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SYSTEM REQUIREMENTS

IBM PC, 256K Memory
One or two disk drives

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Chapter One - Introduction

This manual describes PC Tools, a disk and file utility program, and also the supplementary programs PCBackup, PCRestor, Compress, Mirror and Rebuild. These programs are for IBM Personal computers and compatibles. PC Tools is described first; the other programs are described in a later chapter.

PC Tools provides many of the same features found in DOS such as the ability to copy files or an entire disk, rename files, and delete files. Combined with these additional features for recovering files that have been accidentally deleted, viewing the contents of any file, locating files on the disk, finding specific text on a disk or in selected files and much more.

PC Tools is also designed to stay "resident" in the computer's memory while other programs are running. This means that you can call up PC Tools at any time from within other programs, to format new disks, back up files, etc. Then, when you're finished using PC Tools, you can return to the original program.

PC Tools includes these features:

DIRECTORY	Maintenance features allow you to sort, create, remove, rename, and "prune and graft" your subdirectories.
COPY	Copy a file, groups of files, or an entire disk.
MOVE	Just like copying files but it will delete the source files copied.
COMPARE	Compare files or entire disks.
FIND	Search a file, a group of files, or an entire disk for a matching string of data.
RENAME	Rename a file or volume label.
DELETE	Delete a file, a group of files or an entire disk.
VERIFY	Verify that all sectors are readable in a file, or group of files. Will also verify an entire disk allowing unused bad sectors to be removed from available use.
VIEW/EDIT	View and/or modify data in a file or on a disk.
UNDELETE	Attempt recovery of deleted files and sub-directories and their data.

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ATTRIBUTE	Display (and optionally modify) the directory status of files and/or the files' time and date.
SORT	Sort files by name, extension, size and/or date/time.
MAPPING	Display the allocation of the sectors on a disk and display the allocation for individual files.
SYSTEM INFO	Display helpful information about your system.
PRINT	Print files.
LOCATE	Search all directories for specific files.
INITIALIZE	Format a data diskette.

Also on your PC Tools disk are these hard disk utilities:

COMPRESS	Analyze a hard disk or floppy diskette for fragmentation and optionally correct it.
PCBACKUP	Make floppy diskette archival backups of your hard disk files.
PCRESTOR	Restore hard disk files from floppy diskette backups made with PCBACKUP.
MIRROR and REBUILD	Recover from accidental format of your hard disk.

Hardware Requirements

PC Tools is designed to work with the IBM PC, PCjr (256K), XT, AT, and most IBM-compatible computers. Your computer should have at least 128K of memory. If you wish to keep PC Tools "resident" in memory while other programs are running, it's a good idea to have 256K or more memory. You need only one disk drive, though PC Tools can also work with multiple disk drives, including hard disks and RAMdisks.

NOTE: We have made a great effort to make PC Tools compatible with other resident programs such as Prokey and Sidekick. Therefore, PC Tools can be made resident either before or after making resident other programs. PC Tools is very "well-behaved" in its operation while some other resident programs are not. If you

experience any problems with PC Tools and other resident programs, try changing the order in which your resident program are loaded. (We'd also appreciate knowing which programs you had trouble with.)

To start up PC Tools, you need to boot your computer with version 2.0 (or higher) of DOS. Once PC Tools is running, it can work with disks formatted by any version of DOS.

What You Need to Know

PC Tools can act as a replacement for the following internal and external DOS commands: COMP, COPY, DIR, DISKCOMP, DISKCOPY, ERASE, FORMAT, RENAME, TREE, TYPE, VER, CHDIR, MKDIR, RMDIR, ATTRIB, LABEL, VOL, BACKUP and RESTORE.

To use PC Tools, we assume that you are generally familiar with MS-DOS or IBM PC-DOS, and know about files, filenames and extensions, and how to use the common DOS commands. You should know how to boot DOS (answering the date and time questions if necessary) to get to the DOS "A>" prompt. If you need to know more about these things, you should refer to your IBM Disk Operating System manual.

If you wish to make extensive use of the VIEW/EDIT or FIND options, an understanding of ASCII characters and hexadecimal numbers is also helpful.

About This Manual

This manual will show you how to use each option step-by-step. In nearly every case, PC Tools will show "reminder" prompts as to what commands or menu options are valid. We encourage you to carefully read through this manual to take advantage of all of PC Tools' features. This manual is divided into four chapters:

Chapter One is an introduction to PC Tools and its features.

PC Tools

Chapter Two shows you how to use PC Tools to make a backup of itself and to put DOS on the PC Tools disk. It includes a few more introductory examples, and explains how to keep PC Tools resident in memory.

Chapter Three explains each option of PC Tools in depth.

Chapter Four describes the hard disk utility programs COMPRESS, PCBACKUP, PCRESTOR, MIRROR and REBUILD which make using your hard disk much more efficient and safer.

An appendix at the end of the manual describes the other software backup and utility products from Central Point Software.

Getting Started

If you bought this product from your local dealer or from a mail order company, fill out and send in your registration card now. Being a registered owner entitles you to technical support, should you need it, and it lets us tell you about product updates. When we enhance or update the PC Tools program in the future, all registered owners will be able to purchase the update at a reduced price. (If you purchased your PC Tools directly from Central Point Software, you are already registered as an owner - you don't need to return a registration card.)

PC Tools is not copy-protected in any way. You can back it up using the PC Tools COPY DISK option, the DOS COPY command, or any other standard disk copy program. We encourage you to make a backup copy and put your original PC Tools disk in a safe place.

The PC Tools disk comes to you without DOS. You can either boot from a DOS disk before inserting the PC Tools disk, or you can install DOS onto your PC Tools disk to make it self-booting.

(**Note:** The examples in the next chapter will show you how to make a backup of the PC Tools disk and place DOS on the disk.)

Chapter Two - Introductory Examples

The examples in this chapter give you an introductory look at what PC Tools can do for you. We encourage you to try these examples step-by-step, making a backup of the disk and adding the DOS files. You'll also see how to make PC Tools resident in memory, so that it is available at any time from DOS or from inside another program.

Running PC Tools

1. Insert your DOS 2.0 (or higher version) system disk into your boot disk drive and turn the computer on. Answer the date and time questions when they appear.
2. The "A>" prompt, with a blinking cursor, should appear next. Remove the DOS system disk from the drive, and insert the PC Tools disk.
3. If you have a color monitor or monochrome display and adapter, type "pctools" and press Enter:

```
A>pctools
```

If you don't have a color monitor but do have a color graphics board in your PC, type "pctools /bw" and press Enter. (The "/bw" option provides a clearer display on black-and-white or single-color monitors.):

```
A>pctools /bw
```

The disk will whirl for a few moments as the PC Tools program is loaded from the disk into the computer's memory. The PC Tools main menu and the list of files on your PC Tools disk will appear next.

PC Tools

```
PC Tools R 3.00                               Vol Label=PCTOOLS
-----File Functions-----Scroll Lock ON
Path=A:\*.*
Name      Ext      Size      Attr      Date      Name      Ext      Size      Attr      Date
IBMBIO    COM      12288    HSR.      1/01/80
IBMDOS    COM      12288    HSR.      1/01/80
PCTOOLS   EXE      83840    ...A      9/14/85

+-----+
| 3 files LISTed   = 108416 bytes.           3 files in sub-dir = 108416 bytes. |
| 0 files SELECTed =          0 bytes.       Available on volume =  68096 bytes. |
+-----+
| Copy  Move  cOmpare  Find  Rename Delete Verify view/Edit Attrbte Print  List |
| Sort  Help  RTN=selct  F1=UNselct F2=alt dir 1st F3=othr menu  Esc=exit PCTls |
| F8=directory LIST argument  F9=file SELECTION argument  F10 chg drive/path |
+-----+
```

IMPORTANT NOTE: When using PC Tools, it is a good idea to change diskettes only when instructed to or when you see the "File Functions" menu as shown above. We have tried to make PC Tools as bullet-proof as possible, but we recommend that you don't confuse it by switching disks on it while it's copying or performing any other function.

Making a Backup of the PC Tools Disk

For this step you need a blank disk or a disk you don't mind erasing.

4. PC Tools has two command menus that appear on the bottom of the screen. You can toggle (switch) between the two by pressing the 'F3' function key on your keyboard. The first menu you will see is the "File Functions" menu. The "Copy Disk" command of PC Tools is on the second menu which we will call the "Disk and Special Functions" menu from here on. Go ahead and press 'F3' now. Next, press 'C' for "Copy". This starts the PC Tools Copy Disk command.

5. A box appears on the center of the screen, with the prompt "Enter SOURCE Drive ID - [A]" with the cursor blinking under the letter "A". You want to copy from the PC Tools disk in drive A, so just press Enter to accept this choice.
 6. A second box appears, with the prompt "Enter TARGET Drive ID" and the letter "A" again. You'll want to copy onto a second disk in drive B. Type the letter "B" and press Enter. (If you have only one drive, it doesn't matter whether you enter "A" or "B". PC Tools knows that you have just one drive, and will operate accordingly.)
 7. A new screen is displayed, with instructions on what disks to insert. Leave the PC Tools disk in drive A. If you have two drives, insert a blank or erasable disk into drive B. Press Enter.
- PC Tools will now begin copying the contents of the PC Tools disk onto the blank disk. For single-drive users: When the display says "Insert the SOURCE diskette in drive A", insert the PC Tools disk into the drive and press any key. When the display says "Insert the TARGET diskette in drive A", insert the blank disk into the drive and press any key.
8. When the disk copy is finished, the PC Tools "Disk and Special Functions" menu is redisplayed. Remove the new disk from the drive and label it as your working copy of PC Tools. We suggest you now put your original PC Tools disk in a safe place and use the working copy from now on. (Whenever we refer to the "PC Tools disk" from now on, either the original disk or your working copy can be used.)

Leaving the PC Tools Program

You may exit PC Tools from either the "File Functions" menu or the "Disk and Special Functions" menu. Simply press the "ESC" key and you'll see the message:

Are you SURE you want to exit PC Tools? (Y/N)

Press "Y" for Yes to exit. You'll be returned to DOS, with the "A>" prompt.

PC Tools

Making PC Tools Self-Booting

Were it not for the differences in the boot procedure for various versions of DOS, you could use PC Tools to copy the DOS files from your master DOS diskette onto the PC Tools diskette to make it "bootable". However, each version of DOS has a different "Boot" sector and unfortunately, a boot sector designed for one version of DOS won't necessarily work with another.

To make your PC Tools disk bootable, you will use the DOS "SYS" command. Here's how to do it:

1. Insert your DOS Master diskette into your A> drive. Put your work copy of PC Tools into your B> drive. If you do not see a "A>" on the screen now, type "A:" to make drive A the current DOS drive. Now type:

```
SYS B:
```

This is a DOS program that will transfer DOS from the master DOS disk in drive A to your work copy of PC Tools in drive B. When it has completed, type:

```
COPY COMMAND.COM B:
```

This copies the "Command Interpreter" of DOS onto the PC Tools work disk. When it is done it should say "1 file(s) copied". Your PC Tools work disk is now bootable.

Using PC Tools as a 'Resident' Program

PC Tools can also be made "resident" in memory, harmlessly "lurking" in the background while other programs are running. For this feature, you should have at least 256K of memory in your computer.

1. Insert your PC Tools disk into drive A if it's not already there.

2. Type "pctools /r64k":

```
A>pctools /r64k
```

The "/r" means "resident" and the "64K" indicates how much memory to set aside for the PC Tools program and temporary storage.

The disk will whir as the PC Tools program is loaded from disk into the computer's memory, then this message will appear:

```
Building overlay file using path,  
C:\  
PC Tools R3.xx installed.
```

```
A>
```

Your computer will work just like it always does, with two exceptions:

Your programs will not have as much memory to work with, since PC Tools is occupying some of the computer's memory (until you reboot again or remove PC Tools from your computer's memory).

You can now start up PC Tools at any time, even from within other programs.

3. Press CTRL-ESC (Press and hold down the CTRL key, then press the ESC key).

The PC Tools "File Functions" menu will appear. From here you can select any of the options of PC Tools.

4. Press CTRL-ESC again (or press ESC. Answer "Y" to the "Are you SURE you want to exit PC Tools" question).

The original display (before you typed CTRL-ESC) reappears, as if nothing had happened.

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5. Start up one of your other programs, such as a word processor, spreadsheet, etc., while PC Tools is resident. (Don't press CTRL-ALT-DEL, or you will lose the resident PC Tools.) Once your program is running, type CTRL-ESC again. The PC Tools "File Functions" menu will come back. (There may be a short pause first if your program was busy performing a "DOS function".)

You can see that after you make PC Tools resident, it is always ready to go, to provide a number of useful functions for you. Each of the PC Tools options is explained in the next chapter.

6. Exit out of the PC Tools program again. The program you were running before will return to the screen.

Chapter Three - Using PC Tools

The PC Tools Program

Here is a short description of PC Tools and its options, following the notation of the IBM DOS manual:

PCTOOLS Command

Purpose: Provides a number of useful DOS options from a single program, including the ability to recover deleted files and examine disk sectors.

Format: PCTOOLS [/BW] [/RnnnK] [/Fn] [/Od]

Remarks:

The /BW parameter provides a clearer display if you have a black-and-white or single-color monitor, by displaying in black-and-white rather than in color. (If you have a monochrome display board, PC Tools will display in black-and-white automatically.)

The /RnnnK parameter installs PC Tools as a resident program, so that it can be used at any time, including from within other programs. The "nnn" represents how many Kilobytes of memory should be set aside for the PC Tools program and memory buffers. This number must be at least 64, as in "/R64K", to provide 64K of memory for PC Tools. If you have a 20 megabyte or larger hard disk, the minimum memory will probably be approximately 84K (e.g. "/R84k").

The best number to use for the /R option depends on several things. There is a "Recommended /R Settings" table below to help you select an optimum /R value for your computer system. Here are all the details of how PC Tools uses memory:

1. The smallest allowable value is 64K.
2. The number should be at least 64K less than the amount of available user memory in your computer after booting DOS.

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Bring up PC Tools without the "/RxxxK" parameter and the "System Info" option from the "Disk and Special Functions" menu to determine the available user memory and the memory used by DOS and other resident programs. For example, if your computer has 640K of memory, then the largest number you can use for PC Tools is 576K minus the memory used by DOS and other resident programs.

3. If you have only one disk drive, then using a smaller number means that PC Tools will require more disk swaps when copying or comparing between disks.
4. Conversely, the larger the number, the less memory space is available for your other programs.
5. Any number less than 136K will force PC Tools to create an "overlay" file. This file contains much of the program code for PC Tools. The advantage of an overlay file is that PC Tools can be made resident in less memory than it takes to hold the entire PC Tools program and its buffers. The disadvantage of an overlay file is that it will have to go back to the disk sometimes to get the program code for various options. This might slow PC Tools down, especially if it is being run from a floppy disk. Ideally, a RAM disk should provide the best performance.
6. PC Tools supports the Lotus/Intel/Microsoft Expanded Memory Standard. Therefore, if you have an Above Board or equivalent memory expansion board, any overlay file that would be created will instead use expanded memory. PC Tools will also use expanded memory to increase buffer space so disk swaps will be kept to a minimum.
7. If you determine after you have been running for a while that you would like to remove the resident PC Tools program and free the memory that it occupies, be sure that you are at the DOS "A>" prompt, not within another program, and use CTRL-ESC to go to the PC Tools "File Functions" menu. Press F3 to go to the "Disk and Special Functions" menu. When you press CTRL-F3, PC Tools will check to see if it thinks it is wise to free up the memory. If other programs like Sidekick or even the DOS PRINT command are used, they may be made resident AFTER PC Tools. You should NOT let PC Tools free up its memory if other programs were made resident after PC Tools. You should be at the DOS "A>" prompt before using CTRL-ESC. Unpredictable results may occur and you might have to reboot your

computer if you don't follow these instructions. PC Tools will ask for confirmation to proceed. If no other programs were made resident after PC Tools, and if you activated PC Tools with CTRL-ESC from the DOS "A>" prompt, the memory used will be made available again and you will be returned to a DOS "A>" prompt.

8. Recommended /R Settings:

Here are some settings we have found work well for various computer configurations:

PCTOOLS	(to run non-resident)
PCTOOLS /R64K	(to run resident from a 10 meg hard disk)
PCTOOLS /R84K	(to run resident from a 20 meg hard disk)
PCTOOLS /R94K	(to run resident from a 30 meg hard disk)
PCTOOLS /R136K	(to run resident on a floppy disk system)
PCTOOLS /R64K	(to run on a PC with less than 256K)

Note: If PC Tools tells you it does not have enough memory in resident mode, try increasing the "/Rnnn" number by 10K. This should correct the problem (it can occur if you have a large hard disk, lots of subdirectories, or lots of files in any subdirectory).

The /O parameter will force an overlay file regardless of the amount of memory specified and regardless of whether the program was or was not made resident. This can be helpful if you want to assign PC Tools 128K or more memory and want it to maximize its buffer size to avoid disk swaps. You can also specify the drive to create the overlay file on (e.g. "/OC" will create the overlay file on drive "C" regardless of where PC Tools was started from). This is most beneficial on systems with a single drive (and possibly a RAM disk) but no expanded memory. If you omit the drive or if it is invalid, the default drive will be used.

The /Fn parameter can change the keys used to activate PC Tools from CTRL-ESC to CTRL-Fn, where Fn is any one of the function keys (F11 and F12 on the new IBM keyboards are not supported). This is useful if another program you run, such as ProKey, also uses CTRL-ESC. Use the /Fn option when starting PC Tools, replacing the "n" with a number from 1 to 10 to designate which function key to use. For example,

PC Tools

```
PCTOOLS /R64K /F6
```

will load PC Tools and make it a resident program, with an overlay file created on the current DOS drive. CTRL-F6 will activate it instead of CTRL-ESC.

Once PC Tools is installed as a resident program, it can be started at any time by pressing CTRL-ESC. If a "DOS function" is executing, there will be a short pause while the function is completed, before the PC Tools "File Functions" menu appears. When you exit out of the resident PC Tools, you're returned to the interrupted program.

How to Load PC Tools Automatically

If you've copied DOS onto your PC Tools disk, you can make PC Tools load into memory as a resident program automatically whenever you boot the disk. Just type the following lines:

```
COPY CON: AUTOEXEC.BAT  
PCTOOLS /R64K  
(Press the F6 key, then the Enter key.)
```

Now whenever you boot the disk, PC Tools will be installed as a resident program. You can then press CTRL-ESC at any time to start up PC Tools.

If you have a hard disk, you can accomplish the same thing by copying PC Tools to your hard disk and adding the "PC TOOLS /R64K" line to your autoexec.bat file on your hard disk. If you are not sure how to do this, we recommend having your dealer help you or consulting your DOS user's manual.

Note that this step is not required; it's simply another convenient way of using PC Tools.

Scrolling the 'File Functions' Display

PC Tools will normally display the first 26 files on the two column display ("F2" will switch back and forth to a 13 file single column display with expanded information. Try it). In order to perform one of the options on a given file, you indicate that given file by positioning the inverse or colored bar over that file and pressing the option letter. You can select many files by positioning the bar and pressing Enter, once for each file you want to select. When all the files are selected, you press the option letter and the option will function on only those that are selected.

In order to select various files, you need to match the bar to the various files. The "Home" key will adjust the display such that the first file is in the upper left-hand corner with the bar on it. The "End" key will adjust the display such that the last file is at the bottom right-hand corner with the bar on it. (If there are fewer than 26 files to display, all files will be displayed with the bar on the last.) Left arrow keys will move the bar back and forth between the Right and Left sides of the two column display.

The Up and Down arrow keys cause movement up and down one line at a time. The PgUp and PgDn keys will cause movement 7 lines at a time (half of a side). The movement will be either the bar moving itself or a scrolling of the files. The Scroll Lock key, when active, will hold the bar stationary and cause the files to scroll. When the Scroll Lock key is not active, the bar will move. The bar will always highlight a file. So, when Scroll Lock is active and the files cannot be scrolled due to a lack of files to list, the bar will move. Conversely, when Scroll Lock is inactive and the bar is at the beginning or end of the display, the files will be scrolled instead.

When PC Tools is first executed, the default is Scroll Lock active and the bar positioned in the middle on the left side of a two-column display. When scrolling, this will allow you to visually scan ahead of the bar and to anticipate when to stop scrolling. If this is inconvenient, just press the Scroll Lock key to change the scrolling technique.

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Selecting an Option

All PC Tools options are listed in the bottom box of the PC Tools "File Functions" menu. There are actually two command windows. One for "file" commands, one for "disk and special functions". You can switch between them by pressing the "F3" function key. The first window includes standard file oriented commands like Copy, Compare, Find, Rename, Delete, Verify, etc. The second command window lists disk and miscellaneous commands such as Copy and Compare disks, Locate and Undelete files, Add, Delete, and Rename subdirectories.

To begin, select the correct drive and subdirectory. If the drive/subdirectory presently displayed is not the one you wish, press "F10" to change either. (See "Selecting Drives" and "Selecting Subdirectories" which follow.) Note that a file in the directory is displayed in an inverse or colored field. By using the cursor keys, you can cause any file in the directory to be in the inverse or colored field. See "Scrolling the File Functions Display" for a complete explanation.

As before, if the directory is very large, you can also press F8 and select to limit which files you see. If the disk contains subdirectories, pressing F10 will return you to the subdirectory display.

On the File Functions menu, you need to indicate the files upon which to perform the function. There are two ways to accomplish this. First, if you will be performing the function on just one file, you need only move the inverse bar to the file and then press the appropriate highlighted key ("E" to view/Edit, for example).

The other method is used if you will be performing the function on more than one file. To do this, you simply need to select the files. To select a file, move the inverse bar to it and press ENTER. You will note that a number will be placed to the left of the current (highlighted) file.

You will note that after a function is complete, any files you have selected, will remain so. This is for your convenience in performing

subsequent functions on the same files. To unselect all files, just press F1.

You will also note that as files are selected and unselected a count of the number of files selected and their total size is dynamically updated on the screen.

Pressing Enter will place a number to the left of the current (highlighted) file. The first Enter will place the number 1, the second a number 2, etc. These numbers represent the order in which the files will be processed. If you accidentally press Enter to number a file you don't want to process, just press Enter again. The number will disappear. You can also make insertions in the list of numbers by typing a number directly, then pressing Enter.

In addition, you can select one or more files by pressing F9, for the "File Selection Argument". This looks much like the F8 Directory List Argument option. You enter a filename and extension with optional wildcard characters. In this option, however, every file that matches is marked with a number and selected to be processed. This lets you select many similar files with one command. For example, you could select to process every .COM file by pressing F9 and entering the name of:

```
Name = [ *          ]  
Ext   = [COM]
```

When you've selected all the files that you want to process, press the appropriate highlighted key, as explained above.

(Note: You can use the IBM's PrtSc (Print Screen) feature at any time when using PC Tools. If you want a print-out of any PC Tools screen display, make sure your printer is ready, then hold down the Shift key and press PrtSc. The contents of the screen will be printed. Any special graphics characters on the screen are converted into printable characters before being sent to the printer.)

PC Tools always displays the current directory. The "F2" function key will switch between the standard, two-column directory list

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format (which shows 26 files at a time) to the expanded format. The expanded format displays only 13 files, but includes the time, number of clusters occupied by the file, and expands the file attribute codes into complete words. You may switch back and forth between the two types of lists at any time by pressing "F2".

If you have sub-directories on your disk, you can change the directory shown by PC Tools by pressing the "F10" function key labeled "chg drive/path".

Selecting Drives

When you press the "F10" function key to change the drive/path displayed by PC Tools, a box will appear on the center of the screen, similar to the following:

```
-----  
| Enter New Drive Letter below.  Press |  
|   RTN for no change, "Esc" to return |  
|           New Drive ID   -   [A]     |  
|   Valid letters are A thru B.        |  
-----
```

(If you have more than two drives, the valid letters will be different.)

This prompt lets you choose which drive you display the directory of. The drive that was used last appears in the brackets. If you want a directory of this drive, just press Enter. If you want a directory of another drive, type the letter for that drive, then press Enter.

Selecting Subdirectories

What happens next depends on whether or not the disk contains subdirectories. If it does, an additional display appears so that you can select which subdirectory you want. (The PC Tools disk

contains subdirectories. As an example, make sure the PC Tools disk is still in drive A, then press F10 and select drive A.)

The disk will whirl for a few moments and the screen will display:

```
Reading root directory...
```

then:

```
Scanning sub-directories...
```

Then a new screen will appear:

```
PC Tools - R3.xx                               Volume Label=PCTOOLS
-----Path Functions-----
BLINK=DOS CURRENT
Path=A:\

R---SUB1
O |-SUB2-----SUBSUB1
O |               |-SUBSUB2
T |-SUB3
  |-SUB4
```

Use cursor arrow keys to follow the tree to the desired directory
Press ENTER to accept the choice. Press "Esc" to return

This diagram shows that the main, or "root", directory has four subdirectories, named SUB1, SUB2, SUB3, and SUB4. In addition, the subdirectory SUB2 contains two subdirectories of its own, called SUBSUB1 and SUBSUB2. (This is called a "tree" diagram because the subdirectories extend from the "root" directory like branches on a tree.)

By using the cursor keys on the numeric keypad, you can select any subdirectory. You can move up, down, right, or left, following the "branches" between directories.

When the directory you want is selected, press Enter to actually see the files in that directory.

PC Tools

Directory

After you've selected the subdirectory you want, or if the disk does not contain any subdirectories, the actual file display will appear next. (The following example is from the ROOT directory of the PC Tools disk.)

```
PC Tools R 3.xx                               Vol Label=PCTOOLS
-----File Functions-----Scroll Lock ON
Path=A:\*.*
  Name      Ext      Size      Attr      Date      Name      Ext      Size      Attr      Date
  IBMBIO    COM      12288    HSR.      1/01/80    IBMBIO    COM      12288    HSR.      1/01/80
  IBMDOS    COM      12288    HSR.      1/01/80    IBMDOS    COM      12288    HSR.      1/01/80
  PCTOOLS   EXE      83840    ...A      9/14/85    PCTOOLS   EXE      83840    ...A      9/14/85

+-----+
| 3 files LISTed   = 108416 bytes.          3 files in sub-dir   = 108416 bytes. |
| 0 files SELECTed =          0 bytes.        Available on volume = 68096 bytes. |
+-----+
| Copy Move cOmpare Find Rename Delete Verify view/Edit Attribute Print List |
| Sort Help RTN=selct  F1=UNselct F2=alt dir 1st F3=othr menu Esc=exit PCTls |
| F8=directory LIST argument  F9=file SELECTION argument  F10=chg drive/path |
+-----+
```

In the upper right corner, the volume label is displayed if there is one. Each file in the directory is listed next, with the following information (depending on which directory list format you have chosen):

- Name**

The name of the file.
- Ext**

The extension name, if any.
- Size**

The number of bytes in the file.
- #Clu**

The number of disk "clusters" used by the file.
This is a more accurate indication of how much disk space a file uses, since a file uses up disk space a cluster at a time. (This is only displayed on the expanded 13 entry directory display.)
- Date**

The date the file was last changed.
- Time**

The time of day the file was last changed. (This is only displayed on the expanded 13 entry directory display.)

Attributes Any "attributes" for the file.

Any IBM file can be marked with one or more "attributes". Most files will be marked as Normal and Archive, but there are a few exceptions. The possible attributes are:

Read-Only (abbreviated "R" on the two-column display) - If a file is marked as Read-Only, then the file can't be changed or erased from DOS. Read-Only provides a good way of protecting files from being accidentally erased.

Hidden ("H") - If a file is marked as Hidden, it does not appear in a normal DOS DIRectory.

System ("S") - Like Hidden, a file marked as System does not appear in a normal DOS DIRectory. (The two DOS system files IBMBIO.COM and IBMDOS.COM are marked as both Hidden and System, and are not listed when you type DIR from DOS.)

Normal - If a file is not marked as Read-Only, Hidden, or System, PC Tools labels it as Normal. (Not explicitly shown on the two-column display.)

Archive ("A") - The Archive attribute is used by the DOS BACKUP program to decide which files to back up. Whenever DOS makes any change to a file, it marks it as Archive, which means the changed file should be backed up. When BACKUP backs up a file, it unmarks it again, meaning it has now been backed up.

(The Attribute option of PC Tools, which is described later, provides a way for you to change the attributes or date and time of any file.)

There are a couple of other things to notice about the PC Tools directory. 1) Unlike a DOS DIRectory, all Hidden and System files are listed. That way you can see exactly what files are on your disks, even if the files are marked as Hidden or System. 2) Subdirectory entries, however, do not appear with the other files in the PC Tools directory. They are shown separately in the Subdirectory display (described earlier), so you can easily choose which directory or subdirectory you want to work with.

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Directory PRINTING

You can print the disk directory at any time by typing "L" for "List". It will list all files in the selected directory, not just what is shown on the screen. (If you wish to list only the files on the screen, press shift-PrtSc.) You can sort (see below) the directory first to produce a more ordered directory list. You can restrict the files printed by using F8 to enter a Directory List Argument (see below). This will be reflected in the path information on line 3 of the display.

Directory SORTING

You can sort the disk directory by filename, extension, size, or date and time. Press "S" for "Sort". A new set of help lines will appear at the bottom of the screen:

```
Choose the sorting method desired.If it appears as desired,  
    enter "U" to update the directory on the disk.  
F7=by NAME F8=by EXT F9=by SIZE F10=by DATE/TIME ESC =return
```

When you press the appropriate function key, the directory (as stored in the computer's memory) is instantly sorted and the files are redisplayed in the new order. Sorts can be in ascending or descending order. If you want to make the changes permanent, press "U" to update the actual directory on the disk. Unless you update the directory by pressing "U", the sorted order will last only until you change directories in PC Tools. The directory on the disk will remain unchanged. If you do not want to make changes permanent, just press ESC to work with the sorted list.

If considerable file creations and deletions have occurred, gaps may be present in the directory. These gaps will slow down any file searching that DOS will perform from time to time. Sorting your directories in any manner (and updating them by pressing "U") will remove these gaps. By so doing, you will increase the performance of your computer. Also, PC Tools, while sorting, will move the

subdirectory entries to the front regardless of the sorting technique. This will speed up DOS path searching.

Directory LIST Argument

Suppose, for example, that you want to see only those files which begin with the letter "I", or you want to see only the "COM" files. You can limit which files are displayed by pressing the F8 key.

When you press F8, you're presented with a new screen:

```
PC Tools - R3.xx                               Volume Label=PCTOOLS
-----File Functions-----
Path=A:\

Enter the Directory List argument.

Enter the name and/or extension to be used as a search
argument for the directory listing. A question mark (?)
is a "WILDCARD" which will always match any character
found in that position. An asterisk (*) in the name or
extension will match that position and all remaining
positions.

Name=[*      ]
Ext =[*      ]

Name and extension correct as entered, (Y/N)?  [y]

F10 = Blank the Name and Extension. Esc = Return.
```

The screen instructions explain how you can use "?" and "*" to match different filenames. The "wildcard" characters work just like those used in DOS. Here are a few examples:

```
Name=[*      ]
Ext =[*      ]
```

will match all files and show the entire directory.

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```
Name=[ I*      ]  
Ext  =[ *      ]
```

matches any file that begins with the letter "I".

```
Name=[ *      ]  
Ext  =[ COM]
```

matches only the files with an extension of "COM".

```
Name=[ F?N      ]  
Ext  =[ BAK]
```

will match the files FAN.BAK, FIN.BAK, FUN.BAK, or any filename with an F, any letter, an N, and an extension of BAK.

Type the name you want to match and press Enter, or just press Enter to accept the current name. Type in the extension in the same way. If the name and extension have been changed to something else, you can press F10 to change them both back to "*". If you make a mistake, just answer the (Y/N) question with N for No, and you'll be able to retype them. Otherwise, press Y for Yes, and the directory will be redisplayed, showing only the files you selected. The currently selected directory list argument is shown on the path line of the directory display.

DIRECTORY MAINTENANCE

The Directory Maintenance option of PC Tools allows you to Rename, Create, and Remove subdirectories. You can also change the current subdirectory for DOS and "prune and graft" subdirectories.

Directory Maintenance is located in the "Disk and Special Functions" menu (press "F3" from the "File Functions" menu). To begin, press the "D" key (for Directory maintenance). Next you will select the drive to work with as shown in the section "Selecting Drives". Once

PC Tools has read the directory information for the selected drives, you will see:

```
Use Cursor arrow keys to follow the chain to the desired directory.
Then choose a directory maintenance option below, or ESC to exit.
F1=rename F2=create F3=remove F4=change DOS current directory F5=prune/graft
```

To rename, create or remove a sub-directory, or change the DOS current directory, simply choose the sub-directory and press the appropriate function key and follow the instructions displayed on the screen.

Prune and graft requires a bit of explanation. Let us assume you have three sub-directories as "branches" of the root directory. Let's call them TRUNK1, TRUNK2, and TRUNK3. Now, let's assume that TRUNK1 also has two "branches", called BRANCH1 and BRANCH2. And to make it interesting, assume BRANCH2 has a "branch", LIMB1. The tree display from PC Tools will look something like this:

```
R
O-- | --TRUNK1-- | --BRANCH1
O   |               +--BRANCH2-----LIMB1
T   | --TRUNK2
    +--TRUNK3
```

Suppose you now want to change this structure, such that BRANCH2 (and LIMB1) are "branches" of TRUNK2. With the standard DOS utilities this would be a time-consuming and tedious task, indeed. But, with PC Tools, it's easy!

Point to BRANCH2 using the cursor keys then press the "F5" function key to begin "Prune and Graft". Then confirm that this is the subdirectory you wish to prune by pressing the "P" key. Now, simply move to TRUNK2, using the cursor keys as usual and press Enter. You'll now be asked to confirm that you want to go ahead with the prune/graft operation. Indicate that you do and you'll get the revised tree display, looking something like this:

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```
R
O-- | --TRUNK1-----BRANCH1
O   | --TRUNK2-----BRANCH2-----LIMB1
T   +--TRUNK3
```

WARNING: If PC Tools is resident, be sure that no files in the affected sub-directories are in use by another program. Also, remember to change any batch files, etc., that may depend on the old tree structure.

Once you have finished the desired task, pressing the ESC key will return you to the "Disk and Special Functions" screen shown.

COPY

Copy allows you to copy a group of files, or an entire disk.

COPY Files

The COPY FILES option allows you to copy normal DOS files quickly and easily.

You can copy the files:

- 1) from one disk to another, or
- 2) back onto the same disk with a different name, or
- 3) on the same disk into a different subdirectory (if the disk contains subdirectories).

To begin, select the correct drive, subdirectory and file(s) as described earlier in this chapter.

When you've selected all the files that you want to copy, press "C" for "Copy" to begin. PC Tools will ask you for the Target drive as

shown below. If only one drive is being used, you will be prompted to insert the proper disk when necessary.

```
=====
| Enter TARGET Drive ID - [B]                |
|                                           |
| Valid letters are A thru B.                |
| Press ESC key to return to main menu.      |
=====
```

The directory on the TARGET disk is read. If this disk contains subdirectories, another subdirectory tree diagram will appear. Use the arrow keys and Enter to select which subdirectory you want to copy the files into.

The files are then copied one by one from the SOURCE disk to the TARGET disk. The file currently being copied is always displayed on the screen. If for some reason you wish to stop the copying, press ESC.

If you selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu. Any file(s) selected will remain selected for your convenience.

COPY Disk

COPY DISK is a fast, reliable routine for copying standard DOS-formatted diskettes. (It does not copy copy-protected disks.) COPY DISK formats as it copies, so disks do not have to be formatted ahead of time. To copy a disk, simply select the COPY option from the "Disk and Special Functions" menu (Press "F3" from the "File Functions" menu), choose the SOURCE and TARGET drives, insert the disks, and press Enter. If you're copying using only one drive, PC Tools will tell you when to insert each disk. If you need to stop the copying before it has finished, just press ESC.

There are 40 tracks on a disk (except for 3 1/2 inch disks and AT high capacity disks which have 80 tracks), numbered from 0 to 39.

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As COPY DISK makes the copy, it first reads a number of tracks from the SOURCE disk into memory, then writes those tracks to the TARGET disk. It repeats this process until all the tracks are copied. As it makes the copy, PC Tools keeps you informed of what is happening, using a copy-status display at the bottom of the screen. For double-sided disks, it will look something like this:

	1	2	3	3
Track	0123456789012345678901234567890123456789			
Side 0	RRRRRRRRRRRR			
Side 1	WRRRRRRRRRRR			

After the word "Track" are the track numbers from 0 to 39. For every track read, an "R" is displayed. Then PC Tools shows an "F" when the track on the target disk is formatted, and a "W" as the track is written. After the track is copied successfully, a dot (.) appears. If an error is detected in the copy process an "E" will be shown instead of a dot (.). An "E" would indicate an unsuccessful copy. The TARGET disk may be bad or the drive may need cleaning.

When the disk copy is finished, you're returned to the main menu.

MOVE

MOVE Files

Move operates exactly the same as Copy, except that the source file is deleted after the copy is successfully completed.

To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

When you've selected all the files that you want to move, press "M" for "Move" to begin. You'll be asked to confirm that you really want to delete the source files. If so, after each file is copied, the source file will be deleted.

If you've selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu.

COMPARE

Compare will allow you to see if two different disks or files are identical.

COMPARE File

The COMPARE FILE option is similar to the DOS command COMP. It compares two files to see if they are identical. It can also compare several pairs of files at once.

As with the COPY FILES option, the files to be compared can be:

- 1) on different disks, with either the same filename or different filenames,
- 2) on the same disk in a different subdirectory, with either the same filename or different filenames, or
- 3) on the same disk and directory, with different filenames.

To begin, select the correct drive, subdirectory and file(s) as described earlier in this chapter.

After you've selected the files you want to compare, press "O" for "cOmpare" to begin the compare. You'll be prompted for the drive containing the files to be compared, then:

If you want to compare all files with matching names, press "Y".
Otherwise, press any key to continue.

If you press "Y", PC Tools will compare the files you selected with files of the same name on the SECOND drive. If you press any

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other key, PC Tools will ask you (in a moment) for the filename you want to compare each selected file with.

Next, the SECOND drive whirs. If this disk contains subdirectories, another subdirectory "tree" display appears for you to select which subdirectory the files to be compared with are in.

Now the actual file comparing begins. If you answered "Y" to the matching files question, PC Tools will look for those same names on the SECOND drive and compare the files. If you pressed any other key, then for each file you'll see a display similar to the following:

```
PC Tools - R3.xx                               Volume Label=None
-----File Compare Service-----
Path=A:\

TO Path=B:\

FILE1 .EXT is being compared

Please enter name and extension of file to compare
(ESC will end)

      Name=[FILE1    ]
      Ext =[EXT]
```

Note that it shows you what paths the files to be compared are on. If you want to compare with the same filename, just press Enter twice. Otherwise type in the new filename and extension. It will display:

```
FILE1 .EXT (on Drive A) is being COMPARED to FILE2
.EXT (on Drive B)
Enter "G" to proceed with compare
      or ESC to ignore
```

Press "G" to compare the two files. PC Tools will read each file. If the files have different lengths, it will say so right away. If the contents of the two files differ at all, it will tell you which sector and which position in the sector the first difference was found in, and what those different values in each file are.

If you selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu. Any file(s) selected will remain selected for your convenience.

COMPARE Disk

The COMPARE DISK option is similar to the DOS external command DISKCOMP. It compares two disks to see if they are identical. If there are any differences, it will show you what and where those differences are.

Compare disk is selected from the "Disk and Special Functions" menu (press "F3" from the "File Functions" menu). To start, type "O" for "cOmpare".

After you select which drives to use, PC Tools will prompt you to insert the disks into the proper drives and press a key. It will then begin reading the disk in the first drive, then comparing it with the disk in the second drive. As it compares, a track status display (similar to the one used in COPY DISK) is shown at the bottom of the screen, similar to this:

```

                1             2             3             3
Track 0123456789012345678901234567890123456789
Side 0  ....CRRRRRRRRRRR
Side 1  ....RRRRRRRRRRRR
```

PC Tools displays an "R" for every track it reads. Then as the track is compared, a "C" replaces the "R". If the track compare is successful, a period replaces the "C".

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If any differences are found, PC Tools tells you the sector number and the offset within the sector of each difference, along with the two differing values. You can either press ESC to exit to the "Disk and Special Functions" menu, or press any other key to continue comparing.

If a disk error occurs, PC Tools will tell you which logical sector was bad then display an "E" in the track status display for this track. This doesn't necessarily mean the entire track is bad, it just helps you remember which tracks had errors.

FIND

The FIND option lets you look for a byte or a string of bytes on the disk or within a file. You can enter the bytes as either hexadecimal values or text (ASCII) characters.

FIND File

To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

When all of the files you want are selected, press "F" for "Find". The search string display will appear next:


```
PC Tools - R3.xx                                     Volume=None
-----File Find Service-----
Path=A:\
File=FILENAME.EXT

Please enter character string for which to scan below.
(You may enter the search string in ASCII or HEX. You may change entry
modes by pressing F1.)

[                                                     ]<-- ASCII
-----
0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3      SEARCH
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2      ARGUMENT
-----
                                LENGTH:00
[                                                     ]<-- HEX

RTN=begin search  F1=toggle entry mode  ESC=exit
```

If you want to look for a string of text characters, just type the characters. The corresponding hexadecimal values will appear below. If you want to look for hex values, first press F1. The cursor will move down to the HEX line. Now type in the two-digit hex values. PC Tools will check to see that you're entering valid hexadecimal numbers (digits 0 thru 9, A thru F). If you make a mistake, the speaker will beep.

When you're finished entering text characters or hex values, press Enter to begin the actual search. The disk will whir as PC Tools reads each sector of the file or files, looking for the bytes you entered. (Note: The search is not "case-sensitive". In other words, you can enter text as any combination of uppercase and lowercase letters; PC Tools will find any matching string, even if the case is different.) If it finds the string of bytes, it will display:

```
Search argument found in relative sector xxxx
Press "E" to view/edit the sector or
      "G" to continue searching.
```

To search for another occurrence of the same bytes, press "G" to continue the search.

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If you want to view or edit the sector that contains the string, press "E" for Edit. The VIEW/EDIT display will appear for that sector, with the cursor on the first byte of the matching string. You can make changes to this sector if you like. (See the section on VIEW/EDIT later in the manual for a description of this display.) When you exit the VIEW/EDIT option, you're returned to the SEARCH screen so that you can continue the search with "G".

If the bytes cannot be found, or if you press ESC to stop the search, PC Tools simply shows:

```
Search complete.  
Press any key to continue.
```

If you selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu. Any file(s) selected will remain selected for your convenience.

FIND Disk

The FIND by DISK option is very similar to FIND by FILE. You enter a string of bytes to search for, as either text characters or hexadecimal values. If PC Tools finds the bytes anywhere on the disk, it will tell you on what sector they were found.

After you've selected the FIND by DISK option from the "Disk and Special Functions" menu (press the "F3" key from the "File Functions" menu) and chosen an appropriate drive, a search string display will appear, similar to the one used in FIND by FILE. (See FIND FILE, above.) Enter the bytes you want to search for. You can enter them on the top line as text characters, or press F1 and enter them on the bottom line as hexadecimal values. When you've typed in the bytes you want to search for, press Enter.

The disk will whir as PC Tools looks for the bytes. If it finds them, it will display:

```
Search argument found in relative sector nnnnn  
Press "E" to view/edit the sector or  
    "G" to continue searching.
```

(Note that the sector number shown here is the absolute sector number on the disk. In SEARCH by FILE, however, the relative sector number in the file is shown instead of the number of sectors from the beginning of the disk.)

To view or edit that sector on the disk, press "E" for Edit. To search for another occurrence of the same string of bytes, press "G". To exit, press ESC.

RENAME

Rename will allow you to rename files or the disk volume label.

RENAME File

You can change the name of one or more files using the RENAME FILE option.

To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

When the files you want to rename are selected, press "R" for "Rename". For each file you selected, the following will be displayed:

PC Tools

PC Tools - R3.xx

Volume=None

-----File Rename Service-----
Path=B:\

FILENAME.EXT is being renamed

Please enter the new file and extension names
(ESC will end)

Name=[FILENAME]
Ext =[EXT]

Type in the new filename. If you only need to change one or two letters of the filename, you can use the right and left arrow keys to position the cursor where you want, then type in the new letters. If you're renaming to a shorter filename, you'll need to type spaces to clear out the rest of the old name. Press Enter.

After you've entered the new name, you'll see:

FILENAME.EXT is to be RENAMED to NEWNAME .NEW

Please confirm. "Y" to RENAME
 "N" to REENTER
 "B" to BYPASS
 ESC to RETURN

Press "Y" for Yes to rename the file. The disk will whir as the name change is made permanent. Press "N" for No if you made a mistake entering the new filename. You'll get another chance to enter the new name. Press "B" for Bypass to skip this file (without renaming it). Press ESC to exit if you don't want to rename any more of the selected files.

If you selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu. Any file(s) selected will remain selected for your convenience.

RENAME Disk

The RENAME DISK option allows you to rename or add a volume label to your diskettes. Select this option from the "Disk and Special Functions" menu (press the "F3" key from the "File Functions" menu) by typing "R" for "Rename". Then it asks for a drive letter. Then displays:

```
PC Tools - R3.xx
-----Disk Rename Service-----

Drive B

Current volume label=OLDLABEL

Enter the new volume label [          ]

ESC to return to main menu
```

Type in the the new volume label name and press Enter. The disk will whir as the label is renamed. (Press ESC if you decide you don't want to rename the volume label.) If you blank the name, the volume label will be removed.

The DELETE option lets you delete (or "Erase") one or more files from a disk. To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

When the files you want to delete are selected, press "D" for "Delete".

If you've selected more than one file, you'll see:

```
You have selected multiple files to delete.
```

```
If you want to delete all files without
individual confirmations, press "Y".
For individual confirmations, press "N".
```

```
Press ESC to Exit
```

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If you're sure that you want to delete all the files you've selected, press "Y". The disk will whir as those files are deleted.

If you want to double-check each file before it is deleted, or if you selected only one file to delete, you'll see for each file:

```
FILENAME.EXT is to be DELETED
```

```
Please confirm.  "Y" to DELETE  
                  "N" to bypass
```

```
Press ESC to Exit
```

Press "Y" to delete this file. Press "N" if you don't want to delete the file. Then the next file to be deleted will be displayed.

If you selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu. Any file(s) selected will remain selected for your convenience.

VERIFY

Verify allows you to confirm that there are no bad spots in any of your files or on any of your disks.

VERIFY File

The VERIFY FILE option reads all of the sectors in a file to make certain the entire file can be read without any disk errors. To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

When the files you want to verify are selected, press "V" for "Verify".

For each file you'll see:

```
FILENAME.EXT is being verified.    Reading sector xxxxx
```

The sector number shown will change rapidly as PC Tools reads each sector of the file. If there are no errors while reading the file, PC Tools displays:

```
FILENAME.EXT verifies OK!
```

and the next file in turn is verified. If there is an error, PC Tools will display:

```
FILENAME.EXT has an ERROR in logical sector xxxxxxxx
```

If you selected more than one file, each will be processed in turn. After all files have been processed (or if you pressed ESC), you are returned to the "File Functions" menu. Any file(s) selected will remain selected for your convenience.

VERIFY Disk

This option lets you verify that all of the information on your DOS disk is readable, including files, subdirectories, and volume information. VERIFY DISK is designed to work with formatted DOS disks which are not copy-protected. (It does not work with blank unformatted disks because a blank disk does not contain any information to verify.)

Select this option from the "Disk and Special Functions" menu (press "F3" key from the "File Functions" menu) by typing "V" for "Verify". After entering the drive letter, PC Tools will display:

PC Tools

```
Drive B is about to be verified,  
Press any key to continue  
Press ESC to Exit
```

To proceed with the verify, press a key. PC Tools will read the sectors of the disk, checking for disk errors:

```
Drive B is being verified.  
Currently reading logical sectors xxxxxxxx thru yyyyyyyy.
```

If an error occurs on any sector, you will be shown the number of the sector in error. You will be told if the sector is part of the DOS system area, part of an existing file, available or already marked bad. If the sector is available, PC Tools will optionally mark the sector as bad to prevent future use. In any case, you can use view/Edit DISK to attempt correction of the problem.

You can press ESC to return to the "Disk and Special Functions" menu, or press any other key to continue verifying the rest of the disk.

VIEW/EDIT

The VIEW/EDIT option allows you to view the contents of any sector of a file, or any sector on the disk, and makes changes to the sector if you want. It can also be used to fix some kinds of disk errors. A good understanding of hexadecimal, bytes, and ASCII is helpful when using VIEW/EDIT.

VIEW/EDIT File

To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter. When the files you want to VIEW/EDIT are selected, press "E" for "View/Edit". (See View/Edit continued below.)

VIEW/EDIT Disk

To look at any sector on the disk (whether or not it is part of a file), select "E" for "view/Edit" from the "Disk and Special Functions" menu (press "F3" from the main PC Tools menu). Choose an appropriate drive letter. The disk will whir as PC Tools reads the first sector (sector 0) from the disk.

VIEW/EDIT (Continued)

The VIEW/EDIT displays for FILE and DISK are very similar. You'll see something like this:

```
PC Tools - R3.xx                                     Volume Label=None
-----Disk View/Edit Service-----
Path=B:\*.*
Relative sector being displayed is: xxxxxxxx

Displacement  -----Hex codes-----  ASCII value
0000(0000)    50 43 54 4F 4F 4C 53 20 45 58 45 20 00 00 00 00  PCTOOLS EXE
0016(0010)    00 00 00 00 00 00 70 5A D9 0A AB 00 00 32 01 00  pz+
0032(0020)    50 48 4F 4E 45 20 20 20 20 20 20 10 00 00 00 00  PHONE >
0048(0030)    00 00 00 00 00 00 7D 41 8C 07 E2 00 00 00 00 00  }A
0064(0040)    4E 4F 4B 45 59 20 20 20 44 4F 43 20 00 00 00 00  NOKEY DOC
0080(0050)    00 00 00 00 00 00 02 31 A1 0A D1 00 B7 15 00 00  1
0096(0060)    43 4F 50 59 49 49 50 43 45 58 45 20 00 00 00 00  COPYIIPCEXE
0112(0070)    00 00 00 00 00 00 67 49 8C 0A 60 02 80 7B 00 00  gI . {
0128(0080)    4A 49 4D 20 20 20 20 20 20 20 20 20 00 00 00 00  JIM
0144(0090)    00 00 00 00 00 00 5C 7E 9D 0A 68 02 8E 01 00 00  ~ h
0160(00A0)    49 42 4D 33 36 20 20 20 20 20 20 10 00 00 00 00  IBM36 >
0176(00B0)    00 00 00 00 00 00 D1 80 A4 0A 17 03 00 00 00 00
0192(00C0)    E5 55 54 4F 45 58 45 43 42 41 54 20 00 00 00 00  AUTOEXECBAT
0208(00D0)    00 00 00 00 00 00 12 00 21 00 20 04 0E 00 00 00  .
0224(00E0)    E5 48 55 52 53 44 41 59 20 20 20 20 00 00 00 00  THURSDAY
0240(00F0)    00 00 00 00 00 00 87 06 EC 08 CC 00 A5 00 00 00

Home=beg of file/disk  End=end of file/disk
Esc=Exit PgDn=forward PgUp=back F1=toggle mode F2=chg sector num F3=edit
```

Every sector on an IBM disk contains 512 separate values, or bytes. The VIEW/EDIT option shows 256 bytes, or half a sector, on the screen at a time.

Each line of the display shows 16 bytes from the sector, displayed as two-digit hexadecimal numbers in the middle area, then the same 16 values as ASCII characters on the right. Some or all of the characters may appear as gibberish. This is because those bytes may

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be program or data values and were never intended to be displayed as text.

The numbers on the left are "offset" or "displacement" numbers. Think of the 512 bytes as being numbered from 0 as the first byte of the sector to 511 as the last byte (0000 to 01FF in hexadecimal). The first line shows the first 16 bytes, bytes 0 through 15. The next line shows the next 16 bytes, bytes 16 through 31; the next shows bytes 32 through 47, etc. The displacement number on the left tells you how many bytes into the sector each line is (0000, 0016, 0032, etc.) For example, the first byte on the first line is byte 0000; the first byte on the second line is byte 0016, etc. The numbers in parentheses are the same offset numbers in hexadecimal.

Notice the help lines at the bottom of the screen. Pressing the Page down (Pg Dn) key will show you the next half-sector. Pressing the Page down key repeatedly will move you through the file or disk a half-sector at a time (until you reach the end of the file or disk). The Page up (Pg Up) key moves you back to the previous half-sector. Home moves you to the first sector (sector 0), and End moves you to the last sector.

If you want to move directly to a certain sector, press F2, then enter the desired sector number. If the sector number you entered is too large for the file or disk you're viewing, PC Tools will simply read the largest-numbered sector it can.

If you are using VIEW/EDIT by file, you can see just the ASCII text, without the hexadecimal values, press F1. Press F1 again to switch back to the mixed hex/ASCII display.

If you want to edit the sector (make changes to it), press F3. A blinking box cursor will appear over the first hex byte, and the help lines at the bottom of the screen will change to:

```
^ v > < = cursor F1=swap entry area F5=update F6=cancel update
ESC=Exit
Home=first pos End=last pos PgUp=1st half PgDn=2nd half
```

The four arrow keys will move the cursor from byte to byte. Place the cursor over the first byte you want to change. If you then type hexadecimal values, they will replace the old bytes at the cursor position. The new values will appear in color (or highlighted) so you can easily see the changes you've made.

If you want to enter new values as text characters instead of hex bytes, press F1. The cursor will move to the corresponding position in the ASCII character area on the right. Now any characters you type will replace the old characters. The new characters will appear in color (or highlighted) so you can see the changes. Press F1 again if you want to move the cursor back to the hex value area.

Press F5 to update the sector on the disk with the changes you've made. PC Tools will write the changed sector to the disk. Press F6 if you want to cancel the update (not make any changes). PC Tools will re-read the old sector from the disk again.

Note: With the VIEW/EDIT option, you can often fix bad sectors. If you ask VIEW/EDIT to read a sector that contains an error, it will try to read the sector anyway. If it can succeed, the sector data will appear, along with the message "I/O error" near the top of the screen. If you want to fix this sector, press F3 for Edit, then F5 to update the sector. This will rewrite the same sector information back to the disk, this time without a disk error! (This makes the sector readable, but the information contained in the sector might still be incorrect.)

Press ESC to exit the VIEW/EDIT option.

UNDELETE

The UNDELETE option is designed to help you recover files which have been accidentally deleted or erased. It can also be used to restore deleted subdirectories, and the files they contained.

UNDELETE Files

When DOS "erases" a file, it does not actually obliterate all of the file information. It destroys the first letter of the filename in the file's

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directory entry, to mark this as an "erased" file. (Other information, such as the file's size and date, is still intact.) It also marks all of the sectors that the file had used as "free", so that the sectors can be used for something else. This process wipes out the record of which sectors the file had used. In other words, the file information is still on the disk, but there is no longer any record of WHERE on the disk it is, except for the first cluster.

Once a file is deleted, the disk space used by the deleted file is now available for other files. If you later change or save any new files on the disk, this could overwrite some or all of the deleted file's information, making it impossible to completely undelete the file. For this reason, if you accidentally delete a file, you should always use UNDELETE right away to recover the file before any information is lost.

IMPORTANT: On diskettes we recommend that you always copy the disk containing the file you wish to undelete and undelete the file on the copy. (You must use a disk copy program as opposed to a file copy program as file oriented copy programs cannot copy deleted files.) By doing this, you cannot inadvertently damage your only copy of an important data disk. Once the undelete has been successfully completed on the backup disk, you can copy the undeleted file from the backup disk to the original. (Obviously this cannot be done if your file is stored on a hard disk.)

Remember: If you save or change any files on the disk after you've erased a file, you might not be able to recover the file.

Suppose you've just deleted two files, named MYFILE1.DAT and MYFILE2.BAK, from a disk. To recover them, start up PC Tools, press "F3" to get to the "Disk and Special Functions" menu and type "U" for "Undelete". A display similar to the usual "File Functions" menu will appear next:


```
PC Tools - R3.xx                               Volume Label=None
-----File Undelete Service-----Scroll Lock ON
Path=B:\*.*
  Name      Ext      Size    #Clu      Date      Time      Attributes
?YFILE1    DAT@    6129     12    1/01/81    12:00p    Normal
?YFILE2    BAK@     700      2    6/22/83     4:36p    Normal
```

@ = Automatic Recovery Possible

Select file(s) to be un-deleted and then press "G" to proceed
F8=drcty LIST argumnt F9=file SELECTION argumnt F10=chg drive/path
^v=scroll <+=SELECT F1=UNselect F2=alt dir 1st ESC=exit

Notice that the deleted files are displayed here, rather than active files as in most PC Tools displays. Since the first character of each filename was lost when the file was deleted, it appears as a question mark.

Note: If the display instead reads:

No Entries Found

then there aren't any deleted file entries in this subdirectory. Either no files were ever deleted, or else the deleted file entries were completely overwritten because new files have been saved on the disk or in another directory.

To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

Enter first character-?YFILE1 .DAT

The first thing you need to do is replace the first character of the filename, which was destroyed when the file was erased. Type the correct first letter for the filename, and press Enter. (In this example, type "M" and press Enter.)

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If there's already an active file with that name, you'll see: "File already exists, press any key to continue". After pressing a key, you can either enter a different first character, or press ESC to exit.

Another display will appear:

```
PC Tools - R3.xx                               Volume label=None
-----File Undelete Service-----Scroll Lock ON
Path=B:\
  Name      Ext      Size  #Clu   Date    Time  Attributes
MYFILE    DAT      6129   12  1/01/81  12:00p   Normal
-----
```

```
Use function keys to make selection
F1 - Automatic selection of clusters
F2 - Manual selection of clusters
ESC - Exit
```

PC Tools knows where on the disk the first cluster of the file is, and can make intelligent, educated guesses as to where the subsequent clusters are. If you select F1, PC Tools will attempt to recover the deleted file for you. If automatic file recovery is possible, an "@" will be displayed next to the file name. If it is not, you will have to manually select each sector. If you select automatic undeletion, the disk will whir for a few seconds as PC Tools undeletes the file. You should then see the message:

```
File was successfully Undeleted - Press any key to continue
```

If you instead select F2, you can manually select which clusters you want to include in the recovered file. This option might be needed if the file, before it was deleted, had changed in size (for example, a word processor document that had been updated several times) and other files had been saved or deleted.

When you select F2, you'll see a display similar to the VIEW/EDIT display. PC Tools presents to you, in order, the sectors that most likely belong to this file.

```
PC Tools - R3.xx                                     Volume label=None
-----File Undelete Service-----Scroll Lock ON
Path=B:\
  Name      Ext      Size      #Clu      Time      Attributes
  IBMDOS    COM      27760      28      4/22/85    12:09p    Normal
=====
|Cluster|      Data Display Area      |
|number|      |
0124
Displacement  ----- Hex codes-----      ASCII value
0000(0000)    E9 FE 68 00 00 00 42 55 47 20 00 00 00 00 00 00      h  BUG
0016(0010)    00 00 00 00 FF FF FF FF C3 13 03 00 01 00 FF FF      |
0032(0020)    FF FF 00 00 00 00 00 00 00 00 00 98 00 00 00 00
0048(0030)    00 00 00 00 00 00 80 00 00 00 00 00 00 00 00 00
0064(0040)    00 00 00 00 00 00 00 00 00 00 00 00 04 80 18 14
0080(0050)    1E 14 4E 55 4C 20 20 20 20 20 00 90 A5 15 00 00      ^  NUL
0096(0060)    A9 15 00 00 A9 15 00 00 A5 15 00 00 A5 15 00 00
0112(0070)    A5 15 00 00 A5 15 00 00 A5 15 00 00 A9 15 00 00
0128(0080)    A5 15 00 00 A5 15 00 00 A5 15 00 00 A9 15 00 00
0144(0090)    A5 15 00 00 A5 15 00 00 FF FF FF FF 05 00 00 00

      0 out of 28 cluster(s) added to the file

F1=Add to file and display next cluster, F2=Skip to next cluster
F3=Save file, ESC=Exit
```

Notice that in this example, the directory entry says that this file contains 28 clusters. That means you will need to select 28 clusters to completely recover this file.

If the displayed cluster appears to be part of the deleted file, press F1. This will add the cluster to the file being recovered, then show you the next cluster to consider. If you don't want to add the current cluster to the file, press F2. The next cluster will be displayed without any other action. (The first cluster PC Tools displays is the one it knows to be the first cluster of the file. You should always press F1 to add this first cluster to the file.)

When you think you've selected all of the clusters that belong to the file, press F3. This will rebuild and save the file using the clusters you've selected. To exit without changing the deleted file at all, press ESC. If you watch the count at the bottom, PC Tools will, when the total cluster count is reached, automatically save the file.

After you've undeleted a file, you should try using the file to see if the Undelete was successful. If the wrong clusters were selected, the file will not contain all the same information as before it was

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deleted. If you have problems with an undeleted file, you can delete it and try to undelete it again, choosing different clusters this time.

When using either automatic or manual selection of clusters, you might get the message:

```
Cluster chain in use - Unable to recover this file  
Press any key to continue
```

This means that another file was saved after this file was deleted, and it overwrote the first cluster of this file. The file can't be recovered, since the information is lost.

UNDELETE Subdirectories

It is possible to undelete Subdirectories as well as files with PC Tools. This is necessary if you delete all the files in a subdirectory, then delete the subdirectory. If you later wish to recover a file in the deleted subdirectory, you will first need to undelete the subdirectory itself.

Undeleting subdirectories works just like undeleting files, except that you will select "Sub-Dir" instead of "File" after selecting the "UNDELETE" option from the "Disk and Special Functions" menu of PC Tools. Once you have successfully undeleted a subdirectory, you can then undelete its files as described earlier.

Changing File ATTRIBUTES

Earlier in this manual (in the section entitled The FILE DIRECTORY), file attributes were described. To summarize: The possible attributes a file can have are Read Only, Hidden, System, and Archive. The Read Only attribute prevents DOS from being able to change the contents of a file or deleting it. The Hidden and System attributes make a file "invisible" so that it is not listed when you enter the DOS DIR command. The Archive bit is used to tell the

DOS program BACKUP which files have been updated since the last backup.

Using the ATTRIBUTE option of PC Tools, you can change the attributes, and the date and time, of any file. Select the first file to be processed and then press "A" for "Attribute". You'll see:

```
PC Tools - R3.xx                                     Volume=None
-----File Attribute Service-----
Path=B:\

File=FILENAME.EXT                                     Size= 9564 bytes
                                                    #Clu=    3 clusters
```

Initial attributes shown indicate those in effect. To change attributes, use the arrows (^v) to select an attribute to change. ENTER (<-') will change (toggle) that attribute. Press "U" to Update and make the changes permanent. "ESC" will return without any change.

Initial Attributes	New Attributes
Read Only - OFF	Read Only - OFF
Hidden - OFF	Hidden - OFF
System - OFF	System - OFF
Archive - ON	Archive - ON

Initial Time/Date	New Time/Date
12:01p	12:01p
11/20/84	11/20/84

"U" to Update and make changes permanent. ESC to return without changes.

<-- = prior entry --> = next entry

In the left column, the initial or current attributes and time/date for the file are shown. Notice the color (inverse) bar over the first attribute in the right column. Using the up and down arrow keys, you can move the bar to any attribute. Pressing the Enter key will 'toggle' the selected attribute from OFF to ON, or from ON to OFF.

If you want to change the date or the time of the file, press the down arrow key until a blinking cursor appears under the time or date line. Now type in a new time or a new date. Just type the digits, not the colon or the slashes. If you're entering a time with an hour of 9 or less (for example, 3:25), type a zero ahead of the digit (as in 03:25). (Don't forget to type either an "A" or "P" for AM and PM.)

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Similarly, if the date has a single-digit month (2/19), type it as two digits (02/19). If you make a mistake and enter an invalid date or time, the speaker will beep. You can backspace and correct the mistake.

Once you've set attributes the way you want them, press "U" to make the changes. The new attributes will be recorded on the disk. You can also use the left and right arrow keys to select a different file. The left arrow key will display the previous file in the directory; the right arrow key will display the next file.

If you instead decide you don't want to change the attributes or time/date, press ESC.

MAPPING

The MAPPING option of PC Tools lets you see which sectors, or "clusters", of a disk are used by which files, and which sectors are free for use. It is extremely useful in determining if a file is non-contiguous, which can cause poor system performance (more about this later in this section).

After you've selected the MAPPING option from the "Disk and Special Functions" menu (press "F3" from the "File Functions" menu) and an appropriate drive letter, the disk will whir and a display similar to the following will appear:

PC Tools - R3.xx

Volume=None

-----File Mapping Service-----

Path=B:*.*

Entire disk mapped

	Track	1	1	2	2	3	3	3
	0	5	0	5	0	5	0	5

Double sided

Side 0

Side 1

Bhhh.....*****

Fhh.....*****

Fhh.....*****

Dhh.....*****

Dhh.....*****

Dhh.....*****

hhh.....*****

hhh.....*****

hhh.....*****

Explanation of Codes

* Available	. Allocated
B Boot record	h hidden
F File Alloc Table	r Read Only
D Directory	x Bad Cluster

"F" to map files. ESC to return.

(Note: If you're mapping a hard disk, the display will be somewhat different - this is the floppy disk display.)

Each position in the grid represents one cluster. PC DOS always allocates disk space for files a cluster at a time. One thing that complicates the disk storage is that clusters can be different sizes. On single-sided floppy disks, one cluster equals one sector. On double-sided disks, one cluster equals two sectors. On hard disks, clusters can be 4 or even 8 sectors long. Regardless of the size of a cluster for any given disk, PC DOS always sets aside disk space by clusters, not sectors.

For floppy disks, PC Tools shows the corresponding track numbers above the grid (Track 0, 5, 10, 15, etc.). If you're mapping a single-sided disk, the actual sector numbers are also shown on the left. For hard disks, the clusters are shown in a large grid, without track numbers (since different hard disks use tracks and sectors in different ways).

Each space in the grid contains a symbol, showing what that cluster is used for. Here is an elaboration of the codes shown for the above

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example (the codes in the manual may be different from screen codes as IBM graphics characters are used to make the display more readable):

* Available - This cluster is available for file storage. It is not being used right now.

B Boot record - This cluster contains the boot record. Every disk contains a boot record, even if it is not capable of booting DOS.

F File Alloc Table - This cluster holds part of the File Allocation Table (FAT), which is used to keep track of where files are stored on the disk and which clusters are available.

D Directory - This cluster is part of the disk's directory.

. Allocated - This cluster is part of a file.

h hidden - This cluster is part of a hidden file.

r Read Only - This cluster is part of a Read-Only file.

x Bad Cluster - This cluster has been marked as bad and unusable.

(For more information on how files are stored on disk, please refer to your IBM Disk Operating System Manual.)

If you want to see which clusters are used by specific files, press "F". If the disk contains subdirectories, a subdirectory "tree" display will appear for you to select the subdirectory containing the files you want to map.

Then the files for that directory will appear. Notice the help line at the bottom of the screen:

```
Select file(s) to be mapped and then press "G" to proceed.  
F8=directory LIST argument  F9=file SELECTION argument  F10=chg path  
^v=scroll  <+=SELECT  F1=UNselect  F2=alt dir 1st  Esc=exit
```

Select the first file you want to map. If you don't select a file, PC Tools will assume you want to start with the first entry of the directory.

Press "G". The disk map will reappear, but only the clusters used by the one file will be shown in the map. Notice the filename on the left, and the new help lines at the bottom:

```
Use arrows(<-- -->) to view other files.  
"D" to view entire disk map. "F" to reselect files. ESC to return.
```

If you press the right or left arrow keys, the next or previous file (respectively) will be shown on the map. Using these features, you can see what clusters on the disk any given file uses. If you want to view the entire disk map again, and return to the file map, press "D". If you want to select a different starting file (or a different directory if the disk contains subdirectories), press "F" again. When you're finished viewing the map, press ESC to exit.

If, when mapping a file, you notice that the clusters are not contiguous, you may have a performance problem. It takes longer to access a file when its clusters are not contiguous due to increased head movement. If it is a file you use frequently (especially for data base files), you may want to reorganize your disk.

SYSTEM INFO

The SYSTEM INFO option of PC Tools provides useful information about your computer. When you select the SYSTEM INFO option, there may be a short pause, then a display similar to the following will appear:

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PC Tools - R3.xx

-----System Information Service-----

Computer - IBM/PC

The BIOS programs are dated - 01/01/85
Operating system - DOS 3.10
Number of logical disk drives - 4
Logical drive letter range - A thru D
Serial Ports - 1
Parallel Ports - 1
User programs are loaded at HEX paragraph - 0600
Memory used by DOS and resident programs - 84736 bytes
Memory available for user programs - 570624 bytes
Total memory reported by DOS - 640K
PC Tools has found the total memory to be - 640K
Additional ROM BIOS found at hex paragraph - C800

Press any key to return

The meanings of some of these items are fairly obvious. Here are brief descriptions of each item:

Computer - PC Tools can "recognize" all of the IBM models and many PC compatibles. If PC Tools does not know what computer this is, it does not display this line.

The BIOS programs are dated - This tells you when the built-in BIOS (Basic Input/Output System) firmware was last changed. This can be useful for comparing computers, since the manufacturer will change the BIOS date if the computer's BIOS is updated in any way.

Operating system - This lets you know which version of DOS you've booted.

Number of logical disk drives - This tells you how many drives are connected, including floppy drives, hard disks, RAM disks (electronic disks), etc. This number is also controlled with the "LASTDRIVE" option of your CONFIG.SYS FILE. The default may be "E" or 5 drives even if you really don't have five drives.

Logical drive letter range - Shows which drive letter names are allowable for the drives you have connected.

Serial Ports - Number of serial ports connected.

Parallel Ports - Number of parallel ports connected.

User programs are loaded at HEX paragraph, and Memory used by DOS and resident programs - These two items are related, since the operating system uses the lowest area of memory and user programs load directly after this. The larger these numbers are, the more memory is being used by the operating system (along with any resident programs loaded before PC Tools) and the less memory is available for user programs. Note that if you are using PC Tools in its resident mode, this will display the size of the operating system and resident programs up to (but not including) PC Tools. If you have other resident programs that were started after PC Tools, they will not be included as operating system memory either.

Memory available for user programs - This is the amount of memory available for user programs (such as PC Tools, word processors, spread sheets, etc). Note that if you have PC Tools resident, it will not reflect the amount of memory taken up by PC Tools, so real available memory will be less by the amount you specified with the "/RxxxK" command when you started PC Tools (usually 64K).

Total memory reported by DOS - This is the amount of memory which DOS believes to be available, which may or may not be all of the computer's memory. See the next item.

PC Tools has found the total memory to be - PC Tools ignores any memory switch settings and determines for itself how much memory is available in the computer (up to 640K). If the two numbers disagree, then you know that either the switches in your computer are set wrong, or else a program such as a RAM disk or print spooler has taken some of the memory for itself and "lied" to DOS about the amount of available memory.

Additional ROM BIOS found at HEX Paragraph - This lets you know if any expansion boards are plugged into your PC that contain "extensions" to the PC BIOS. If none are found, this line will not be displayed. The IBM PC/XT hard disk controller board contains ROM code for the hard disk that uses this BIOS extension protocol.

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PRINT

The PRINT option of PC Tools allows you to print out any file as a standard text file or "dumped" as hexadecimal values and ASCII characters. To begin, select the correct drive, subdirectory, and file(s) as described earlier in this chapter.

Press "P" for "Print". For each file you've selected, you'll see:

```
PC Tools - R3.xx                               Volume Label=None
-----File Print Service-----
Path=B:\
```

```
File=FILENAME.EXT
```

Please specify your print options as follows:

- "P" - print as a standard text file (file contains control characters as necessary)
- "D" - each sector DUMPED in ASCII and HEX
- "N" - skip this file and go to next one selected
- ESC - return

To print the file, make sure your printer is on, then press "P" to print the file as text, or "D" to print it as a dump of hex and ASCII values (similar to the VIEW/EDIT display). You can stop the printing at any time if you need to by pressing ESC.

If you don't want to print the selected file, press "N" to skip to the next selected file. To exit the PRINT option, press ESC.

Note: The PRINT option can only print files. If you want to print directory listings, use the List option from the "File Functions" menu. If you wish to print the contents of the screen, press shift-PrtSc.

LOCATE

If you have disks with subdirectories, the LOCATE option can help you find which subdirectories contain which files. Suppose you're

looking for a certain file, but can't remember which subdirectory it is in. The LOCATE option will search all subdirectories on the disk, looking for the filename. This is especially helpful when you're working with hard disks, which may contain many subdirectories and many files.

When you select the LOCATE option from the "Disk and Special Functions" menu and an appropriate drive letter, this display will appear:

```
PC Tools - R3.xx
-----File Locator Service-----
Path=B:\

Enter the name and/or extension to be used as a search
argument for the directory listing. A question mark (?)
is a "WILDCARD" which will always match any character
found in that position. An asterisk in the name or
extension will match that position and all remaining
positions.

      Name=[*          ]
      Ext =[*    ]

Name and extension correct as entered, (Y/N)?  [y]

Press ESC to Exit
```

If you're looking for a single file, just enter the filename and extension. If you're looking for several files with similar names, you can use the "wildcard" characters "*" and "?".

After you've entered the desired filename, answer the (Y/N) question with "Y". PC Tools will begin to search each subdirectory on the disk, showing you the directory it's currently searching in. For every matching file it finds, it displays a "directory entry" line for that file. You can read the entire pathname for the file.

The LOCATE option is also convenient for seeing a directory of the entire disk. If you enter "*" for both filename and extension, PC Tools will show you every file in every subdirectory on the disk.

INITIALIZE (FORMAT)

The INITIALIZE (Format) option of PC Tools allows you to format a new data diskette. Brand new disks must be formatted before they can be used for saving files. Formatting writes special information onto every track of the disk so that your computer can recognize this as an IBM DOS disk. Formatting also completely erases anything that was on the disk before.

The Initialize option can be especially convenient if the PC Tools program is resident in memory. For example, suppose you're working on a new word processor document, and suddenly realize that you don't have an available disk on which to save the file. Without PC Tools, you would have to exit the word processor (losing the document you were working on), format a new disk from DOS, start the word processor again, retype the text all over again, then save the file. With PC Tools resident in memory, however, just press CTRL-ESC to start up PC Tools, use the INITIALIZE option to format a new disk, exit out of PC Tools right back to your waiting word processor program, then save the text!

(Note: The INITIALIZE option is designed for formatting new data disks. It does not make bootable disks. You can, however, turn a disk formatted with PC Tools into a bootable disk using the DOS "SYS" command and copying the "COMMAND.COM" file to the newly formatted disk. Complete instructions are given by the PC Tools FORMAT option.)

Select "N" for "iNitalize" from the "Disk and Special Functions" menu and the drive letter for the drive that contains the disk to be formatted. The following display will appear:

PC Tools - R3.xx

-----Disk Initialization Service-----

Drive B is about to be initialized (formatted).

Choose the formatting desired
and press ENTER to begin.

360K<--->Double-sided, 9 sectors per track
320K
180K
160K

Press ESC to Exit

The possible formatting options are:

720K -	3 1/2 diskette, 80 tracks, Double-sided, 9 sectors per track,
360K -	Double-sided, 9 sectors per track, 40 tracks
320K -	Double-sided, 8 sectors per track, 40 tracks
180K -	Single-sided, 9 sectors per track, 40 tracks
160K -	Single-sided, 8 sectors per track, 40 tracks
1.2M -	AT high capacity, 80 tracks, Double-sided, 15 sectors per track

The display will only give you those options that are possible on the given drive.

If you're going to be using this formatted disk on a computer with single-sided drives, you should select one of the single-sided options. If you'll be using this disk with DOS Version 1.0 or 1.1, you should select an 8-sector option, since DOS 1.0 and 1.1 do not work correctly with disks that use 9 sectors per track. The 1.2M format can only be selected if your computer is an AT and contains a high capacity drive. If you are formatting a 3 1/2 inch disk, select the 720K option.

Use the cursor keys to select the formatting option you want. Make sure the disk to be formatted is in the correct drive, then press Enter. PC Tools will format the disk using the option you selected.

PC Tools

When the formatting is complete, PC Tools will ask you if you wish to give the newly formatted disk the capability of being made bootable. If you select "Y", it will write boot information to the disk. This does take disk space so unless you plan to boot from the disk, we recommend not taking this option. If you do, it will not make the disk bootable; it will only write the boot record and reserve space for DOS on the disk. You will need to use the DOS "SYS" command and copy the file "COMMAND.COM" to the new disk before it can be booted. This, of course, can be done anytime later.

When the format operation is complete, the above display will reappear. You can either select to format another disk, or press ESC to exit to the "Disk and Special Functions" menu.

PC Tools has one other advantage over the DOS FORMAT command: If it encounters any bad sectors, it will mark only those that are bad as unusable. The DOS FORMAT command will make the entire track that contains the bad sector unavailable.

Chapter Four - Hard Disk Utilities

The following programs have been added to PC Tools as of version 3 and are designed to make using your hard disk easier, faster and safer!

COMPRESS

The file COMPRESS.EXE is a program which will analyze a hard disk or floppy diskette for fragmentation and optionally correct it.

Fragmentation is the condition where the different parts of a file are not stored together on the disk. This can occur due to the way DOS allocates space for a new file or an old growing file. If there has been much file creation and deletion activity, then it's likely that some of the files are fragmented. There are two reasons that this is undesirable. First, if portions of a file are stored in widely separated areas of the disk, then accesses to that file will be slowed. Therefore, disk-intensive programs will perform better if the disk is compressed. Second, the Undelete facility of PC Tools will sometimes be unable to recover files perfectly if the deleted files were fragmented.

You may start the program by typing:

```
COMPRESS C: /BW
```

(Where C: is the name of the disk to be compressed)

/BW (optional) will suppress colors on the screen while COMPRESS is running. If you have difficulty reading the color display on your monitor, /BW can improve its appearance. /BW is ignored for monochrome systems.

The program is easy to use. Just follow the on-screen prompts. Here are a few points which are not obvious:

PC Tools

1. Options 1 to 4 only examine the disk and display information; they don't alter the disk. Option 5 (Compress) actually performs the compression.
2. Option 3 (Surface scan) will take about seven minutes to scan a 10 Megabyte disk. You may press Esc to stop it early.
3. Option 5 (Compress) performs a complex procedure and will probably take over half an hour the first time, depending on the state of the disk and how much work needs to be done. Once a disk has been fully compressed, future compressions will go faster.
4. If you halt compression early by pressing Escape, the program will leave the disk fragmented (uncompressed), but your files will be intact and useable. You may later begin compression again to finish the job.
5. Compression requires a minimum of two free 'clusters' on the disk.
6. The order of directory entries is unchanged by compression, but the physical order of disk files will be optimized as follows:
 - a. Files with the 'hidden' attribute are not relocated.
 - b. COMMAND.COM
 - c. Subdirectories
 - d. System attribute
 - e. Read-only attribute
 - f. *.BAT, *.COM, *.EXE in order of their original starting clusters.
 - g. All remaining files are sorted by date (the newest file is last).
7. Compression usually destroys the last traces of any deleted files. If you want to use PC Tools to Undelete any files, be sure to do so BEFORE compression.

Hard Disk BACKUP and RESTORE

Introduction

This section describes the utility programs PCBACKUP.EXE and PCRESTOR.EXE which are found on your PC Tools diskette. The purpose of these programs is to make floppy diskette archival copies (backups) of your hard disk files and, when needed, to restore your hard disk files from the backups. These programs are similar to the DOS utilities BACKUP and RESTORE but are more convenient and much faster.

Features:

- * Format the floppy diskettes automatically during the backup.
- * Backup all files, selected files or only altered files.
- * Restore all files or only selected files.
- * Verify that the backups are identical to the hard disk files.
- * Will work with almost any kind of floppy drive, including 3.5 inch 720k drives, 5.25 inch 360k drives, 3.5 inch 1.44 Meg drives and 5.25 inch 1.2 Meg AT-type drives.

System Requirements:

A hard disk, of course. One or more floppy drives.

At least 128 k bytes of free memory. DOS version 2.00 or higher.

For faster operation, we recommend ten or more DOS buffers. This is selected in your system's configuration file CONFIG.SYS (e.g. BUFFERS=10).

PC Tools

Getting Started

We recommend that you copy the PCBACKUP and PCRESTOR programs into a sub-directory on your hard disk. You can use PC Tools to create a directory and to copy the files. You could also do it with DOS commands, as follows:

```
C:                (assuming that your hard disk is drive C)
MKDIR \TOOLS      (make the directory, example name TOOLS)
CHDIR \TOOLS      (change to the new directory)
COPY, A:PC*.EXE, C: (PCBACKUP.EXE, PCRESTOR.EXE and PCTOOLS.EXE)
```

Using PCBACKUP

Remember that whenever you want to run PCBACKUP or PC Restore, be sure to first set the current drive and the current directory to where these programs reside. The programs expect to find their configuration and log files in the current directory and we recommend that you keep them all together.

Start the program by typing PCBACKUP, C: (where C: is your hard disk).

You may quit the program at any time by pressing the Esc key.

The first time that you run PCBACKUP (or whenever it cannot find its configuration file), it will ask you some questions about your diskette drives. PCBACKUP can use either one or two floppy drives to make the backups. If you have two floppy drives which support identical media and capacities, then you may use them both. PCBACKUP will write to one drive while you are swapping diskettes in the other. This speeds up the backup process.

When you have answered the questions about your disk drives, PCBACKUP will display the configuration and give you the chance to either accept or change it. If you accept it, the program will assume the choices are correct and ask you if you wish to save this configuration. If you answer Y, it will write the configuration information into a file named PCBACKUP.CFG in the current directory; if you answer N, it will use the configuration this one time but then forget it afterwards.

Once a configuration is saved, PCBACKUP won't need to ask about it again (neither will PC Restore, since it uses that same configuration file).

You will next be presented with the Backup Specifications display. This is where you may select the files to be backed up. You may press Y to modify any or all of the displayed choices; follow the instructions on the screen. If you accept the standard specifications, then ALL files on the hard disk will be backed up.

A note for experienced users: It is possible to select each item of the Backup Specifications display from the DOS command line. This is NOT required and usually only the drive letter should be entered on the command line. But if you wish to run PCBACKUP from a DOS batch file, the command format is:

```
PCBACKUP, c:, PATH=\pathname, FILES=filename.ext, /NS /M /NU /C /B
```

The meaning of each option is described below. All except /C and /B are presented on the Backup Specifications display and can be changed there.

c: Drive letter of the hard disk.

pathname. The DOS path to the particular subdirectory you wish to back up. If specified, it must start with a reverse slash (\) and begin at the root directory. This is used to restrict the backup to the files contained in the path. If a path is not specified, then the backup will begin with the files in the root directory and, unless /NS is used, will also include all the files in all subdirectories.

filename. Name of the file(s) you wish to back up. Normally all files are backed up, regardless of their names. This option restricts the backup to only those files having this name or, if you use the wildcard characters * or ?, to a group of files with similar names.

.ext Extension to the filename. This option restricts the backup to only those files with this extension or, if you use the wildcard characters * or ?, to those files with similar extensions. Normally files are backed up regardless of their extensions.

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/NS No Subdirectories. This restricts the backup to only those files in the one selected directory. Normally, files from all of the selected path's subdirectories are also backed up.

/M Modified files only. This restricts the backup to those files which have been written or altered since the last backup (we call this an 'incremental' backup). Normally this distinction is ignored, and all files are backed up even if their "archive flags" indicate that they are unchanged since the last backup.

/NU No Update of the "archive flags". Normally each hard disk file's flag is updated (cleared to 0) after that file has been backed up.

/C The hardware configuration menu is displayed, even if the configuration file PCBACKUP.CFG already exists. This allows you to override or change the previous configuration. Normally that menu is displayed only if the file PCBACKUP.CFG cannot be found in the current directory of the current drive. This option is available only on the DOS command line.

/B Batch file mode. The backup process will begin immediately without waiting for you to press any keys. All desired options (for example: PATH) must be included on the DOS command line unless the normal, standard selections are adequate. If the backup process is completed without errors, then control is returned directly to DOS. This option is available only on the DOS command line.

You may press Esc to quit the program or, when the backup specifications are satisfactory, you may begin the backup process. Remove any disks from your floppy drives. Get your stack of floppy diskettes ready, but do not insert any into the drives until you are requested to do so. Press B to begin. Follow the on-screen prompts.

Other Information about Backups

1. PCBACKUP can make two different kinds of backups: Total and Partial. The type is determined by your selection of files to be backed up:

Total = backup all files from all directories. A new PCBACKUP.LOG file is always created and the program begins with diskette number 1. The previous contents of the backup diskettes used are overwritten and lost.

Partial = backup only selected files. Files are selected by: directory, file name, or archive status. If no log file exists, then a new one is created and the backup begins with diskette #1, erasing the diskettes as it goes. If a log file already exists, then the new data is appended (added at the end) to the existing group of backup diskettes and the program prompts you for which diskettes it needs. For partial backups, the previous contents (if any) of the backup diskettes are preserved, which allows PC Restore to possibly recover the files from past backup sessions. Note that when data is added to a group of diskettes, the number required may increase.

2. Don't make a new Total backup using the same diskettes which hold your previous Total backup. Since a Total backup destroys the previous contents of the diskettes, the danger exists that if something goes wrong, you would lose both the new backup and the old one. Instead, for a total backup you should use a different group of diskettes: after successful completion of the new backup you may then re-use the older group of diskettes.

3. The backup floppy diskettes do NOT need to be pre-formatted.

4. PCBACKUP includes 'error-recovery' and other information with the backed up files on the diskettes. This may cause the number of bytes written to seem about 10% greater than the actual sizes of your files.

5. Backups may be made as often as desired or, conversely, as seldom as you dare. We suggest periodic (about once a week) 'total' backups combined with more frequent incremental (only modified files) backups.

6. PCBACKUP uses a special non-standard diskette format to improve performance and provide for error recovery. Note that standard DOS functions like DIR and DISKCOPY will be unable to read from the backup diskettes.

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7. Label each diskette with something like "Backup disk# <number>". The numbering of the diskettes is important, since PCBACKUP and PCRESTOR will always ask for each diskette by its number. If you mix up unlabeled diskettes, you'll just have to try each one until the program recognizes the one it needs.
8. **Caution:** Do NOT attempt to use PCBACKUP (or PCRESTOR) with drives affected by the DOS utilities JOIN, SUBST, ASSIGN or PRINT. Don't attempt to backup from, or restore onto, a network drive.

Using PCRESTOR

The PCRESTOR program is used primarily to restore hard disk files from the floppy diskette backups made previously by the PCBACKUP program. PCRESTOR can also verify that backup files on the diskettes are identical to files on the hard disk.

Start the program by typing PCRESTOR, C: (where C: is your hard disk).

You may quit the program at any time by pressing the Esc key.

If the PCRESTOR program does not find the configuration file (PCBACKUP.CFG) in the current directory of the current drive, it will ask you some questions about your floppy drives (just as PCBACKUP would).

If PCRESTOR finds the log file (PCBACKUP.LOG) in the current directory of the current drive, it will read the information contained in it. But if the log file is not found, PCRESTOR must create it by reading the backup floppy diskettes and it will ask you to insert one or more of them, by number.

You will next see the PCRESTOR main menu.

On the left side of your screen is a list of the files you have backed up in the past. This list was read from the log file (or from the backup diskettes, if the log file was missing). The file sizes, dates and times are displayed.

On the right side of your screen is a corresponding list of the files currently on your hard disk. If a file is found on your hard disk with the same name and path as a log file entry, then that hard disk file is listed on the right side. But if no such corresponding file is found, then there will be a blank line on the right side.

Above the left side of your screen will appear three pieces of information: the path name, the 'selection argument' and the 'set' number. The displayed path name is the path on the hard disk where the file was located at the time it was backed up. This same path on the hard disk is searched for the files to list on the right side. The 'file selection argument' (usually *.*) is described with the F8 function key below. The 'set' number is a convention used by PCRESTOR to display the backed up files in convenient groups: a new 'set' begins with each backup session and also with each different path within a backup session.

The central column contains codes describing the relationship between a backup file on the left and a hard disk file on the right. At various stages of operation this column may be used in any of these ways:

Backup file	=	Hard disk file	These files have equal dates & times.
Backup file	>	Hard disk file	The backup file is the newer one.
Backup file	<	Hard disk file	The backup file is the older.
Backup file	V	Hard disk file	Verified files have identical data.
Backup file	E	Hard disk file	The files did not verify as identical.
Backup file	R	Hard disk file	The hard disk file has been restored.
Backup file	S	Hard disk file	Same date & time, but sizes are different
Backup file	(blank)		Hard disk file was not found.

The lower part of the screen lists the various keys you may press and the functions which they perform.

The Esc key stops the current operation; if none is in progress, it quits the program.

You may scroll through the file list with the up/down arrow keys. For quicker movement, the PgUp and PgDn keys jump by several

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files at a time. The Home and End keys jump to the top and bottom of the current 'set'.

VERIFY mode means that the backed up files on the floppy diskettes will be compared, for identical size and data content, with their counterparts on the hard disk which have the same paths and names. No files are altered.

RESTORE mode means that the backup files will be read from the diskettes and then written to your hard disk. If a file of that name already exists on your hard disk, then you will be prompted with various options before the hard disk file is replaced. No action is taken until you press F1, F2 or F3.

F7 allows you to select a different hard drive.

F8 allows you to specify the 'file selection argument'. This restricts, by their names, the files to be displayed and also to be verified or restored. The normal rule is *.* (no restrictions by file name; display all files).

F9 and F10 are used to move forward and backward through the 'sets' of files.

F1, F2 and F3 begin the disk operations, either Verify or Restore, depending upon the currently displayed Mode:

F1 for all files on the backup diskettes (may be restricted by F8).

F2 for only files in the current set (may be further restricted by F8).

F3 for only the one file selected by the moving display 'bar'.

MIRROR and REBUILD Utilities

***** WARNING! *****

REBUILD is intended to be used ONLY when needed to recover from a disastrous mistake! REBUILD rebuilds your hard disk's FAT and root from the backup. Run this program only immediately after an accidental ERASE *.* RECOVER *.* or FORMAT. Casual use of REBUILD is dangerous. It is very important to understand that REBUILD depends totally upon the backup file written by MIRROR: it simply restores the entire FAT and the entire root directory to the state recorded in the backup file. If you have not recently used MIRROR then you will definitely lose new files created since the last time you used MIRROR and you may also lose some other data as well.

When you erase files or format a hard disk, the data in the files is not actually erased, only the records of the files' names (in the directory) and locations (in the FAT) are lost. If you have been using PCBACKUP, then you could use PCRESTOR to recover everything, but that does require a lot more time. If that information were saved somewhere else, it could easily recover the apparently erased hard disk files. Fortunately, there is an easier way to recover from an accidentally formatted hard disk...

The programs MIRROR.COM and REBUILD.COM provide some degree of protection against accidental ERASE *.* , RECOVER *.* or FORMAT of your hard disk. The method used is to keep a backup copy of the File Allocation Table (FAT) and the root directory of your hard disk in a special hidden file. If someday the unthinkable happens, you then can use our program REBUILD to quickly rebuild the critical hard disk information from that backup you previously made. REBUILD will do its best to restore your hard disk to the same state as MIRROR recorded, effectively undoing the ERASE *.* or FORMAT.

MIRROR.COM backs up the current FAT and root each time it is run. It should be run at least once a day. It is entirely automatic - just type MIRROR to run the program. Or include MIRROR in your

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AUTOEXEC file. This will run the program every time you turn on your computer.

If you don't already have an AUTOEXEC file, here is one way to create one:

```
copy con, c:\autoexec.bat    (Assuming C: is your hard disk)
MIRROR c:                    (DOS will wait for you to type)
^Z                            (Press the F6 key for this) 1 File(s) copied.
(DOS displays this message)
```

REBUILD is also totally automatic. When you type it in, the program will ask you to confirm that you really want to run it. (See warning at the beginning of this section.) If you tell it to proceed, REBUILD will continue without further input from you.

Note: Some versions of MS-DOS FORMAT may destroy information saved by MIRROR. If this occurs, REBUILD will not work.

Other Products

We also sell these other disk utility and software backup products:

Copy II PC is the most complete copy program available for the IBM PC. It backs up most protected disks with no parameter changes, and uses all available memory to make fast, reliable copies. It can also run popular software such as Lotus 1-2-3 from the hard disk without inserting the original, also eliminating the need to uninstall before doing a hard disk backup and restore. Copy II PC includes a disk speed test to help keep your drives in top shape. For IBM PC/XT/AT/some compatibles. \$39.95

Copy II PC OPTION BOARD is a hardware based disk backup system providing the utmost in disk backup capability. Many protection schemes rely on quirks of the floppy disk controller built into the IBM PC. The Option Board simply replaces the floppy disk controller during the copy process with much more powerful disk duplication circuitry. Unless the original disk has been physically damaged, the Option Board should copy it. For IBM PC/XT/AT, Compaq Deskpro or Portable, Zenith 150, Magnum PC, or 256K Tandy 1000, with one full slot, 256K and at least one 360KB drive available. (Compaq Portable and Tandy 1000 require extra \$15 cable.) \$95

Copy II Mac backs up most protected programs for the Mac and even runs some from the hard disk without a "key" disk. Includes MacTools, a powerful collection of disk utilities. For 512K Mac, Mac SE or Mac Plus, 1 or 2 drives (400 and 800 drives supported). \$39.95

Copy II 64/128 makes backups of most protected software for the Commodore. For Commodore 64/128, 1 or 2 disk drives. \$39.95

Copy II Plus version 7 Apple users' favorite backup and disk utility. For Apple II series, Laser 128; 64K, 1 or 2 drives. \$39.95

We update our software products regularly to handle new protections; updates are always available to registered owners at a reduced price. Protection schemes change frequently so it's a good

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idea to check with us if you need to back up a particular program.
For more information on our products, call or write:

Central Point Software Inc.
9700 SW Capitol Hwy.,#100
Portland, OR 97219
503-244-5782

Hardware Requirements:

IBM PC, XT, AT, jr.
IBM models 30, 50, 60
Most IBM compatibles
256K - uses only 64K in resident mode
One floppy or hard disk.

Fully Supports:

All versions of DOS
Floppy disks, hard disks,
3 1/2" disks including 1.44 meg
diskettes.
Lotus/Intel extended memory

And works well with other resident programs like Prokey and Sidekick.

Imagine a complete set of utilities...

- ✓ Simple to use,
- ✓ Always ready to go - even while running other programs.
- ✓ Take the best features included in the Norton Utilities*, Mace* utilities, FastBack*, and more!
 - COMPRESS a hard disk for better performance.
 - UNFORMAT a hard disk!
 - Fast hard disk **BACKUP** and **RESTORE**.
 - Restructure directories (**PRUNE** and **GRAFT** subdirectory trees).
 - **MOVE** files (copy followed by automatic delete of original file).
 - **VIEW/EDIT** any file or disk sector.
 - **UNDELETE** accidentally erased files.
 - Display and modify file **ATTRIBUTES**.
 - **MAP** disk usage.
 - **LOCATE** files on a disk.
 - **SEARCH** for text within a file or disk.
- ✓ Providing many of the same features found in DOS:
 - **COPY** disks, files.
 - **COMPARE** disks, files.
 - **RENAME** files, disk volume.
 - **DELETE** files.
 - **VERIFY** files, disks.
 - **CHANGE** current DOS **DIRECTORY**.
 - **PRINT** files.
 - **FORMAT** disks.
- ✓ And design it to stay resident in the computer's memory while other programs are running. This means that you can call up PC Tools at any time from within other programs, to format new disks, back up files, etc. Then when you're finished using PC Tools, you can return to the original program.

No wonder PC Magazine names PC Tools their Editor's Choice and adds,

"There's no reason to look beyond PC Tools..."

Central Point Software, Inc.
publisher of the bestselling
COPY II® PLUS for Apple II series,
COPY II® for Apple Macintosh,
COPY II® 64/128 for Commodore 64/128.
COPY II® PC for IBM PC and compatibles.
COPY II® ST for Atari 520/1040 ST

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