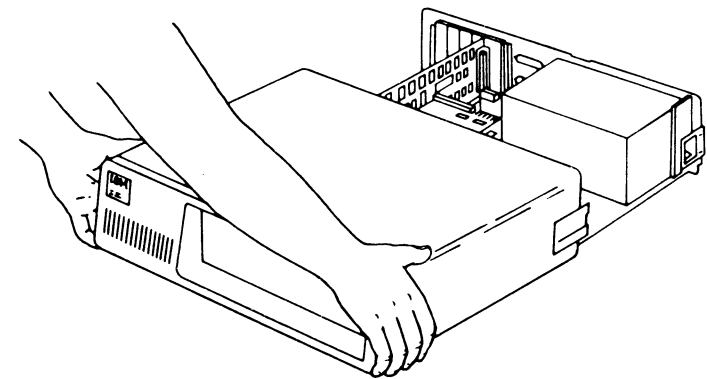
Opening the IBM PC, IBM PC/XT

This section describes removing the cover of an IBM PC or IBM PC/XT. If you have an IBM PC/AT or Compaq computer, you should refer to their operating manuals for this procedure.

With the power off, unplug the monitor and the keyboard and set them aside. This will give you a little working room. Next, position the computer or yourself so you can see the back panel as shown:

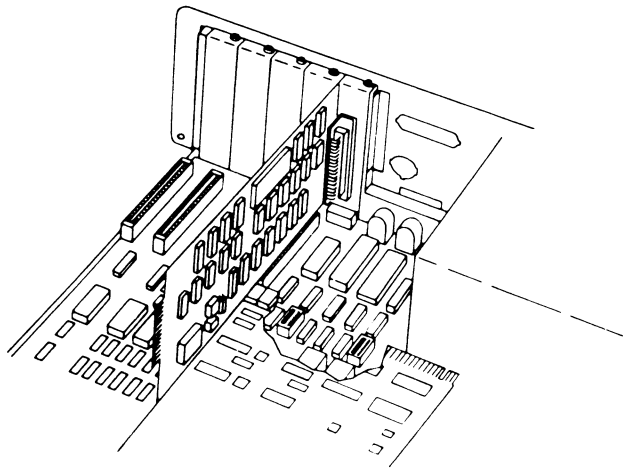


To open the computer, the cover will have to be removed from the chassis. This is done by removing several screws on the back panel of the PC. These screws are marked A - E above. With your screwdriver, remove these screws and put them aside for later. (Note: on older PC's, you will only need to remove the screws marked A and B.) Then, gently slide the cover of the computer toward the front until the inside circuitry is exposed. It is not necessary to totally remove the cover from the chassis, although doing so makes installation of the Option Board a little easier.



Now, if you look down into the computer, you will see the guts of the PC: the computer's main circuit board.

On the right will be either a silver or black box (the power supply); towards the front will be the disk drive assembly; and near the rear panel, on the left side of the board, will be five or eight connectors called expansion slots.



Installing the Option Board

This section describes installing the Option Board into an IBM brand PC or PC/XT. If you have an AT or Compaq computer, please skip ahead to the appropriate installation section.

For location purposes, let's call the slot nearest the power supply slot #1, and the slot nearest the left side of the PC slot #5 (or slot #6 on newer PC's). This numbering scheme ignores the short slots on the PC/XT.

Depending upon the setup of your PC, these slots may already be occupied by other expansion boards. Whatever else you've got working in your PC, in all probability, at least two of these slots are taken up with 1) a video display card which sends information to your monitor, and 2) a disk controller card which controls the operation of the IBM's floppy disk drives.

The Copy II PC Option Board will also be installed into one of these expansion slots. Were it not for a few physical limitations, almost any slot at all would accommodate the board. However, the Option Board must not only be installed into one of the available expansion slots, but it must also be cabled to the disk controller card. (The Option Board will not work in the short slot nearest the power supply in PC/XT's, Compaq Deskpro's, and some compatibles.)

Because of the length of the internal cables necessary for the hook-up, we recommend installing the Option Board in the slot currently occupied by the floppy disk controller, and moving the floppy disk controller to the next slot to the left. Unless you have a hard disk, the floppy disk controller is probably the board in slot #1 (the long slot closest to the power supply). If you do have a hard disk, it is most likely in slot #2. (If you have an XT, slot #1 refers to the first long slot, and slot #2 to the second long slot.)

Locate the floppy disk controller board now. It has a cable coming from the end of the board that plugs into the floppy disk drives.

If the slot immediately to the left of the floppy disk controller is used, you will have to re-arrange some of the other boards in your computer so that this slot is available.

If it is already open (has nothing plugged into it), you can move the floppy disk controller into this slot now. First, you will probably have to remove the blank metal bracket from the chassis of the PC behind this empty slot. Use your screwdriver to remove the small screw at the top of the bracket and set both the bracket and screw aside for now. (Be careful not to drop the screw into the PC!)

Now carefully remove the cable connecting the floppy disk drives to the controller (at the controller end). Next, use your screwdriver to remove the board from the chassis. The screw is located near the end of the card, on the top of the metal bracket mounting it in the PC. When the screw has been removed, carefully lift the board up, and re-insert it into the next slot to the left.

You can go ahead and re-screw the board into the PC, but don't connect the floppy drive cable.

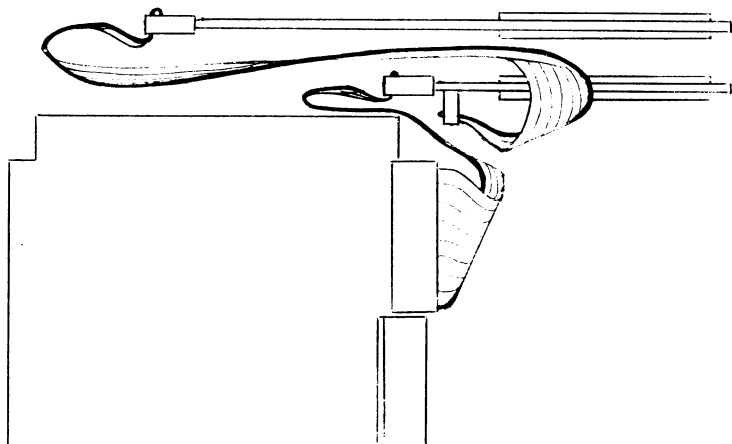
Important: The following paragraphs describe the actual installation of the Option Board. The instructions are different depending upon the type of floppy disk controller your computer has. It has come to our attention that some IBM PC, XT, and compatible owners have floppy disk controller boards (not made by IBM) that use the connector arrangement found on Compaq and IBM PC/AT computers. Here's how to tell: If the

cable coming from your drives to your floppy disk controller has an edge-style connector (that plugs into the edge of the board itself), follow the PC and PC/XT instructions. If it has a connector that plugs into two rows of metal pins on the board, follow the instructions for the IBM PC/AT computer.

Remove the Option Board from its box, and insert it into the slot where the floppy disk controller was. Don't worry about the cable: you'll connect it in just a moment.

Now you have just two connections left to make! First, locate the cable connected to the floppy disk drives. The other end of this cable used to plug into the floppy disk controller, but will now be connected to the Option Board. Plug it into the gold edge connector (J3) on the end of the Option Board. If this cable has a colored line on one side, it should be closest to the top of the Option Board.

Finally, connect the cable coming from the Option Board to the floppy disk controller. This cable will plug into the gold edge connector on the floppy disk controller. The red line on the cable should be up, towards the top of the connector on the floppy disk controller. You can fold the Option Board's cable over the top of the Option Board to make installation easier as shown below:



When you are done, double check the connections. The cable coming from the floppy disk drives should connect to the Option

Board. The Option Board's cable should connect to the floppy disk controller.

Now, screw the Option Board into the chassis using the screw you removed from the blank bracket. Double check that all the boards are firmly seated into their expansion slots! If they are not, you could damage them or the PC when it is turned on!

Putting the PC Back Together

The cover is replaced in the reverse order from which it was removed. Gently slip the cover back over the lower chassis grooves and slide it back towards the rear panel. It should fit comfortably around the chassis with the cover just overhanging the rear panel. Here you can use the screwdriver to insert and tighten the back-panel screws you removed in the beginning. Now reconnect the monitor and keyboard cables.

That's it! The Copy II PC Option Board is now installed in your system. And your computer can now use the extra capability of the version of Copy II PC that is included with the Option Board. Double check that everything has been correctly installed by turning on your computer and verifying that it functions normally. Try running your word processor, spreadsheet or whatever you ordinarily use. Your computer should operate no differently than it did before the Option Board was installed.

If it doesn't, quickly turn off the power! Remove the cover, and verify that all the cables are installed correctly, and that the boards are seated tight into their expansion slots. If all looks OK, but you still can't get your computer to work, see the section titled: "What If The Board Doesn't Work" at the end of this manual.

Installation in a Compaq Portable

For location purposes, let's call the slot closest to the front of the computer (toward the keyboard) slot #1, and the slot nearest the back of the Compaq slot #5.

Depending upon the setup of your Compaq, these slots may already be occupied by other expansion boards. Whatever else you've got working in your computer, in all probability, at least two of these slots are taken up with 1) a video display card which sends information to your monitor, and 2) a disk controller card which controls the operation of the floppy disk drives. The floppy disk controller board is usually in slot #1, the one closest to the keyboard.

The Copy II PC Option Board will also be installed into one of these expansion slots. Were it not for a few physical limitations, almost any slot at all would accommodate the board. However, the Option Board must not only be installed into one of the available expansion slots, but it must also be cabled to the disk controller card. (The Option Board will not work in the short slot nearest the power supply in the PC/XT, Compaq Deskpro, and some compatibles.)

Because of the length of the internal cables necessary for the hook-up, we recommend installing the Option Board in slot #2, the slot right behind the floppy disk controller card.

Locate the floppy disk controller board now. You should see a short cable coming from the top right hand corner of the board that plugs into the back of the floppy disk drives.

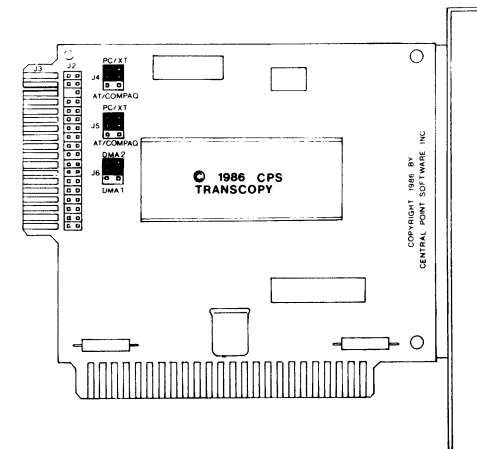
If the slot immediately behind the floppy disk controller is used, you may want to re-arrange some of the other boards in your computer so that this slot is available. If it is empty but there is a blank metal bracket covering the side of the slot on the case, go ahead and remove it now as the Option Board has its own metal bracket.

Before installing the Option Board, some jumpers must be moved and the Option Board cable must be reversed (it came to you configured for installation in an IBM PC or PC/XT). The modification is simple, however. Here's how to do it:

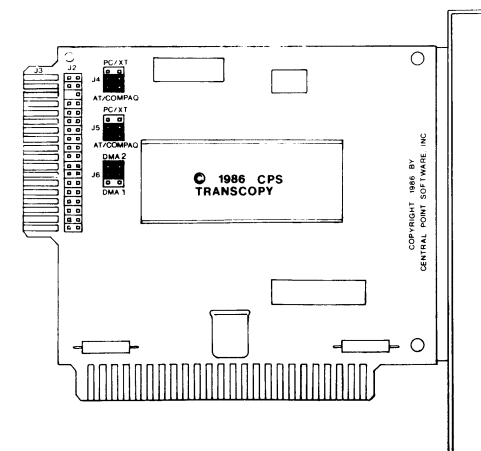
Remove the cable from the connector labeled J2 on the Option Board. You will re-install it onto the J3 connector in a moment, but first, you need to change a jumper on the board.

Near the end of the board farthest away from the metal bracket you should see a row of small jumpers labeled "PC/XT" at one end and

"AT/Compaq" at the other. This jumper block has several pins and plastic jumpers, each one connecting an end pin to the middle pin. Refer to the following diagram to help locate these jumpers:



This means the Option Board is currently configured to be installed into an IBM PC or PC/XT. You need to configure it now for your Compaq computer. To do this, carefully remove each of the plastic jumpers one at a time and connect them to the middle and end pins closest to the AT/Compaq lettering on the board. When you're done, it should look like this:



Next, you need to reinstall the cable on the Option Board. Take the short cable you removed from the board earlier and plug it in to the end of the Option Board (the gold-plated connector labeled J3). The red line on the cable should be closest to the top of the Option Board. Note that this is different from the way the cable was installed on the board originally. This is necessary as the cable coming from your disk drives needs to plug into connector J2 on the Option Board instead of J3.

Now install the Option Board into the computer. Insert it into the first free slot behind the floppy disk controller (slot #2).

Before you can make the final connections, you need to replace the short cable coming from the floppy disk drives that used to plug into the floppy disk controller as it will not be long enough to connect to the Option Board. Take a moment now to study how the current drive cable connects to the floppy disk drives. Notice that the Compaq drive cable supplied with the Option Board (in Compaq versions only) is identical to the cable already in your computer except that it is longer. Carefully remove the current drive cable and replace it now with the longer cable. Connect the other end of this cable to the 34 pin connector (J2) on the Option Board. The red line should be closest to the top of the Option Board. (You may want to momentarily remove the Option Board to plug the drive cable into the J2 connector as it is a fairly tight fit between the Option Board and the floppy disk controller board. When you have made this connection, go ahead and re-insert the Option Board into slot #2.)

Lastly, connect the cable coming from the Option Board to the floppy disk controller. The red line should be on the left, or the side farthest away from the metal bracket on the floppy disk controller.

When you are done, double check the connections. The cable coming from the floppy disk drives should connect to the Option Board. The Option Board's cable should connect to the floppy disk controller.

Make sure that all the boards are firmly seated into their expansion slots, if they are not, you could damage them or the PC when it is turned on. Now re-install the cover on the Compaq and connect the power cord and any printer, modem, or other cables you disconnected to install the Option Board.

That's it! The Copy II PC Option Board is now installed in your system. And your computer can now use the extra capability of the version of Copy II PC that is included with the Option Board. Double check that everything has been correctly installed by turning on your computer and verifying that it functions normally. Try running your word processor, spreadsheet or whatever you ordinarily use. Your computer should operate no differently than it did before the Option Board was installed.

If it doesn't, quickly turn off the power! Remove the cover, and verify that all the cables are installed correctly, and that the boards are seated tight into their expansion slots. If all looks OK, but you still can't get your computer to work, see the section titled: "What If The Board Doesn't Work" at the end of this manual.

Installation in an IBM PC/AT

Note: While the Option Board can be installed into an IBM PC/AT, it will not work with (read from or write to) a high capacity (1.2 meg.) drive. Your AT must have at least one 360 KB floppy disk drive.

For location purposes, let's call the slot nearest the power supply slot #1, and the slot nearest the left side of the PC slot #8.

Depending upon the setup of your PC/AT, these slots may already be occupied by other expansion boards. Whatever else you've got working in your PC, in all probability, at least two of these slots are taken up with 1) a video display card which sends information to your monitor, and 2) a disk controller card which controls the operation of the IBM's floppy disk and hard disk drives.

The Copy II PC Option Board will also be installed into one of these expansion slots. Were it not for a few physical limitations, almost any slot at all would accommodate the board. However, the Option Board must not only be installed into one of the available expansion slots, but it must also be cabled to the disk controller card.

Because of the length of the internal cables necessary for the hook-up, we recommend installing the Option Board in the slot immediately to the left of the disk controller board (slot #2).

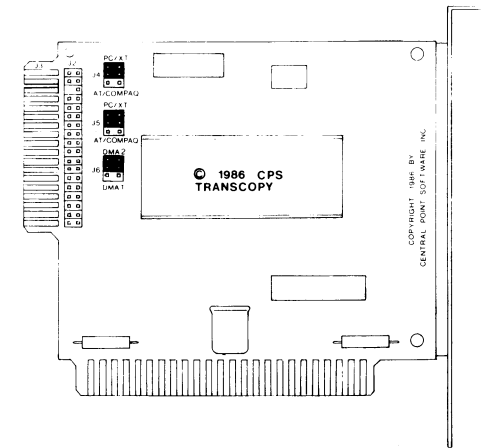
Locate the disk controller board now. It is a full-length board (usually in slot #1) with at least one set of cables plugged into the middle of the board. (If you have a hard disk, there will be several sets of cables, some going to the floppy drives, some going to the hard disk.) In either case, **the floppy drive cable connects to the jumper labeled "J1" on the PC/AT disk drive controller.**

If the slot immediately to the left of the disk controller is used, you will have to re-arrange some of the other boards in your computer so that this slot is available.

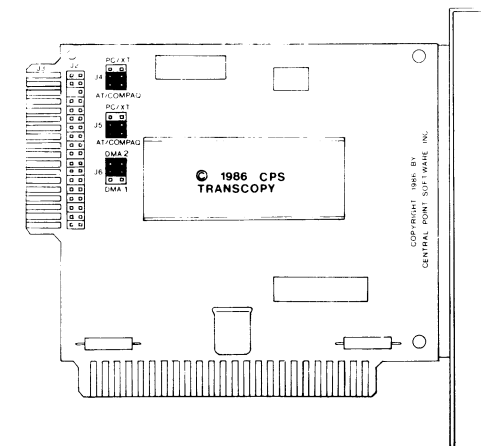
Before you can install the Option Board, you need to change some jumpers and reverse the Option Board cable (as it came to you, it was configured for installation in an IBM PC or PC/XT). Fortunately, the changes are simple. Here's how to do them:

First, remove the short cable from the connector labeled J2 on the Option Board. You will re-install it onto the J3 connector in a moment, but first, you need to change a jumper on the board.

Near the end of the board farthest away from the metal bracket you should see two sets of two small jumpers labeled "PC/XT" at one end and "AT/Compaq" at the other. This jumper block has several pins and plastic jumpers, each one connecting a middle pin and end pin. This means the Option Board is currently configured to be installed into an IBM PC or PC/XT. It should look like this:



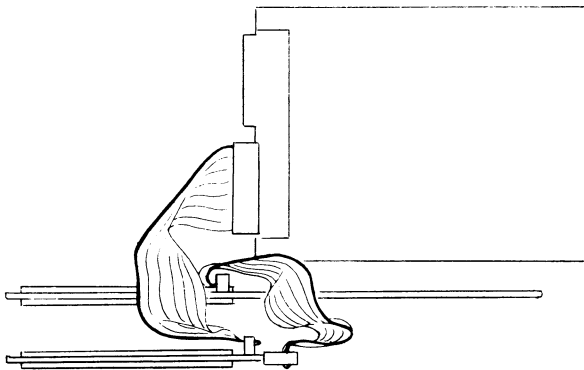
You need to configure it now for your IBM PC/AT computer. To do this, carefully remove each of the plastic jumpers one at a time and connect them to the middle and end pins closest to the AT/Compaq lettering on the board. When you're done, it will look like this:



Next, you need to reinstall the cable on the Option Board. Take the cable you just removed from the board and plug it into the end of the board (the gold-plated connector labeled J3). The red line on the cable should be closest to the top of the Option Board. Note that this is different from the way the cable was installed on the board originally. This is necessary as the cable coming from your disk

drives needs to plug into connector J2 on the Option Board instead of J3.

Now you are ready to connect the Option Board to the floppy disk drives. This is done by plugging in the cable coming from the back of the floppy disk drives into the J2 connector on the Option Board. On the PC/AT, this cable is fairly short, being designed only to plug into the disk controller connector at J1. Now, however, we need to stretch it just a bit to go over the top of the disk controller and plug into the Option Board. To make it fit, it may be necessary to cut the plastic tape that holds the various cables together. The fit is tight, but by careful folding of the cable, you can plug it into the J2 connector on the Option Board and still have enough flexibility to plug the Option Board into slot #2 (immediately to the left of the Option Board - see following figure).



After you have installed the Option Board into slot #2, you have just one connection left to make. The cable that leaves the end of the Option Board needs to plug into the disk controller board at J1 (which is where the floppy disk drive cable used to connect). The red line on the cable should be up, towards the top of the connector on the disk controller board.

When you are done, double check the connections. The cable coming from the floppy disk drives should connect to the Option

Board. The Option Board's cable should connect to the floppy disk controller.

Now, screw the Option Board into the chassis. Make sure that all the boards are firmly seated into their expansion slots, if they are not, you could damage them or the PC when it is turned on. Now re-install the cover on the computer and connect the power code and any printer, modem, or other cables you disconnected to install the Option Board.

That's it! The Copy II PC Option Board is now installed in your system. And your computer can now use the extra capability of the version of Copy II PC that is included with the Option Board. Double check that everything has been correctly installed by turning on your computer and verifying that it functions normally. Try running your word processor, spreadsheet or whatever you ordinarily use. Your computer should operate no differently than it did before the Option Board was installed.

If it doesn't, quickly turn off the power! Remove the cover, and verify that all the cables are installed correctly, and that the boards are seated tight into their expansion slots. If all looks OK, but you still can't get your computer to work, see the section titled: "What If The Board Doesn't Work" at the end of this manual.

Installation into Other Computers

The Copy II PC Option Board may be successfully installed into many other computers. Here are some exceptions that have been reported by customers: SANYO MBC 665 and 886, Tandy 1200 (newer models with the floppy disk controller on the motherboard), Televideo TPC II, and IBM's PS/2 models 50, 60 and 80 (the card won't fit - the slots are non-standard).

Please note that if you wish to install the Option Board into an IBM Model 30 or Tandy 1000, you will need to order special cables from us. Please specify the computer when ordering.

Although we can't provide support for computers we don't have access to, here are a few "rules of thumb" to follow:

Jumper Block Positions

PC/XT-AT/Compaq jumpers

If your drive cable connects to the Option Board's EDGE connector, these jumper blocks must remain in the PC/XT position. If your drive cable connects to the Option Board's PIN connector, these jumper blocks must be moved to the AT/Compaq position.

DMA Jumpers

These jumper blocks should remain at the DMA 2 position unless:

- you have a Tandy 1000 computer
- you have an IBM Model 30 computer
- your computer "hangs" while reading the original disk

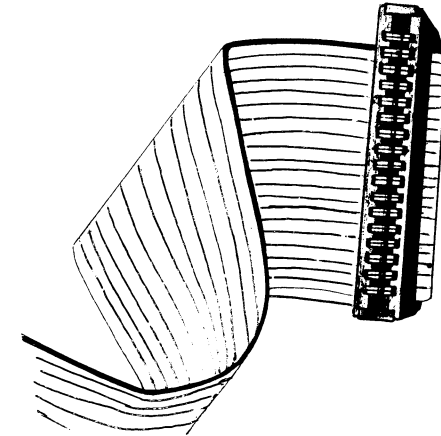
If you move these jumper blocks to the DMA 1 position, you must start TC by typing TC/C1.

The Option Board will not read from or write to a high capacity (1.2 meg) drive. Be certain both your source and target drives are 360KB floppy disk drives.

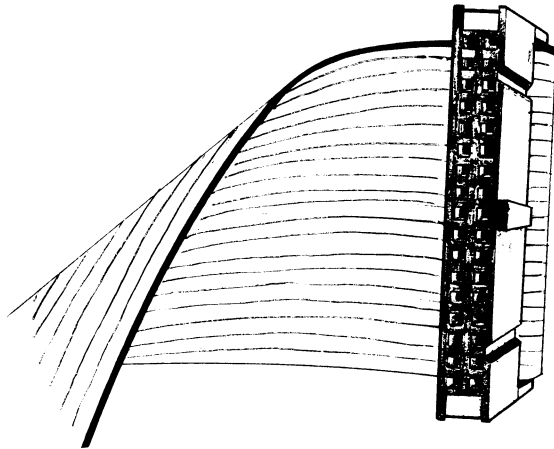
Here are some computers that our customers have told us the Option Board will work with. They have also indicated that some machines require special installation procedures. These will be noted with a number in (.). See the number following this list for the corresponding instructions.

ACS 1000 (3)	NCR (2)
AT&T 6300 (3)	OLIVETTI (3)
COLUMBIA 1600 (2,8)	SANYO MBC 775 (2)
CORONA PC (2,8)	SPERRY IT (3)
EPSON EQUITY II (3)	SPERRY PC (2)
HP VECTRA (2,6)	TANDON PC (3)
IBM MODEL 30 (7)	TANDY 1000 (7)
ITT EXTRA (2)	XEROX (3)
KAYPRO PC (2)	ZENITH 150 (2,5)
MAGNUM XT (3)	

1. If the floppy disk controller has an "edge" style connector (it has gold-edged fingers that the cable plugs onto - see following picture), then follow the cable routing and jumper block positions for the IBM PC and PC/XT.

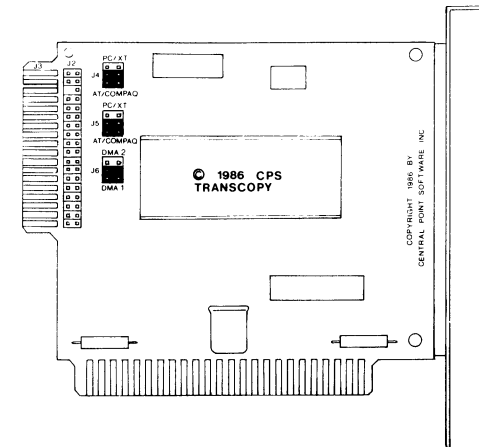


2. If the floppy disk controller has a "pin" style connector (a connector with a double row of metal pins - see picture below), then follow the cable routing and jumper block positions for the IBM PC/AT.



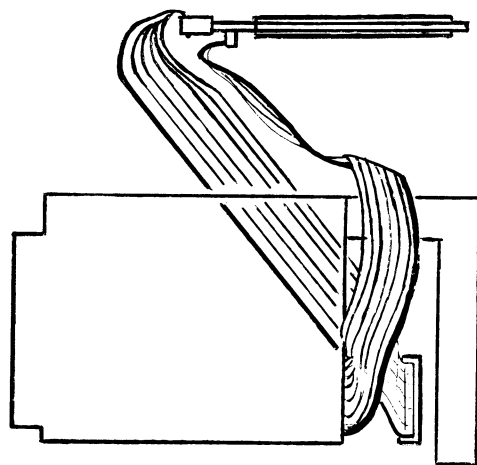
3. If the system does not have a floppy disk controller board but rather the floppy drives connect directly to the motherboard, then follow the cable routing and jumper block positions for the IBM PC/AT. EXCEPT that the Option Board cable will be routed from J3 to the motherboard instead of to a controller card.
4. The Option Board can be installed into almost any slot except the short slot nearest the power supply. We recommend slots that prove to be the easiest way to get all the cables to reach, but if you find a better way, go ahead and use it.
5. The Zenith 150 computer may require you to break off a pin on the J2 connector of the Option Board. It is O.K. to do this, as all the pins on left side of this connector are unused. (One is broken off already as needed by the IBM PC/AT.)
6. The HP Vectra has been tested by H.P. They tell us that you need to watch carefully how you remove the cables as the red line isn't always toward the top as it is in other computers. Also, you will need the Compaq portable cable as the existing cables are not quite long enough.
7. Installation into a Tandy 1000 or IBM PS/2 Model 30 requires one additional change plus the Tandy 1000 or IBM Model 30 cable available from us. First, the "DMA" jumpers on the Option

Board need to be moved into the "DMA1" position as shown below. Also for the Tandy 1000, the jumper blocks should be in the AT/Compaq positions:



The drive cables will connect to the J2 connector with the red line closest to the bottom of the Option Board. Connect the remaining cable to the J3 connector with the red line down. The other end of this cable connects to the Tandy motherboard. The red line on this cable goes closest to the edge of the Tandy motherboard.

Installation is otherwise straightforward except routing the cables around the metal structure of the case is a bit awkward. Here's a picture that should help:



Note: When using the software with the Tandy 1000 or IBM PS/2 Model 30, you must include the "/C1" option as described in the next section.

8. These computers may require you to make (or have a dealer make for you) extra long cables.

Making Backups with TC

The disk supplied with the OPTION BOARD contains a special version of COPY II PC for use only with the OPTION BOARD. It is called "TC". We gave it a different name so those of you who have "COPY II PC" could copy it onto your original COPY II PC diskette or hard disk without erasing the standard COPY II PC program. In case you are interested, the "TC" stands for "Transition Copier", which is a bit technical, but describes the nature of the COPY II PC OPTION BOARD. In general terms, it copies the magnetic transitions from one diskette to another without looking for anything in particular. As such, it is a simpler, but more powerful type of copying device, as it does not have to operate under the normal limitations of the standard disk circuitry.

The COPY II PC OPTION BOARD diskette is not self-booting. You can copy the files on the Option Board diskette to any other diskette or hard disk that is convenient for you (using the DOS "COPY" command). If you have COPY II PC, you can transfer the TC program to your COPY II PC disk. Here's how:

Put your OPTION BOARD disk in drive A, and your standard COPY II PC disk in drive B, and type:

```
COPY A:TC.EXE B:
```

Note: The above step will not transfer all the files onto your COPY II PC disk as there is not enough room. Specifically, this will not copy the "TE" file, however, this is not needed to make backup disks. We do recommend that you keep your original Option Board diskette in a safe place.

If you have COPY II PC, you will already be familiar with TC. It has a few more options and a new menu mode, but for the most part you can ignore these and use it just as you have used COPY II PC in the past. The only requirement is that the OPTION BOARD must be installed in the computer when you use TC. It does not need to be in the computer that runs the copy, only in the computer that makes the copy.

Here is a description of the features of TC:

TC d1: d2: /1 /Snn /Enn /Knn-nn /Wnn-nn /Ann /BW /C1

All of the above parameters are optional. In fact, if you don't specify the drive parameters (d1: or d2:), TC will display a menu that will present you with all the above options (except color or b/w display). You can, however, enter them on the command line as shown above.

It should be noted that when using TC, you will almost never need to change parameters. You can duplicate in excess of 98 percent of all copy-protected software just using the default (standard) mode of TC - it's that simple.

The following table describes each of the Option Board parameters:

Parameter	Description
d1	This is the source drive (the one containing the original diskette).
d2	This is the target drive (the one containing the blank diskette to be copied onto).
/1	Specifies a single-sided copy. It is not necessary to use the /1 parameter on a single sided disk, it just speeds up the backup process.
/Snn	Allows you to specify the start track (first track to copy). If you don't use this parameter, it will start with track 0 (the first track).
/Enn	Allows you to specify the end track (last track to copy). If you don't use this parameter, it will end with track 27 (in HEX). This is the last track that is usable on most IBM drives.
/Knn-nn	Tells TC to preserve the length of the track or tracks specified. If no tracks are specified after the /K, all track lengths will be preserved. <u>Note: do not use this option unless required as it can affect the reliability of the backup disk.</u>

/Wnn-nn	Tells TC to look for and re-produce "weak bits". These are bits that read back differently each time and are used in some protection schemes.
/Ann-nn	This option turns off the "Copy Across Index" mode of TC. It is normally left on, but certain protection schemes require that the track splice be right at index. With the /A option, the splice point will remain exactly as it is on the original.
/BW	Tells TC to use black and white mode (no color).
/C1	Forces the use of DMA channel 1 (required for the Tandy 1000, IBM Model 30, Most AT&T 6300's, and any computer using the Option Board's DMA 1 setting).
/Tn	Sets the tolerance for the Keep Track Length option. This entry is specified in bits. Therefore, a selection of /T4 will keep the track length to +/- 4 bits. Values of 0 to F are allowed.

Why does TC let you specify the Start and End tracks to copy? As a simple convenience only. In the event you get any errors while copying the disk (we'll explain these in a bit), you can select to copy only the tracks which had problems. Actually, you will probably almost never need to do this, but in case you do...

Here are some examples of using TC with various parameters:

TC A: B: /1

This tells TC that the source diskette is single sided, and expects the original disk to be in drive A>, and the duplicate to be in drive B>.

TC A: B: /A29

This turns off the "Copy Across Index" mode of TC. In this mode, the track splice point will be left right at index. Since the /A option

turns on this feature only on the track specified, it will be off on all other tracks. In the above example, we want it off on all tracks. Since track 29 (hex) is not normally used, /A29 accomplishes this for us.

```
TC A: /W07-09
```

This will do a single drive copy using drive A>, and will check for weak bits on tracks 7 to 9. It will prompt you to insert the original and duplicate diskettes as required.

```
TC B: A: /E29
```

This will expect the source disk (original disk) to be in drive B>, and the target disk (copy) to be in drive A>. It will also copy up to track 29 which is available on some IBM disk drives.

Using the Menu Mode of TC

If you like, you can use the menu mode of TC to set the source and target drives, as well as specify a single drive copy or set the starting and ending tracks to copy. To do so, simply type TC. After displaying a short message on the copyright law, you will be asked to press return. Then you should see a menu that looks similar to this:

```
-----
|                TRANSCOPY Vx.xx                |
| (C) 1985-7 CENTRAL POINT SOFTWARE, INC.      |
|-----
```

```
Source drive:  A
Target drive:  B

Starting track: 00
Ending track:  27

Track increment: 01

Number of sides: 2

Keep track length? N
Copy weak bits?    N
Copy across Index? Y
Verify write?     Y
```

```
-----
|                MESSAGES                |
|-----
| Enter letter (A - D) of                |
| drive that will contain the          |
| source                                |
|-----
```

- INSERT DISKETTES -

```
SPACE to Begin      Q to Quit
ESC   to Restart    ENTER to Accept
```

On the left side of the screen are prompts for each of the parameters described earlier. The MESSAGES box will display a short description of each option. You can press the ENTER (sometimes called RETURN) key to move to the desired line and enter the change. For example, if you wanted to tell TC that the original is a single sided diskette, you would press the enter key 5 times to place it at the line that says "Number of sides: 2". The cursor will stop over the 2. Now simply type a 1. You could then press the SPACE bar to begin copying this disk. If you make a mistake, press ESC (escape) to restart. If you decide not to make a copy at this time, press Q (for Quit).

Hard Disk Buffering

The Option Board software ("TC") has an additional feature useful to single drive users: It will "buffer" data to a hard disk or RAM disk or Intel Above Board to reduce the number of disk-swaps that

would otherwise be necessary. What this means to you is that during the copy process, you may see the hard disk light turn on periodically. When this happens, the Option Board software is simply creating or reading from a temporary file it created to reduce the number of times you would have to pull out the original disk and insert the backup, then insert the original disk again.

When the copy is complete, TC will automatically erase the temporary file it created so that space is not wasted on your hard disk.

This feature is completely automatic. You do not need to specify anything to tell TC to look for a hard disk, RAM disk, or Intel Above Board. It does this automatically every time it is run.

Please note that even though TC is using the hard disk, this does not mean it can copy a program to the hard disk where it will run (it can't). If you need the ability to transfer protected software to a hard disk, we recommend our "COPY II PC" program, which includes the ability to transfer many popular programs to a hard disk, bypassing the need to have a "key" disk or go through lengthy install/uninstall procedures.

The TC Track Status Line

On the bottom of the screen while making a backup you will see a track status display that looks like this:

```
HEX 00000000000000000111111111111111222222222222
TRACK 0123456789ABCDEF0123456789ABCDEF0123456789
```

```
-----
SIDE 0:
SIDE 1:
```

The tracks are numbered in hexadecimal. If you don't know what "hexadecimal" is, don't worry. You won't need to know to make backups.

As each track is read, you will see a 'R', then an 'A' appear briefly on the screen. The 'R' stands for reading, and the 'A' stands for analyzing. The more parameters you have selected, the longer the 'A' will stay on the screen for each track, as it has to do more work. It will read side 0 of each track first, then move to side 1 before stepping to the next track (unless you have told it you are making a single-sided copy).

As each track is written, you will see a 'W' then a '.'. The 'W' stands for writing and the '.' means the track has been written and verified (unless you have turned off the write verify option from the menu mode of TC or selected the "Copy "Weak Bits" option which also turns off write verify).

If a "V" is displayed for any track, it means that a write verify error occurred on that track. This can indicate that the target diskette is bad. If you see some 'V's on the track display after the backup is done, we suggest you try the duplicate disk before deciding it is bad. Some computers tend to report more spurious 'V' errors than others. You might also occasionally see a 'K' error left on the screen. This is a warning only, and means that TC could not keep the track length exactly.

As each track is copied (using the menu mode), you will see the word "Length" and some numbers appear in the upper middle of the screen. This is the length (number of bytes) of each track. The numbers will usually start with "18" and understanding them isn't really necessary at all. We occasionally use them to help us figure out new protection schemes, etc.

Making Backups of Non-IBM Disks

TC can be used to create backups of nearly all IBM PC compatible disks. It can also duplicate some other formats. Because TC simply copies magnetic transitions from one disk to another, it is not too concerned with how those transitions are created or ordered. Diskette formats can be grouped into three basic types:

MFM example: IBM PC, Kaypro, Amiga
 FM example: Atari
 GCR example: Apple

The option board and TC can copy all of the above formats. (Standard Apple and Atari formats are copied readily. The TC software may not be able to copy all protected Apple and Atari disks, however. It also can't copy the back side of "flippy" diskettes.) The only major formats it can not handle are Commodore and Macintosh. This is due to the fact that the Commodore and Macintosh "data rate" (similar to drive speed) varies significantly from an IBM disk. It should be noted that not all IBM drives are capable of reliably reading and writing GCR formats (Apple disks). The only way to know is to try.

What if the Backups Don't Work?

TC should make working backups of virtually all IBM PC protected diskettes.

If you can't make a backup, try it again. Since TC doesn't do any verification during disk reads, it might only be a glitch that caused the backup not to run. If this still doesn't work, try the following steps:

- 1) Be sure to boot your system with a master DOS from the A drive since the Option Board software's reliability can be affected by other memory resident software and configuration system files.
- 2) Try reversing drives (if you have two). For example, if you made the backup from drive A to drive B the first time, try it again using drive B as the source drive and drive A as the target. Some drives are better at reading or writing than others and this may do the trick.
- 3) Try making the backup after selecting "Y" to the "Keep Track Length" option. This is needed to copy some disks whose protection schemes try to defeat the Option Board. The Option Board software can detect most of these schemes automatically and will set the keep track length option for you. Occasionally,

however, it cannot tell that this option is needed so you may have to select it. If you don't use the menu mode of TC, you would accomplish this by starting TC as follows:

```
TC A: B: /K
```

It might also help to select a tighter tolerance for the Keep Track Length option. This is done with the /T parameter. Try making the backup as follows:

```
TC A: B: /K /T1
```

This will slow down the backup process, but will make as accurate a backup as possible as the track length will be kept to within 1 bit.

- 4) Try making the backup after selecting "N" to the "Copy Across Index" option, and "Y" to the "Keep Track Length" option. This essentially turns off almost all of the Option Board's analysis features. It also lets the disk drive itself determine the exact track start and end which might help for some disks. The following command line will accomplish this:

```
TC A: B: /A29 /K /T1
```

- 5) Try making the copy using the "Weak Bit" parameter. You can do this by either answering "Y" at this question in the menu mode or using the /W parameter on the command line, for example:

```
TC A: B: /W
```

- 6) Try making the backup again using a track end of 29. Most older IBM's have drives that could step out this far (two tracks beyond the normal end of the disk), and some very old protection schemes put the stuff they are looking for out there. We didn't make the default track end 29 as this can interfere with making single drive copies on newer drives that can't step beyond track 27. Here is a command line to do this:

```
TC A: B: /E29
```

If this still doesn't work, one of the following things may be happening:

- 1) The original diskette may use a protection scheme that "modifies" the diskette. As an example, it is possible to burn small holes in the diskette, then check for the presence of these holes. The duplicate disk, of course, will not have the holes (as disk drives are not designed to put holes in diskettes), so the copy will not function. Unfortunately, the Option Board can not directly make backups of these disks as it can't burn holes in diskettes either.

Disks that use this protection scheme will frequently have a message on the label or in the documentation saying "DO NOT WRITE PROTECT THIS DISK" as they must write to the original as part of the verification process. Examples of programs that have used this type of protection in the past include DBASE /// Ver. 1.0 and Framework Ver. 1.0. The newer versions of these programs (Ver. 1.1) can be backed-up with the Option Board.

If you encounter a diskette that the Option Board can't handle, and you have tried all of the above steps, we now have a product called the "Enhanced Option Board" that can make executable backups of disks protected by physical damage to the diskette. See page 43 for more information. The price of the Enhanced Option Board is \$195 (\$100 with the exchange of the standard Option Board).

Using the Option Board Editor

The Copy II PC Option Board includes a track editor called TE.COM. The 'TE' stands for 'Transition Editor'. It allows you to see the format of the original disk before it is (optionally) written.

IMPORTANT: TE.COM will not help you copy disks that TC.COM can't. It is not necessary to understand or use TE.COM to make backups. TE has been provided for people with experience working with disk drives and copy-protection schemes. Do not feel you have to understand it to use the Option Board effectively. We have provided it solely for those people who already understand how such an editor might be used and provide it on an as-is basis. We're sorry, but because of its highly technical nature, no phone support is available.

TE.COM will let you do the following:

- 1) Look at the data on any track in both HEX and ASCII.
- 2) Modify the data on any track. If data is changed within a sector, the corresponding CRC bytes will also be recalculated so the sector can be read without an error.
- 3) "Inspect" a track. This will list on the PC's screen all sector IDs found on that track. They will be displayed regardless of any errors in the ID or data fields, and will show all ID information including CRC errors and data address marks.
- 4) Look at both data and clock bits. Any byte with invalid clocks will be shown highlighted for easier reading.

To use TE.COM, type:

```
TE d: /bw
```

The d: is the drive which contains the disk to be edited or viewed, and is optional. If not specified, TE.COM will use drive B. The /bw parameter is also optional and instructs the editor not to use color mode. The only time you will need to use /bw is if you use the IBM color display adapter with a non-color monitor.

Once TE.COM has been started, you should see a screen similar to the one below:

```
Using drive b      Track 00h (0)   Side 0   Mode: IBM   View Data.
Track Start: 0000  Track End: 186A  Track Length = 186B  Index: 186A

0000 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0010 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0020 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0030 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0040 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0050 4E 4E 4E 4E 4E 00 00 00 00 00 00 00 00 00 00  NNNNN.....
0060 00 C2 C2 C2 FC 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  .OOO.NNNNNNNN
0070 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0080 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
0090 4E 4E 4E 4E 4E 4E 4E 00 00 00 00 00 00 00 00  NNNNNNN.....
00A0 00 00 00 A1 A1 A1 FE 00 00 01 02 CA 6F 4E 4E 4E  ....AAA.....00
00B0 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E  NNNNNNNNNNNNNN
00C0 4E 4E 4E 00 00 00 00 00 00 00 00 00 00 00 00  A1 NNN.....
00D0 A1 A1 FB EB 2C 90 49 42 4D 20 20 32 2E 30 00 02  AA.S,.IBM 2.
00E0 02 01 00 02 70 00 D0 02 FD 02 00 09 00 02 00 00  ....P.A.....
00F0 00 00 00 0A DF 02 25 02 09 2A FF 50 F6 00 02 CD  ....O....* P-
      Pointer = 0040
```

F1=help 2=drive 3/4=data/clock 5/6=start/end 7/8=setstart/end 9=edit

This is the main display. The numbers on the left are the offset into the track buffer (in hex). The second and third groups of numbers from the left are the actual track bytes. (You won't see anything but zeros here until you read data from a track - see the "R" command below.) The last group of characters on the right are the ASCII representations of the track data.

On the bottom of the screen are listed the function key commands. Pressing the F1 key will print a complete list of commands as shown:

TRANSEDIT HELP SCREEN

```
F1  Display this help screen
F2  Select drive number
F3  Display Data bytes
F4  Display Clock bytes
F5  Move pointer to track start
F6  Move pointer to track end
F7  Set track start to current pointer position
F8  Set track end to current pointer position
F9  Toggle between Edit and View modes
F10 Exit to DOS

R   Read track      M   Set Mode (IBM or Apple)
W   Write track     S   Scan an IBM disk for errors
I   Inspect track
^B  Move pointer to beginning of buffer
^E  Move pointer to end of buffer
```

Press ENTER to continue...

The arrow keys on the numeric keypad will move the current pointer position. Page up and Page down, Home and End all perform their normal cursor movement functions.

The "R" command (read) is what gets the editor going. When you press "R", TE will ask you what track and side you want to look at (see the next section, Format of IBM PC disks).

You may see the letters "s", "e", and "i" between the Hex and ASCII display areas. The "s" means this is the start of the track. The "e" means this is the end of the track. The "i" means this is where the physical index hole was detected.

TE does both a read and an analyze when you tell it to read a track. It will separate the data from the clock bits and set the start and end of the track. You can do more than just look. Pressing the F9 function key will put you into edit mode. Pressing it again will take

you back to the view mode. If you want, you can use the "W" (write) command to re-write the track with your changes.

You can also specify which drive to work with by pressing the F2 key while you are in the editor. This allows you to read from one disk, edit the track, and write it to another disk if you like.

If you use the editor to change data in a sector, make sure you press the F9 key again to leave edit mode before writing the track. This will cause the editor to recalculate the sector's CRC. If you don't do this, the sector will be unreadable by DOS or any other program.

The mode command "M" will toggle the editor between IBM (MFM) and Apple (GCR) formats. In Apple mode, the number of sync bits accompanying any data byte can be seen by toggling the display to show clock bits. All sync bytes (those bytes that have sync bits attached) are shown highlighted. The start and end pointers will be properly set so the track can be written. Please note that since Apple's GCR format encodes the data on the disk, the ASCII display will be meaningless - all the data is still GCR encoded.

If you plan to use the editor, we suggest you read the next section which will give you an introduction to the format of IBM PC disks.

Format of IBM PC Diskettes

An IBM PC disk is divided into 40 tracks, numbered 0 to 27 (in hex). Each track normally has either 8 or 9 sectors, depending upon which DOS was used to create it. Each sector contains 512 bytes of data (although this can be changed and often is with protection schemes). Any disk can also use either 1 or both sides, resulting in up to 80 tracks of data. Because the disk controller needs to be able to find any given sector of data very quickly, each sector is given a unique ID containing all the above information.

On an even lower level, the floppy disk controller needs to be able to distinguish ID's from data. For example, you might have a pattern of data in a sector that could also be interpreted as a sector ID. Special kinds of bytes are therefore needed to eliminate this potential confusion. These are called "sync bytes". There are actually two

kinds of sync bytes that you can see when you look at a track; a sequence of 00 bytes followed by three A1's. The A1's are a special kind of byte that have what is called "missing clocks". All this means is that they violate the normal recording rules. The editor will highlight these bytes to make them easier to find.

(Note: you may see other highlighted bytes, especially right after sector ID's and data fields. These are normal and are the "splice points" caused by writing a data field. Because these splice points produce a few bytes of unreliable data it is likely that they, too, will violate the normal recording rules and will therefore be highlighted by the editor.)

Whenever you see the three highlighted A1's in a row, you know one of two things is next: the sector ID or the sector Data. If it is an ID, the next byte, often referred to as an "address mark" will be a FE. If it is the data portion of a sector, it will be a FB.

If you take a look at a standard disk with the editor, you will see an equal number of both ID's and Data fields on the disk. In fact, they come in pairs, with the short ID field preceding each sector's data.

You should also see one last type of byte on the disk. Like sync bytes, they come grouped together, but serve a different purpose. They are called "gap" bytes and are usually 4E's. As their name suggests, they form a gap or buffer around the ID and Data portions of a sector. They are needed to provide just a little bit of extra space in case something is written at not quite the right time. For example, your drive may be spinning slightly faster or slower than the drive that originally formatted the disk. Without gap bytes to take up the difference, one sector could partially overwrite another, making at least one of them unreadable.

In summary then, a standard sector looks something like this:

```

GAP BYTES      4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E
SYNC BYTES     00 00 00 00 00 00 00 00 00 A1 A1 A1
SECTOR ID      FE 00 01 08 02 DB B9 4E 4E 4E 4E 4E
GAP BYTES      4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E 4E
SYNC BYTES     00 00 00 00 00 00 00 00 00 A1 A1 A1
SECTOR DATA   FB . . .

```

After the FB would be the 512 (200 hex) data bytes stored in the sector. If the track contains a text file filled with ASCII characters, you can see them on the right side of the display in the editor. You should be able to recognize some of the data you have stored.

After both the ID and Data are a couple of bytes called "CRC"s. These special bytes form a type of check on the data that verifies that it is OK. Whenever you see the ominous message "Error Reading Drive n" from DOS, it is actually telling you that the CRC bytes didn't match what it expected for that sector. Both ID's and Data fields have CRC bytes. The editor will automatically recalculate them for you if you change any of the data in a data field.

Here's how to read the sector ID information: Immediately following the FE are 4 bytes. These store the Track, Side, Sector, and Size information described earlier. In the above example, these bytes are 00 01 08 02. This means that it is the sector ID for sector eight on track 0, side 1. The last byte also tells us that it is a normal 512 bytes sector. Here's a simple table you can use to determine the size from the size byte in the ID field:

SIZE	ID	BYTE	ACTUAL SIZE
	00		128
	01		256
	02		512
	03		1,024
	04		2,048
	05		4,096
	06		8,192

Actually, only slightly more than 6,000 bytes can fit on a track, so a size of 06 is impossible, although it is used in the ID's on some protected diskettes. Sometimes, the sector ID will say the sector is

one size when in reality it is another. This is done only to allow the standard disk controller to read special data that might be imbedded in gaps (as part of a protection scheme).

You can use the editor's "Inspect" command to do a lot of the work of decoding sector ID's for you. It will look through the entire track in memory, finding and decoding all the sector ID's it finds. It will even tell you if there are any errors in the ID or Data fields, usually a dead giveaway of either a protection scheme or damaged disk.

While this overview has been short, it should at least get you started using the editor. If you are curious enough to want to use it, the best way to start is to try it out on a standard disk. If your experimentations will include writing to a disk, make sure it is not one with important data or programs!

What if the Board Doesn't Work?

If you experience problems during or after installation of the OPTION BOARD, give us a call at (503) 244-5782 (our hours are 8:00 to 5:00, West Coast time). We have technical support people on staff who can often walk you through a confusing part of the installation and help you get everything running. Before you call, please double check your installation to see if it is something simple. For example, the most common installation problem is plugging in the cables upside down. The symptom of this is drives that run all the time and the computer not booting anything. If this happens, check that the cables are installed properly.

Repair of the Option Board

The OPTION BOARD is warranted for a period of 90 days from date of purchase against manufacturing defects. This warranty does not include damage due to accidents, misuse, or improper installation (including attempting to install the board into a non-supported computer).

If you feel the board might be defective, give us a call before returning it. The problem might be something simple that our technical support department can help you with over the phone. If they can't get it working for you, they'll give you an RMA (Returned Merchandise Authorization) number and instructions for returning the board for repair or replacement at that time.

If you need to return the Option Board to us, please package it in its original box (or suitable container) including your original dated receipt and ship it prepaid (and insured!) to:

CENTRAL POINT SOFTWARE, INC.
REPAIR DEPARTMENT
RMA # (write your RMA number here)
9700 SW CAPITOL HWY, SUITE 100
PORTLAND, OR 97219

Please include \$40 to cover the cost of repairing the board if it is out of warranty. Also include a short description of the problem. We'll repair or replace the board and return it to you.

The Enhanced Option Board

Introduction

The extra features of the Enhanced Option Board are only helpful for diskettes protected by physically damaging the media. For obvious reasons, this protection scheme is rarely used. Since the Enhanced Option Board is not a short card and is much more expensive than the standard board, you probably do not have the Enhanced Option Board. In the event you find you need the Enhanced Option Board, contact us for exchange information.

The Enhanced Option Board is a special version of the Copy II PC Option Board. In addition to the standard Option Board features, it includes extra circuitry to allow you to run backups of software which uses one particularly difficult type of 'copy-protection' scheme. This version of the board can be visually identified by the toggle switch and pushbutton in the metal mounting panel. If your board lacks these switches, then it's not an Enhanced Option Board and you should ignore the remainder of this chapter.

Note: The Enhanced Option Board will not work in the AT&T 6300 or PS/2 computers for IBM.

Terms used in this chapter:

Original disk	The 'copy-protected' key diskette.
Backup disk	A copy of the original, made using TC.
EOB	Enhanced Option Board
Parameters (parms)	A precise description of a disk's media hole(s).
Parm file	A disk file containing saved parms.

The extra circuitry on the Enhanced Option Board (the EOB) is useful only for running backups of those programs 'protected' by schemes which involve deliberate physical damage to the magnetic

media of the diskette, usually one or more small burn-spots (sometimes called 'holes') on the surface. If you wish, you can see this burn-spot by rotating the diskette inside its jacket until it's visible. Be careful to touch the media surface only at the hub, never in the oblong window. While you gently rotate the disk, look at the bottom surface (the top side has the label) through the oblong window. Eventually you should find a dull, round burn-spot about 1 millimeter across.

WARNING: If your program is 'protected' by any other scheme, then you should ignore this chapter to avoid damaging your original diskette.

To deal with this particular scheme, the EOB is not only used to make the duplicate diskette, but is also active while the 'protected' program is running. These special backups will work only in a machine with an EOB installed. Note: This is different from ordinary Option Board copies.

A backup copy made by TC will be an exact copy of the data on the original, but TC cannot copy those 'holes'. You must run our utility program to analyze the original disk, determine the exact number and location of the 'holes' and save this data into a parm file. This operation usually needs to be done only once for each original 'protected' diskette.

To use the backup, you will run our utility program again to read that parm file and program (setup) the EOB with the locations of the 'holes'. When you run the backup, the EOB will wait for the 'protection' scheme to perform its check and will then electronically simulate the 'holes'.

Detailed procedures follow.

Making the Backup

1. Use the program TC.EXE (it's on the Option Board diskette) to make a backup of the original 'protected' disk. Use the standard options.

2. Run the program PK.COM (on the Option Board diskette) by typing:

PK

Note that you may quit the program at any time with Ctrl-C.

The program will ask for the name of the drive which contains the original 'protected' diskette. Insert that diskette and answer the question (for drive A, you can just press Enter). The first phase of analysis will spend about 10 seconds trying to find the 'holes' by reading from the disk.

3. PK will ask if you wish to proceed with the 2nd phase of analysis, which must write onto parts of the original diskette. For your first try, you should skip the 2nd phase. For some of the originals which have only a single 'hole', the first phase alone will be good enough. If the original diskette's 'protection' really is the burn-spot-hole scheme, then the 2nd phase will confirm the results from the first phase and improve their accuracy. Phase 2 cannot run if the disk is write-protected. The writing done by phase 2 is similar to what the 'protection' scheme itself would perform and is ordinarily harmless, however....

WARNING: If the original disk's 'protection' is anything other than the burn-spot type, then this 2nd phase can damage the original disk and prevent it from working.

4. When it is finished, PK will instruct you to remove the original diskette. It will then ask for the name of the file where the new parms should be saved. Drive and path name are allowed.

Example: for an original program named XYZ.COM, we suggest saving the parms to your hard disk as file C:XYZ.PRM. If a file with the selected name already exists, PK will ask if it's OK to erase and overwrite it with the new file. If you answer No, it will allow you to select a different file name.

5. Put the original 'protected' diskette away in a safe place.

Using the Backup (manual method)

1. To use the backup disk, you must first send the information from the parm file to the EOB. Begin this process by typing:

PK, parmfilename.prm (use your actual parm file's name)

Note that you may quit the program at any time with Ctrl-C.

2. PK will ask for the name of the drive (usually A) where the 'protected' program will expect to find the original key disk. Answer the question, or just press Enter to accept the displayed drive name.
3. PK will remind you that the EOB must be Reset before changing parms. If these are the first parms to be used since you turned on your machine, then you don't have to Reset it; just press Enter and go to step 4.

The Reset button on the rear of the EOB forces the EOB into an idle state: forgetting previous parms (if any), ignoring the toggle switch and waiting for new parms. If you have already setup the EOB for a 'protected' program but now wish to use the parms for a different one, note that the EOB will not discard the previous parms or accept new ones unless you first get its attention by resetting it: firmly press and release the EOB Reset button.

The EOB will be automatically reset when you shut off your computer's power or press your computer's Reset button (if it has one). However, a warm-boot (Ctrl-Alt-Del) does not reset the EOB.

4. Set the EOB toggle switch ON. The EOB will now patiently wait for the 'protected' program to check the key disk, and take action to simulate those media 'holes'. Place the backup key disk in the drive and run your program as if it really is the original disk.

CAUTION: The EOB, when setup as described above, can interfere with normal operation of any unprotected disk in the key drive (the drive you selected in step #2 above). Use the toggle switch on the rear of the EOB to tell it which disk is in the key drive. While the

switch is ON (lever up), the EOB will take the action specified by the parms to allow the backup to work. But while the switch is OFF (lever down), the EOB will take no action and allow normal disks to work. In this way you can place various disks in the key drive, but enable the EOB only when necessary for the 'protected' one.

EOB Toggle Switch Operation Table

The disk in the 'key' drive	EOB Toggle switch	EOB mode	What will happen?
Backup key disk	On -->	Enabled	The backup runs OK
Other disks	Off -->	Inhibited	Normal disk operation
Backup key disk	Off -->	Inhibited	Wrong! Backup won't run
Other disks	On -->	Enabled	Spurious Disk Errors

Using the Backup (batch file method)

This section assumes that you are familiar with DOS batch files. If you are not familiar with them, then consult your DOS User's Manual.

If you would prefer to setup the EOB automatically and skip the questions and prompts of the manual method, then you might setup a DOS batch file. The program PK will recognize the special option word /BATCH. The following example creates the batch file C:GO.BAT to setup the EOB for running a 'protected' program named XYZ, using a parm file from the subdirectory C:\PARMS. Of course you should specify the drives, paths and filenames which are appropriate for your system.

An example:

```
COPY, CON, C:GO.BAT
PK, C:\PARMS\XYZ.PRM /BATCH      (DOS will wait for you
                                   to type each line)
XYZ
^Z                                (press the F6 key to get this)
1 File(s) copied                 (DOS will display this message)
```

When you type GO, the EOB will be setup and your program XYZ will begin. Be sure to also set the EOB toggle switch ON (lever up) to enable it.

Note: the /BATCH option suppresses all the prompts and questions from PK, even the reminder about resetting the EOB. If you have more than one 'protected' program which will require setting up the EOB, then you must remember to reset the EOB before invoking PK for the new parms. If you forget this and attempt to reprogram the EOB without resetting it, then it will ignore the new parms, keep the previous ones and the 2nd 'protected' program will not run properly (although PK will not detect this or display an error message). Just reset the EOB and begin again the steps for USING THE BACKUP.

The following technical details are NOT needed to use this product.

Entering "PK/TECH" causes PK to display additional technical information during disk analysis and to ask questions about exactly how much of the diskette to examine (the program normally examines only side zero).

"PK filename/TECH" will display the parms before they are sent to the EOB.

"PK /?" will display a short 'help' message, reminding you of these options.

Parm File example (1-hole):

```
DRIVE=0, HEAD=0, TRACK=27h, SECTOR=5, X=00E7h
```

If omitted, drive and head are assumed 0 (drive A, 1st side). X is the byte offset of the hole. Track, sector and X are never omitted.

Lines beginning with a semicolon (;) are ignored. The keywords can appear in any order and be shortened to their initials. The standard radix is decimal, hex values must have the trailing 'h' (e.g. Track=27h and T=39 are equivalent).

The red lamp on the EOB flashes as the board takes action to defeat the 'protection' scheme. The meaning of the yellow lamp depends upon what state the EOB is in: when it's reset, the little computer in the EOB checks itself and uses repetitive blinking codes to indicate faults; after the EOB is programmed, the yellow lamp indicates when the toggle switch is ON; it also flickers during normal access to the designated drive.

Using an Autoloader

For those software publishers, corporations and disk duplication firms that duplicate diskettes in volume, an automatic diskette loader, called an autoloader, can be added to your system. A diskette autoloader provides high speed, unattended diskette duplication. It requires the use of additional equipment not supplied with your Option Board or can be used with the GhostWriter Copy Board described on page 54.

If you have further questions about the advantages of using a diskette autoloader, we recommend that you contact Trace, Inc. (formerly Formaster Magnetic Designs) at 2190 Bering Drive, San Jose, CA 95131, (408) 435-7800. Although a number of companies offer these systems, Trace Corporation is the industry's price performance leader in high-speed diskette autoloaders and diskette duplication system.

Several software publishers have asked us to support autoloaders so that the Option Board can be used as part of a low-cost disk duplication system. The Option Board dramatically increases the capability of using an IBM PC or compatible as the host computer to drive an autoloader. Some of its features include:

1. Supports virtually all MFM formats
2. Supports Apple GCR and FM formats
3. Can create "image" files on a hard disk
4. Automatically duplicates most MFM copy-protections
5. Compatible with most diskette autoloaders

To use the Option Board with an autoloader, you will need in addition to the normal hardware:

1. A serial port (COM1) inside your PC.
2. A serial cable to interconnect the loader and PC.
3. A cable adapter to connect your loader to the "B" drive connector inside your PC.
4. A compatible autoloader.

Item 1 is available at most computer stores. Items 2 through 4 above are available from the manufacturer of your autoloader.

In addition to the above hardware, we recommend:

1. A hard disk (20 megabytes suggested)
2. An Intel "Above Board"

See your autoloader manual for instructions on how to connect the Copy II PC Option Board to your loader. Most manufacturers of loaders now support the Option Board and can help you with specific installation questions and supply any additional cables you might need.

To use your autoloader, you will need to use the file on the Option Board disk called "TCLOADER.EXE". This stands for "TC AUTOLOADER" since it supports the protocol for loader communication. (Note: it cannot be used without an autoloader! There is a file on the disk called "TCMANUAL.EXE" which works just like the TCLOADER program except that it will let you hand-feed the diskettes into a disk drive. Like the loader version, TCMANUAL will keep track of good and bad diskettes and if you have enough memory, it will only read the master once and write each duplicate from memory instead of re-reading it each time.)

These files work just like the standard TC.EXE program described in this manual except that the TCLOADER program will automatically insert disks, and when they are copied, put them into the good or bad bin of the loader. It will also inform you of any diskette jams or let you know when the loader is out of diskettes.

In addition, these versions of the TC program support some extra commands you might find useful:

You can create an image file on the hard disk. This is extremely useful since the read portion of the Option Board does not verify. Using an image file, you can read the master disk onto your hard disk, then make a copy from the hard disk back to a floppy diskette. Once you have verified that this first copy is correct, you can continue to use the image file you created on your hard disk with confidence, since all copies made from it will be identical to the first copy (the Option Board does do full bit-for-bit verification of the copies it makes).

To create an image file using TCLOADER, all you need to do is to specify your hard disk drive as the target. TCLOADER will notice that you are trying to copy to a hard disk and will assume you want to create an image file. It will draw a small window on the screen and show you the names of all existing image files in the current subdirectory on your hard disk, and will ask you to enter a new name. The name can be up to 8 characters long. TCLOADER will add the extension of ".IMG" to all image files so you and it can tell them apart from other files on your hard disk. Next, TCLOADER will allow you to enter two lines of comments. We suggest that this include the full software name, the publisher, the version, and any other comments that will help you recognize this file at a later date.

Once the name and comments have been entered, the window will disappear and you can enter any other parameters you wish using the regular menu. When you start the copy process, the master disk will be read and an image file created on your hard disk.

To make copies using your image file, you can simply reverse the above process. Enter your hard disk drive letter as the source drive, and a floppy drive letter as the target. Again, you will see the image window appear. This time, however, you can use the arrow keys on the keyboard to select the image you wish to copy. Once selected, the image window will again disappear.

You can also specify the image name and number of copies to make from the TCLOADER command line. Two new command line parameters are available:

```
d:<image name>
 /N<nnnn>
```

The first parameter above allows you to specify the name of the image you wish to duplicate. The second parameter specifies the number of copies to make. Here's an example of both in use:

```
TCLOADER C:MYFILE B: /N50
```

This example will make 50 copies of the image named "MYFILE" which you previously created on your hard disk. The source drive (your hard disk) is drive "C". The target drive (the autoloader) is

drive "B". When the copies are made, TCLOADER will exit back to DOS. This allows it to be used in batch files.

A note about image file size: Image files can be quite large. In fact, a standard 360K IBM PC floppy disk is about 1 megabyte as an image file. This is due to the clock bits, ID's, gaps, etc. that are all part of a diskette but normally transparent since they are handled by the floppy disk controller chip in the IBM PC. For this reason we suggest that you use a 20 megabyte or larger hard disk.

A Note about performance: The Option Board will duplicate diskettes just as fast as is possible within the limitations of the system it is installed into. If you find that it is not duplicating diskettes as fast as you think it should, here are some things to try:

1. An Intel "Above Board" with 2 meg of memory installed will greatly help performance as it will replace hard disk reads with memory reads. The entire image file will be read into memory before the first disk is made and you will save the overhead of continuously re-reading the image file from the hard disk.
2. A faster processor is very helpful. The verify that is done after each track is written is done by the CPU in your computer. The faster it is, the faster this verify is completed. If your processor is too slow, 1 or 2 revolutions may be lost for each track. While this won't hurt anything, it can slow down the copy process. We recommend an 8 MHZ 8088, although a PC running at 4.77 MHZ will allow the Option Board to run at full speed in most cases.

If you have further questions about using the Option Board with your autoloader, please contact your autoloader manufacturer. If you want further information about the advantages of using a diskette autoloader, we recommend that you contact Trace, Inc. (formerly Formaster Magnetic Designs) at 2190 Bering Drive, San Jose, CA 95131, (408) 435-7800.

Other Products

GhostWriter now available!

Many of our customers have asked us when we would develop a full-feature disk duplication system that supports almost all disk formats (including Commodore and Macintosh). We're proud to announce that we have completed such a system! It turned out so well that Trace, Inc. (formerly Formaster / Magnetic Designs) has put their name on it and markets it under the name "GhostWriter".

The GhostWriter includes these features:

1. Supports Macintosh and Commodore disk formats
2. Copies up to 10 disks per minute (Apple II, Commodore 64) or 4 disks per minute (IBM 360K), with full verification!
3. Includes full read verification of most formats
4. Has an external autoloader port for easier installation
5. Fully supports 600 RPM (double-speed) drives
6. Can duplicate both sides of a disk simultaneously (using two GhostWriter boards and an appropriate drive)

If you are looking for a disk duplication system and are considering one of the \$20,000 systems now available, you may wish to compare them to the GhostWriter before you purchase. The GhostWriter easily competes with these systems and offers several features they don't, including:

1. Full read verify. Some systems verify the master diskette simply by reading each track twice and comparing the two track images. This is fine if the disk is marginal, but if it has gone completely bad (e.g. a sector has a "hard" disk error), it will not catch it. The only way to reliably do read verification is to check that all the sector ID's exist on every track and that each sector's data is good. This requires some pretty fancy software, but is necessary unless you want to hand check every sector of every disk you ever duplicate. The Ghostwriter will completely verify Apple II, Macintosh, Commodore, IBM, Amiga, Atari ST and most other MFM and FM formats.

2. Versatility and price savings. Some disk duplication systems will allow you to connect two autoloaders and run them simultaneously. This seems like a great idea until you look at the price of these systems. They will typically cost about \$10,000 without the autoloaders. The Ghostwriter lets you take advantage of the low prices available for IBM PC compatible systems. For example, you can configure two GhostWriter systems for less than the price of a single stand-alone disk duplication system. Further, the stand-alone disk duplication systems can often only duplicate a single master at a time (two autoloaders, but only one master). With two Ghostwriter systems, you not only save money, but can duplicate different masters simultaneously. In addition, since a GhostWriter system is also a standard IBM PC or compatible, when you aren't duplicating disks, you can use it for other tasks.
3. Ease of Use. The GhostWriter will automatically determine the format of the disk you are duplicating, and set itself accordingly. In fact, starting a duplication run is as easy as typing:

GW

Then selecting the name of the disk to make from an on-screen menu. The GhostWriter software will take it from there, keeping you informed as it proceeds with the name of the master you are duplicating, number of good and bad disks, and the time to duplicate each disk displayed on the PC's screen.

4. The GhostWriter works with standard drives. Some high-cost disk duplication systems require custom drives. For example, they vary the drive speed to handle the various formats (such as Commodore and Macintosh) that require variable data rates. Unfortunately, this approach means that you must buy your drives from the supplier of your disk duplication system and these drives are usually far more expensive than standard drives (e.g. \$1,200 instead of \$300).

The GhostWriter can use standard drives. All the circuitry to handle the difficult GCR formats is in the GhostWriter - not in the drive. This means that your drive cost is considerably less. But you still have the flexibility of using the more expensive 600 RPM, simultaneous double side (SDS) drives if you wish to

increase your throughput. These drives typically provide extra quality-control features such as the ability to detect and reject disks that do not meet minimum amplitude specifications. The GhostWriter gives you the choice.

The GhostWriter copy board has a suggested retail price of \$495. It works in most IBM PC compatible computers and supports (but does not require) diskette autoloaders from Trace, Inc. (formerly Formaster Magnetic Designs). The GhostWriter copy board is also available in the following system configuration from Trace, Inc.

GhostWriter Manual Copy System: A low-volume duplication system that includes the GhostWriter copy board, GhostWriter copy software and Trace High Performance XT compatible with Trace copy drive.

GhostWriter Automated Copy System: A medium-volume production system that includes the GhostWriter copy board, GhostWriter copy software, Trace High Performance XT compatible with Trace copy drive, and a diskette autoloader for 3.5" or 5.25" diskettes.

GhostWriter High Performance Copy System: This system copies over 210 diskettes per hour! The system includes the basic configuration of the Automated Copy System with the addition of Trace's proprietary 2XSDS High Performance drives and the 2XSDS GhostWriter copy boards.

Please address all inquiries to:

Trace, Incorporated
2190 Bering Drive
San Jose, CA 95131
(408) 435-7800

Index

/I parameter: 25
 /Ann-nn parameter: 26
 /BATCH: 47, 48
 /bw parameter: 26, 34
 "/C1" option: 23, 26
 /Enn parameter: 25
 /Knn-nn parameter: 25
 /Snn parameter: 25
 /Tn parameter: 26, 32
 /Wnn-nn parameter: 26, 32
 1.2 meg drives: 14
 2nd phase of analysis: 45
 4E's: 38
 34 pin connector: 13
 600 RPM (double-speed) drives:
 54, 55
 ^B": 36
 ^E": 36
 A1's: 38
 ACS 1000: 19
 actual track bytes: 35
 additional cables: 51
 "address mark": 38
 Amiga: 54
 analysis features: 32
 analyze the original disk: 44
 Apple (GCR): 37, 50
 Apple and Atari formats: 31
 Apple's GCR format encodes: 37
 ASCII: 34-37, 39
 AT&T 6300: 19, 26
 AT/Compaq position: 19, 22
 Atari ST: 54
 autoloader: 53
 autoloader, additional hardware:
 50
 automatic diskette loader: 50
 available expansion slots: 11
 basic configuration: 56
 bit-for-bit verification: 51
 black and white mode: 26
 blank metal bracket: 8, 11
 "buffer": 28
 byte offset: 48
 cable: 9
 cable adapter: 50
 cable routing: 20
 cables upside down: 41
 chassis: 6, 8, 10, 18
 clock bits: 36, 37
 color mode: 34
 colored line: 9
 COLUMBIA 1600: 19
 command line: 25
 command line parameters: 52
 Commodore: 31, 54
 Compaq drive cable: 13
 Compaq portable cable: 21
 compatible autoloader: 50
 complete list of commands: 35
 configuration system files: 31
 configure: 12, 55
 COPY II PC disk: 24
 "Copy Across Index": 26, 32
 CORONA PC: 19
 cost of repair: 42
 CPU: 53
 CRC bytes: 34, 39
 Ctrl-Alt-Del: 46
 Ctrl-C: 45, 46
 current pointer position: 36
 custom drives: 55
 "d1": 25
 "d2": 25
 data address marks: 34
 data and clock bits: 34
 data byte: 37, 39
 data fields: 34, 38
 data in a sector: 37
 data portion: 38
 "data rate": 31
 decoding sector ID's: 40
 default: 25
 default track: 32
 deliberate physical damage: 43
 difficult GCR formats: 55

disk analysis: 48
 disk drive assembly: 6
 disk duplication systems: 55
 disk is write-protected: 45
 Diskette formats: 30
 diskette autoloaders: 50, 53
 DMA 1: 19, 21, 26
 DMA 2: 19
 DMA Jumpers: 19, 21
 DOS batch file: 47
 Drive and path name: 45
 "e" byte: 36
 Ease of Use: 55
 EDGE connector: 9, 19, 20
 edit mode: 36, 37
 editor: 34, 37
 electronically simulate: 44
 end track: 25, 30, 32, 36
 "Enhanced Option Board": 33
 EOB: 43, 44, 46, 48
 EOB Reset button: 46
 EOB toggle switch: 46, 48
 EPSON EQUITY II: 19
 "Error Reading Drive n": 39
 errors: 26
 exchange information: 43
 expansion slots: 6, 7, 10, 11, 14,
 18
 extension of ".IMG": 52
 external autoloader port: 54
 extra long cables: 23
 extra quality-control features: 56
 faster processor: 53
 "FB": 38, 39
 "FE": 38, 39
 final connections: 13
 first free slot: 13
 first phase of analysis: 45
 "flippy" diskettes: 31
 floppy disk controller: 8, 11, 14,
 37
 floppy disk controller chip: 53
 floppy disk controller,
 (motherboard): 21
 floppy disk controller, pinstyle:
 19, 20
 FM formats: 31, 50, 54
 function key commands: 35-37
 "gap" bytes: 38
 GCR: 31, 37
 GhostWriter: 50, 54, 55
 hanging: 19
 hard disk: 29
 "hard" disk error: 54
 hard disk light: 29
 HEX: 29, 34, 36, 49
 high capacity (1.2 meg) drive: 19
 highlighted bytes: 38
 HP Vectra: 4, 19, 21
 "i": 36
 IBM (MFM) format: 37
 IBM: 54
 IBM color display adapter: 34
 IBM PC: 4, 20
 IBM PC or compatible: 55
 IBM PC, older model: 6
 IBM PC/AT: 4
 IBM PC/XT: 4, 19
 IBM PS/2 Model 30: 18, 19, 21,
 23, 27
 IBM PS/2 models 50, 60 and 80:
 18
 idle state: 46
 image file: 50-52
 image file size: 53
 image name: 52
 image window: 52
 "Inspect" a track: 34, 36
 "Inspect" command: 40
 install: 2, 4, 41
 Intel Above Board: 28, 29, 53
 internal cables: 8, 11
 invalid clocks: 34
 ITT EXTRA: 19
 "J1": 15, 17
 "J2": 15, 17, 22
 "J3": 11, 15, 22
 Jumper Block Positions: 5, 11,
 12, 14, 15, 19-22

"K" error: 30
 KAYPRO PC: 19
 "Keep Track Length" option: 26, 31
 key disk: 46
 Leading Edge Model D and M: 4
 "Length": 30
 length of the internal cables: 15
 lever down: 47
 lever up: 47
 "M": 36, 37
 Macintosh and Commodore disk formats: 54
 Macintosh disks: 31, 54
 magnetic media: 43
 magnetic transitions: 24, 30
 Magnum PC/XT: 4, 19
 main display: 35
 master DOS: 31
 media 'holes': 46
 memory resident software: 31
 MESSAGES box: 28
 metal bracket: 15
 metal mounting panel: 43
 metal pins: 9
 MFM: 31, 50, 54
 "missing clocks": 38
 mode command: 37
 Modify the data: 34
 monitor, unplug: 5
 motherboard: 21
 Move pointer to beginning/end of buffer: 36
 NCR PC 4: 4, 19
 new protection schemes: 30
 non-color monitor: 34
 non-supported computer: 42
 number of bytes: 30
 numeric keypad: 36
 OLIVETTI: 19
 Option Board parameters: 25
 options: 25
 original diskette: 33, 43
 other compatibles: 4
 other formats: 30
 parameters: 25, 30, 43, 45, 52
 Parm file: 43, 44, 46, 47
 physical damage: 33
 physical index hole: 36
 physical limitations: 7, 11, 14
 PK: 45-48
 power code: 18
 power supply: 6
 previous parms: 46
 price: 3, 33, 55
 program (setup): 44
 protection schemes: 3, 26, 31, 43
 protocol for loader communication: 51
 pushbutton: 43
 questionnaire: 2
 quit the program: 28, 45, 46
 "R" command: 30, 35, 36
 RAM disk: 28, 29
 Read track: 36
 recalculate the sector's CRC: 37
 red lamp: 49
 red line: 13, 17, 22
 registration card: 2
 reinstall the cable: 13
 repetitive blinking codes: 49
 reprogram: 48
 Reset button: 46, 48
 Returned Merchandise Authorization: 42
 reversing drives: 31
 "S": 36
 SANYO MBC 665 and 886: 18
 SANYO MBC 775: 19
 Scan an IBM disk: 36
 sector: 37
 sector Data: 38
 sector ID: 37-39
 self-booting: 24
 serial cable: 50
 serial port (COM1): 50
 Set Mode (IBM or Apple): 36
 short cable: 11, 13
 short slot: 11
 simulate media holes: 46

simultaneous double side (SDS) drives: 55
 single-sided copy: 25
 slot: 7
 small burn-spots: 44
 source diskette: 26
 source drive: 25, 52
 SPACE bar to begin: 28
 special installation procedures: 19
 special kinds of bytes: 37
 specific installation questions: 51
 SPERRY IT: 19
 SPERRY PC: 19
 "splice points": 38
 standard disk circuitry: 24
 standard drives: 55
 standard floppy disk controller: 2
 standard radix: 49
 standard sector: 38
 start and end pointers: 37
 start track: 25, 36
 summary: 4, 38
 sync bytes: 37, 38
 system hangs: 18
 TANDON PC: 19
 Tandy 1000: 4, 18, 19, 21, 23, 26
 Tandy 1200: 18
 Tandy motherboard: 22
 target drive: 25, 52
 TC: 19, 24
 TC, additional commands: 51
 TC.COM: 34
 TC.EXE: 44
 TC/C1: 19
 TCLOADER: 52
 TCLOADER command line: 52
 TCLOADER program: 51
 "TCLOADER.EXE": 51
 TCMANUAL: 51
 "TCMANUALEXE": 51
 TE: 24, 34, 36
 TE.COM: 34
 technical details: 48
 technical support: 41
 Teletype TPC II: 18
 temporary file: 29
 text file: 39
 things to try: 53
 toggle switch: 43, 46
 toggling the display: 37
 Trace, Inc.: 50, 53, 54, 56
 track buffer (in hex): 35
 track end: 25, 32, 36
 track splice: 26
 track splice point: 26
 track status display: 29
 trailing 'h': 49
 "Transition Copier": 24
 Transition Editor: 34
 unique ID: 37
 unreliable data: 38
 "V": 30
 variable data rates: 55
 various formats: 55
 various parameters: 26
 verification process: 33
 verify: 39, 51, 54
 verify option: 30
 versions: 5
 view mode: 37
 visually identified: 43
 "W" (write) command: 30, 36, 37
 warm-boot: 46
 WARNING: 4, 45
 warranty: 42
 "Weak Bit" parameter: 27, 30, 32
 Write track: 36
 write verify error: 30
 writing a data field: 38
 XEROX: 19
 "Y": 31
 yellow lamp: 49
 Zenith 150: 4, 19, 21