

User's Guide

THE MAGAZINE FOR IBM PC & CP/M SYSTEM USERS

Revised No. 1

\$5

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CP/M Tutorial

CP/M Summary

Using CompuServe

Disaster Prevention & Recovery

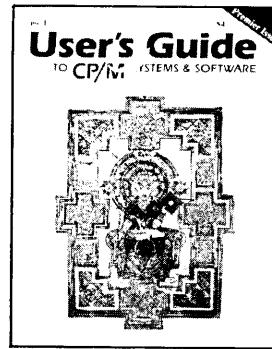


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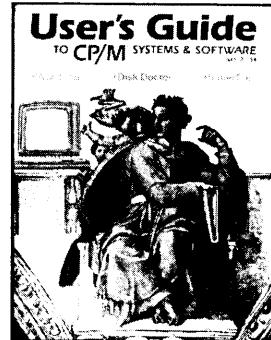
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Impatient User's Guide® to CP/M
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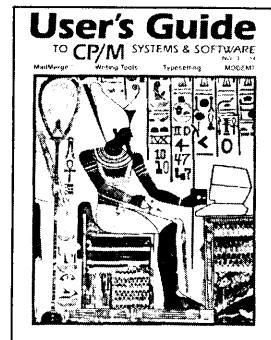
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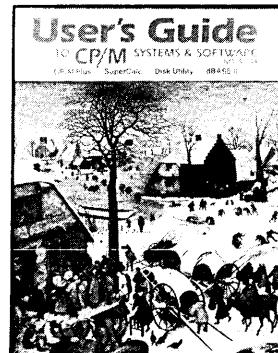
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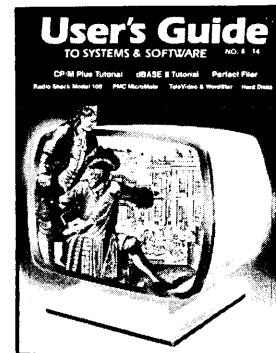
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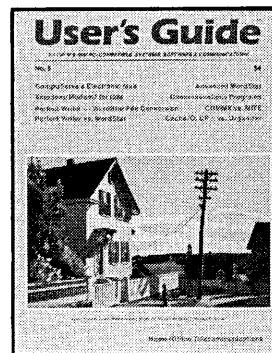
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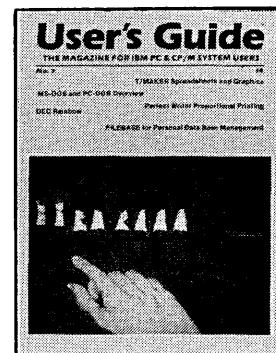
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User's Guide

User's Guide

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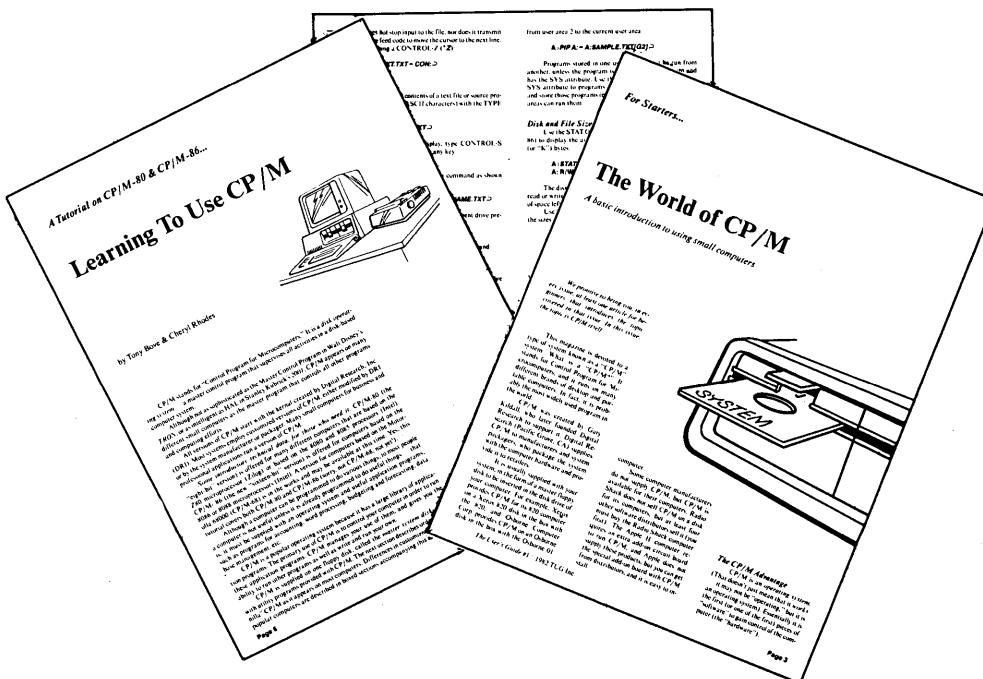
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Caring for and feeding your microcomputer system.

By Kelly Smith

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Number 1 Revised Edition



About The Cover

This issue's cover is an enhanced version of an "apostolic" page from the fabulous Book of Kells, an Irish illuminated manuscript of the 9th Century. This book is on display in Dublin in two separate locations. The Books of Matthew and Mark are in the Georgian reading library above the book store on Trinity College Campus, and the books of Luke and John are on display at the National Museum a few blocks from Trinity.

The Book of Kells contains pigments imported from Syria and Afghanistan long before Marco Polo was said to have opened the trade to the Orient. The blue is lapis lazuli, and the ochre and yellow pigments are found only in the area around Jerusalem. These pigments indicate that 8th Century Irish monks conducted trade with the holy land, probably by sea.

This title page is an illustration of John, the author of the book of Revelations. The Book of Kells, like the Lindisfarne Gospels and many other dark age illuminated manuscripts, are loaded with submerged codes. The keys to deciphering these codes are found in the front of the book in a section called the Canon (much like a computer program heading). This is usually a section which enables the reader to read the texts in differential order to arrive at different meaning or a clarification.

This same technique was carried out in the Kabbalah, and in many pre-Christian Gnostic texts such as the book of Jubalies and the Enochion. In this sense they operated very much like *user's guides* to the culture and its religions.

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H.H.

Editorial...

A New Magazine For Computer Users

Covering CP/M Systems and Software

How can these things be?

— The Gospel According to St. John 3:9

This issue is the first of a new kind of magazine, and a new medium for documentation of the highest quality.

The User's Guide may be the only magazine in the computing, or in *any* consumer interest, that offers detailed lengthy tutorials (sometimes over twenty pages) on using specific products. And in computing, there is such a need for good documentation!

We chose to focus on CP/M systems because there are so many different computers that run CP/M. As CP/M proliferates (over 500,000 systems now operating), there is a potential for something unique to occur in the computer industry: people who are not programmers may begin to understand CP/M, and thereby know how to use *many different computers* at the same time, rather than know only one specific system.

The immense popularity of CP/M (every "mass market" personal computer now runs CP/M, as well as nearly every business desktop computer system) is due largely to its familiar set of commands and application programs.

CP/M has been called the "Rosetta Stone" and the "Holy Grail" of microcomputing. For beginners, a knowledge of CP/M suddenly unlocks the mysteries of the computer and makes available a library of "holy texts" (distinctive application programs). Newcomers become "enlightened" to the magic of using a computer in a variety of applications.

To programmers, CP/M provides the "Rosetta Stone" key to using several different languages to write a variety of different applications, all in different styles. To system packagers, CP/M offers the capability to include, within one modern desktop computer system, a mix of proven programs from older and larger systems.

CP/M is really a software medium to allow standard application programs to run on a variety of different computers. As an "operating system" (its technical name), it is fair, not so friendly as hoped, but simple and versatile.

As a medium for software exchange, it is excellent. Important also is its ability to function as a medium for *data exchange*. People who use computers for word processing first discovered the advantage of having a CP/M system: the ability to transmit "files" (collections of data, such as a chapter of a book) to other, almost completely different systems, and use the files on those systems. As magazine writers and producers, we recognized the advantage of having our electronic

library stored in the CP/M format. We can write and edit articles electronically, and transmit them to a typesetting service, without ever printing them on paper. We can also use our files on other CP/M systems. Why not cover CP/M? It is the system of choice for us, and for many other writers and publishers.

Like the Book of Kells Canon, this first issue provides a CP/M tutorial that acts as a key to decipher future issues. This issue introduces the world of CP/M and some of its terminology, and lays a foundation with useful habits and tips on preventive maintenance.

The issue also introduces one activity that is gaining in importance with users: data communications. CompuServe is a service you can call by phone and use with your home or office computer. Such information services will soon provide electronic banking, "tele-shopping," reservations by computer, research data bases, etc. They may revolutionize the way we bank, shop, plan trips and do business.

In future issues we intend to cover typical personal computer applications such as word processing, financial modeling and forecasting, preparing taxes, performing multiple printing and mailing list operations, and managing a data base.

We want to provide the best documentation in the industry, on a timely basis that covers the best software as soon as it is available.

We want readers to know they can always reach for *The User's Guide* when they need to know how to use a CP/M system or an application program. We want subscribers to learn as much as possible over the next few years, to become more knowledgeable about their investment in computing tools. We are proving that such computing tools are useful in producing this magazine and in servicing our subscribers and advertisers.

The User's Guide will provide articles that show you how to use personal computers in interesting and useful applications. You need not know anything about computers to gain useful knowledge about computing from this publication. We'd like to answer your questions, and point the way for you to solve your problems, for one thing is certain: this industry has a long way to go before it can make computers that can explain themselves.

Eight Issues Later

In the late Fall of 1982, when our first issue hit computer stores and selected bookstores, CP/M was the recognized standard operating system for personal computers. The IBM PC was starting to ship in mass quantities, and three operating systems were available for the machine: CP/M-86, PC-DOS and the UCSD Pascal system.

Eight issues later the computer marketplace has changed. The IBM PC bandwagon came and went, taking every software developer with it. PC-DOS and its generalized version called MS-DOS became the de-facto standard for sixteen-bit personal computers. More and more manufacturers produced "PC-compatible" machines whose compatibility was measured in the most simplistic terms: the same processor (8088) and the same operating system (or close enough — MS-DOS).

After a year of too many IBM PC-compatibles and not enough innovation, Apple Computer surprises everyone with the MacIntosh. The Mac has a bold and somewhat arrogant design that does away with Control keys and cursor movement keys in favor of a single mouse device with "pull-down" menus.

Many of us are relieved to see competition and innovation return to the marketplace after a full year of the IBM juggernaut. A lot has happened since the Fall of 1982, including hard times for some computer manufacturers and explosive growth for others.

In our first issue we reviewed one of the most popular CP/M computers, with over 150,000 users: the Osborne One. Since that time Osborne Computer Corp. has filed for bankruptcy, and prices were slashed to make the Osborne One (at \$900 for a unit with a service contract) perhaps the best deal of 1984, while supply lasts.

We also reviewed the Alspa computer, which we use regularly for word processing, and the CompuPro system, which we now use for managing our circulation and subscription fulfillment. These computers are "CP/M machines" being used in typical applications using off-the-shelf software products: WordStar, dBASE II, SuperCalc, etc.

This same software has become the "bread and butter" of the IBM PC. WordStar is perhaps the most popular word processing program. SuperCalc III is nearly as popular as Lotus 1-2-3. dBASE II is perhaps the most widely used data

base management system. These programs are "refugees" from the eight-bit world of CP/M machines, and the operation of these programs within the CP/M-like MS-DOS and PC-DOS systems is very similar to operating them on CP/M machines.

In short, the standard configuration IBM PC functions much like any CP/M machine, with no significant difference in speed or in function. To increase speed and function, you need to add extra memory, extra disk storage, or get an IBM PC XT.

Continued on page 35

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User's Guide, Feb/Mar, 84

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Microsystems, Aug 83

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Microsystems Vol. 5/Number 1, Jan 1984

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The World of CP/M

An introduction to the ubiquitous operating system.

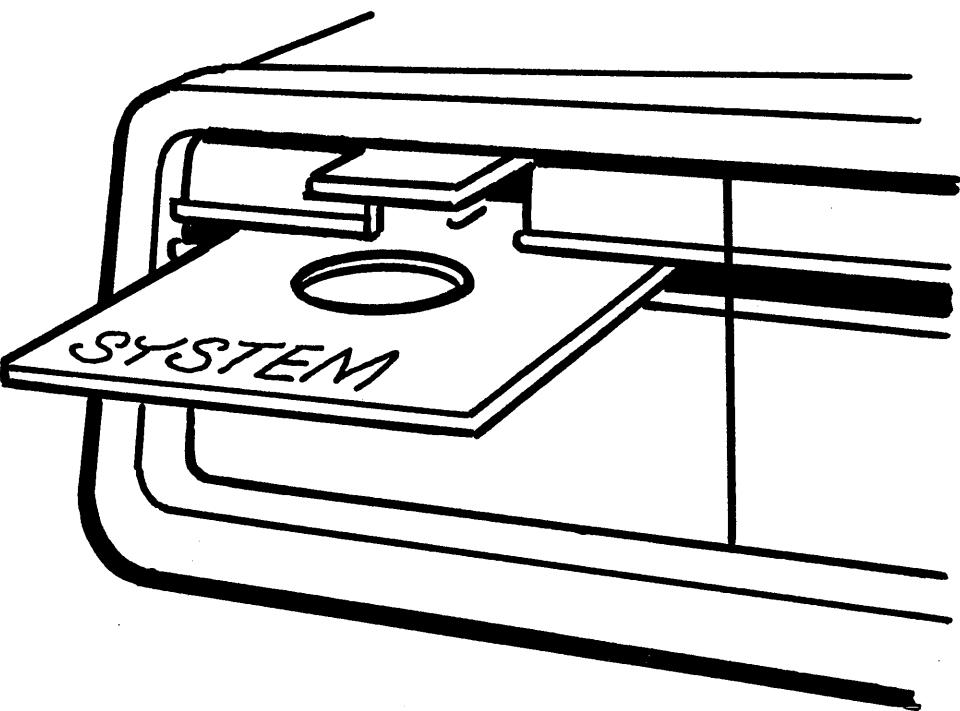
by Tony Bove & Cheryl Rhodes

What is a "CP/M?" The initials stand for "Control Program for Microcomputers." It is a "master control program" that lets you control the flow of data through a computer by typing simple commands at the keyboard.

Many people associate these typed commands with *languages*, and a lot of confusion results from this association. Programming languages have entire vocabularies and are complex enough to be used for accomplishing large tasks. CP/M is not a programming language at all — it is a control program that responds to a very small set of words called *commands*.

You type a command, and CP/M performs the operation. Typical commands are DIR, which tells CP/M to display a directory of the files on the disk, and STAT, which asks CP/M to display the amount of free space left on the disk.

CP/M also runs programs for you.



In fact, you can't run a program without starting CP/M first, although you can override CP/M and go right to a program. CP/M is always acting as a controller for the computer, routing data to and from devices like printers and other disks.

CP/M is known as a *disk operating system* (DOS) or simply *operating system*. It has two fundamental purposes: (1) to store and retrieve information using a floppy disk or hard disk, and (2) to run *programs*. Think about it: your fundamental purposes in using a computer are the same. You need to store and retrieve information, and run application programs. Therefore you need to learn how to use CP/M commands.

Why CP/M?

For some computer buyers, the question is never asked. A CP/M system disk is supplied with the computer. The computer is not smart enough to run programs and handle data storage without a disk operating system.

For other computer buyers, CP/M is an option for the computer, which comes with its *own* operating system, usually a *proprietary* one. What does that mean? It means the operating system runs only on that brand of computer or very similar brands.

Why is CP/M built-in with some computers, and an option with others? CP/M is designed to run on any computer, regardless of the computer's hardware (screen, keyboard and other idiosyncrasies). There is a version of CP/M (or CP/M-86, for the more powerful "sixteen-bit" computers) for nearly every personal computer on the market. In fact, it is probably the most widely used operating system in the world.

CP/M was not created by a computer manufacturer (which is one reason why it is not proprietary and used on only one machine). It was written and brought to market independently by Gary Kildall, a systems programmer and consultant for Intel and other corporations. As CP/M's popularity increased, partly due to its design and manufacturers' need for it, and partly

due to its success among the early pioneers and hobbyists, Dr. Kildall founded Digital Research, Inc. (DRI) to support it.

DRI (Pacific Grove, CA) supplies CP/M to computer manufacturers and system packagers, who package CP/M with their computers and supply the systems to retailers, who then sell them to you with service, support, and possibly training and system setup.

CP/M comes in the form of a master floppy disk to be inserted in the disk drive marked "drive A" of your computer. For example, Kaypro provides CP/M for its computer on a Kaypro Master disk in the box with the unit.

Some computer manufacturers do not supply CP/M, but CP/M is available for their computers. Radio Shack did not sell CP/M for its computers until 1984, and at least four other software distributors sell souped-up versions of CP/M for Radio Shack computers (you must buy the computer from Radio Shack first).

Other computers, like the Apple II and the Commodore 64, can run CP/M if you add a circuit board to the computer (available from Apple or Commodore, or third-party vendors). The circuit board is easy to install.

The CP/M Advantage

Once you have CP/M, you can purchase additional programs that make your CP/M system a useful business or professional computer. Word processing, data base management, forecasting, budgeting and accounting programs are available for CP/M systems from many independent distributors. At last count there were over *two thousand application programs* for CP/M systems. Nearly every application thought up for desktop computers is possible with a computer that runs CP/M and an off-the-shelf CP/M application program.

The reason for this is simple: CP/M is a standard software system available to use with non-standard computers. Programs written for CP/M do not have to contain the actual code to operate the computer hardware. One program can be written for a "standard

CP/M system" and then used in many different computers.

CP/M has this advantage over proprietary operating systems: the ability to transfer your data to a different manufacturer's computer. Your business could purchase an IBM or Xerox computer running CP/M, and you could buy a transportable Kaypro computer running CP/M for use in your home or while traveling, and be able to exchange data between the different computers.

It is helpful to remember that computers recognize two types of information: *program instructions* and *regular data*. CP/M can store both kinds of information on the same disk, and the information is structured into *files* that are universally recognized by other CP/M systems. It is therefore possible to transfer any file of data, or any program (file of program instructions), from one system to another system where they can also be used.

CP/M systems can be programmed in a variety of computer languages (FORTRAN, Pascal, COBOL, BASIC, Forth, APL, Ada, etc.). Popular programs like WordStar, SpellGuard and SuperCalc were first introduced on CP/M systems. Note, however, that some systems *hide* CP/M from you — you never see it, you only see *menu* selections on your screen to choose from.

Although a CP/M application program will theoretically work in any CP/M system, most have to be slightly modified for specific display screens and printers. Most CP/M programs come equipped with installation programs that perform this modification for you. You simply select your specific display terminal or computer from the "menu" of selections that appears on your screen.

"CP/M compatibility" is all well and good, but can you actually transfer CP/M programs and data files to another computer? Over the phone, yes, or even directly through a cable, if you have the appropriate software *on both systems* (sometimes it has to be the *same program* on both systems).

Can you use your disk in another computer running CP/M? Not until you've read about the horrors of the *disk dilemma*.

The Disk Dilemma

It would be easy to transfer data from one computer to another if both computers stored data *in the same format* on the ubiquitous floppy disk. However, we seem to have three types of disks: eight-inch (diameter), five-inch (actually five and a quarter), and the new three-inch (actually three and a half or three and a quarter) disks.

Unfortunately, formats used for five-inch and three-inch disk systems are usually proprietary to the manufacturers. To buy software for your five-inch or three-inch disk system, the software must be supplied on the type of disk you are using *and in the same*

format.

Most eight-inch disk systems that run CP/M offer the ability to use the CP/M standard disk format: the *eight-inch single-density single sided disk* (also known as the IBM 3740 format). If your data files are on CP/M single-density disks, you should be able to use those disks to transfer those files to another eight-inch disk CP/M system (the same disk should work in both systems).

Most eight-inch disk systems also offer the option of using a proprietary *double-density* format (twice as much data can fit in the same space). You should use the proprietary format for your working disks (to have more space

for working), but you should use the single-density standard format for your archives.

By the way, you should keep archive disks. This is perhaps the most overlooked advantage to using computers: you can archive vast amounts of data on disk, and duplicate the disks (perhaps keeping the duplicates in a lead-lined safe), and thereby have a more secure and compact archive than you could ever have with a paper system. We store the contents of two books and four magazines on a few disks that can fit in a safe-deposit box.

A Typical System

The newest small computers are complete desktop units that include a keyboard, display screen, and at least one floppy disk drive (two are recommended). Floppy disks are fine for many applications; however, if you need more disk capacity to operate your application than two floppy disks can offer, consider getting a *hard disk*.

A typical system also has a printer attached to it by a special cable. The printer is for printing listings, reports, mailing labels and anything else that needs to be in printed form. The printer may also have a "tractor feed" device for feeding continuous form paper.

Printers available with personal computers include the "letter quality" daisy-wheel or thimble-wheel printers (such as the Diablo HyType or the NEC Spinwriter), or the less expensive "dot matrix" printers (such as the popular Epson MX-80 or Centronics 747).

A typical system also has a *modem* device attached by special cable or built-in to the computer. Modems are used for data communications over phone lines. Modems come in two types: acoustic couplers that connect to your telephone handset, or direct-connect modems that connect to the telephone line directly.

What is inside the small computer? There is always a device called the *CPU*, for *central processing unit*, which is driven by the operating system and its programs. This chip (usually from the Intel or Zilog family) is the traffic cop of the circuits, directing the

THE FLOPPY SHUFFLE



flow of program instructions and data.

There is also an area of circuitry known as *internal memory*. The computer can "see" only the amount of program instructions and data that can fit into this region of internal memory, known as RAM (random access memory, also known as really active memory). To "see" any more program instructions and data, the computer must replace the stuff already in internal memory with new program instructions and data *from your disks*.

Therefore (and this is really all you need to know about RAM), you can use a program if it is designed to fit into the region of memory offered by your computer system.

For example, if you have a "48K system," you cannot use a program that requires 56K of RAM. Most systems offer 64K of RAM (the standard amount for business and professional applications), because many CP/M application programs require more than 48K (the standard amount supplied with many home computers).

What is a "K?" It stands for *kilobytes*. A *byte* is a unit of measuring information. One letter, comma, space, period or other character occupies one byte. This article, which is filled with letters, commas, periods, spaces and symbols, is approximately 14336 bytes, or "14K" bytes.

We use "K" for approximately 1000 (actually 1024) bytes to estimate the various sizes of internal RAM or external disk memory. Here are examples of how size information is used:

64K 64 kilobytes, a standard amount of internal memory, or RAM, in computers that can run CP/M.

256K 256 kilobytes, a standard amount of floppy disk space on single-density single sided disks.

5M 5 megabytes, or 5000 kilobytes, a standard amount of disk space in hard disks.

You can add a hard disk to your personal computer to hold a large data base holding data such as inventory, accounting, or client records. Most hard disks for personal computers are

also known as "Winchester-type disks" after the "Winchester" technology developed by IBM.

A professional writer could use a small computer with two floppy disk drives, a printer, and a modem. The two floppy disk drives are more than adequate for word processing, budgeting, project planning and other personal business activities, which can be kept on separate sets of floppy disks.

Typical Applications

For typical applications there are "off the shelf" software packages. Such a package contains a program (or set of programs) that performs the application in a typical way. For example, programs to do accounting follow standard accounting principles and are acceptable for use by certified public accountants.

The most popular application so far has been word processing. Nearly everyone has some word processing to do — writing documents, memos, reports, letters, novels, etc. There are numerous word processing programs available for CP/M systems (such as WordStar, Magic Wand, Spellbinder, etc.).

Another typical application is data communications and electronic mail. There are programs to handle transfer of data to remote computers, to use information services like Dow Jones, The Source or CompuServe, and to "talk" to "host" computers from your home or portable computer. The latter activity is typical among corporate managers away from the office who need to communicate with their office computers.

The most important overall application is data management. Computers can organize information into *data bases* that let you find a specific record with a simple command. However, data base management programs usually need to be tailor-made or adjusted for your data base application.

Standard "off the shelf" accounting and inventory data base programs can be integrated within an overall management program, or separated into "modules" for accounts receivable, accounts payable, payroll, etc. Data management programs usually have

"report generators," or modules that print reports. These modules can be combined and altered to fit your application.

A program useful for a general activity such as accounts payable may be incorporated into a more specific overall program to handle a specific application, such as medical patient billing. There are client-handling programs that are tailor-made for doctors, lawyers, tax accountants and even tailors.

To shop for a computer, you should first shop for an application program suited to your application needs. This advice is summed up as "look for the software first, then the machine (hardware) to run the software you need."

Preparing To Use CP/M

You should already have a computer in front of you to learn CP/M. If you have a friend or associate who already knows CP/M, it might be helpful to invite him or her over to help you get started.

Prepare yourself by getting *three times* as many blank floppy disks as you have master disks in your package. Seriously! You need that many to get started, and you'll need more to continue doing serious work with your personal computer. If you have a hard disk with tape backup, you may not need floppy disks, but then, you definitely need tape!

In other words, keep copies of everything you do. These sound like harsh words, but don't be afraid. There's really nothing you can do to hurt the computer, short of physical violence. You can, however, cause damage to disks and lose important data; if you have a backup copy, the problem is solved by copying disks. Remember one of the most overlooked rules: don't turn the power off or on with a floppy disk still sitting inside the disk drive. This is a common mistake, and you'll probably make it once or twice, but don't worry.

Remember that for every computer phreak there must have been a first time, a stage you're going through now: familiarizing yourself with personal computers and the world of CP/M. ☐

Types and Versions of CP/M

Eight-bit personal computers are perhaps the most widely-used computers. Most of the home computers priced under \$1000 are eight-bit, and most of the business computers priced under \$2000 (\$4000 for multi-user) are eight-bit. A type of CP/M called CP/M-80 is the dominant operating system for eight-bit computers (even though the Apple II, Radio Shack Model I and Commodore 64 dominate computer sales, CP/M is only available as an option for these computers).

The major eight-bit CPUs are the Z80 (Zilog), the 8080 or 8085 (Intel), and the 6502 (MOS Technology). Computers using the Z80, 8080 or 8085 processors can run CP/M-80 version 2.2, also known as *regular CP/M*. Computers with 6502 CPUs (Apple II and //e, Commodore 64) can run CP/M only if you add a circuit board with a Z80 CPU. This issue covers regular CP/M and more.

Some eight-bit computers can also run CP/M Plus (CP/M-80 version 3.0), which in some ways makes an enhanced eight-bit computer act like a sixteen-bit computer (faster disk operations and more internal memory). MP/M, a multiple-user version of CP/M, is also available for eight-bit computers that can support more than one terminal.

Sixteen-bit computers generally use the 8086 or 8088 CPUs (Intel), or the more advanced 80186/80188 or 80286/80288 CPUs (Intel), or the 68000 or 68010 (Motorola).

CP/M-86 and MP/M-86 are available for the entire Intel line of sixteen-bit computers. Concurrent CP/M-86 is also available for these CPUs. CP/M-68K is available for the Motorola 68000 and 68010 CPUs.

Hybrid computers usually have an operating system that emulates both CP/M-80 and CP/M-86 (e.g., the DEC Rainbow version of CP/M, and CompuPro's CP/M 8/16).

CP/M-80 Version 2.2

CP/M-80 version 2.2 is the current version of "regular" CP/M (CP/M

3.0 is called CP/M Plus). Release 2.2 has several enhancements that require changes to some programs written for version 1.4. Most eight-bit computers run CP/M-80 version 2.2.

CP/M-80 is usually tailored to specific machines. The Osborne 1 version, for example, does not work on a Kaypro; however, programs written for CP/M, and data used on CP/M systems, could be used by both the Osborne and Kaypro.

CP/M Plus

CP/M version 3.0, also known as CP/M Plus, is available on some of the newest eight-bit computers. CP/M Plus lets you add more memory to an eight-bit system to make disk operations faster and to run larger programs.

The eight-bit processors are limited in the amount of internal memory they can manage. The limit is 64 kilobytes, which is suitable for most single-user business applications.

CP/M Plus uses a method for adding internal memory to an eight-bit system called *memory bank switching*, in order to have more than 64K available to run larger programs, or to speed up disk operations. CP/M Plus also has utilities not found in regular CP/M to keep time and date information about your files, and to use passwords protect files and disks from unauthorized use.

MP/M and CP/Net MP/M-86 and MP/Net

MP/M (Multi-Programming Monitor control program) is a multiple-user version of CP/M for eight-bit computers. Its second release, MP/M II, is the dominant multiple-user system on eight-bit computers. Its counterpart in the sixteen-bit world is MP/M-86, which is designed to take advantage of sixteen-bit processors.

To have more than one user on a computer, you need a system that can divide the processor time into slices available to each user. The system must also divide internal memory into slices for each program that is running. Sixteen-bit CPUs are much better at han-

dling large amounts of memory than eight-bit CPUs.

CP/Net, for eight-bit computers with MP/M II, and MP/Net, for sixteen-bit computers with MP/M-86, provide *networking capabilities* — the ability to share programs, data, disk storage and other devices among several working computers.

CP/M-68K, CP/M-86 and Concurrent CP/M-86

CP/M-86 and CP/M-68K are very similar to CP/M-80, and all systems can share the same data and files. The difference lies in the fact that CP/M-86 (for the 8086/8088/80186/80188 CPUs) and CP/M-68K (for the 68000) can manage more than 64K memory and can take advantage of other features of these sixteen-bit processors to increase speed and handle larger programs.

Programs must be converted from CP/M-80 to run in CP/M-86 or CP/M-68K. Some programs require very small changes, and others require greater ones depending on how they were designed. Both CP/M-86 and CP/M-68K provide a common file structure for use with other sixteen-bit and eight-bit computers, and a way to grow into Concurrent CP/M-86, perhaps the most useful personal computer operating system.

Concurrent CP/M-86 lets you run several programs simultaneously. You could, for example, write one report while simultaneously printing another and calculating a third. Concurrent CP/M-86 is similar in nearly every aspect to CP/M-86, with the additional capability of running programs in the "background" while running a program in the "foreground."

If you use more than one version of CP/M, you will notice the commonality between the versions. Most of the commands and utility programs work in the same fashion, and you type most of the commands using the same syntax rules. We cover all versions of CP/M in this issue of *User's Guide* except CP/M Plus, which is covered in *User's Guide* issues 4, 5 and 7, and Concurrent CP/M, which is scheduled for coverage in issue 9. ☐

Learning To Use CP/M

*A concise tutorial on using CP/M commands and utilities,
for users of CP/M-86 and CP/M-80 (version 2.2) systems.*

by Tony Bove & Cheryl Rhodes

Since CP/M runs on many different computers, this tutorial is not going to tell you how to unpack your computer and where to find the power switch. This information should be in the first few pages of your manual.

We realize that most manuals are murky and intimidating, so we wrote this tutorial to take over from the point where you first turn on the power for your system. Although your system may have some peculiarities, we try to accommodate them in the text and in examples. Follow the examples closely and you should have no trouble learning CP/M.

Starting CP/M

First, turn on any devices connected to your computer (including disk drives, printers, terminal, etc.), and then turn on the computer unit.

Insert your system disk (either the master disk supplied with the system, or a *backup copy* of it) into drive A. To start CP/M-86 on the IBM PC, you press three keys simultaneously: Ctrl, Alt and Del keys.

For other computers, press the RESET button or key on the computer (some computers have a reset key on the keyboard, and some require a special key combination, such as Shift and RESET). If you don't know what keys to press, your dealer should be able to tell you how to perform a *system reset*.

Typesetting Conventions

Throughout this article we use *THIS typeface* to show exactly what you should type at your keyboard, with the special symbols ↑ for the Control key (CTRL, CNTL or ALT on some keyboards), and ↵ for the Return key (RET, CR or Carriage Return on some keyboards).

Since computer activities nearly always involve typing, you'll see *THIS typeface* used a lot to show commands, with letters in all upper case to distinguish commands from regular text. You may not have to type in upper case — we use it to emphasize commands. We also use *This face in lower case* for text in text files and for text that varies with the specific command (e.g., *DIR filename* tells you to type the *DIR* command with any filename). We use *This Typeface* to show messages displayed by the system or by programs.

If you did these things correctly (used the right disk, found the RESET button, etc.), a message should appear on your screen such as 64K CP/M version 2.2, accompanied by a copyright notice. (This typeface is used to show screen messages.) The copyright notice tells you what company designed the version of CP/M you are using. In many cases, the version is a standard one created by Digital Research, Inc.

CP/M-86 on the IBM PC displays a special "status line" at the bottom of the screen, showing the elapsed time and the current date.

All CP/M systems display this *prompt* message: usually A) or 0A). This prompt tells you what disk drive the system is currently using to look for information.

To see if CP/M is really working, type the word *DIR* and press your Return key. The letters *do not* have to be capital letters — you can type *dir* or *d/r* if you wish.

NOTE:

Your keyboard should have a key marked "Return" or "CR," which stands for Carriage Return. Some keyboards call this key "ENTER" or "NEW LINE." If your keyboard doesn't have a key marked as such, ask your dealer which key functions as the Return or Carriage Return key. Since we have no other way of printing one character to stand for the Return key, we use the ↵ symbol in all examples to stand for it. We also use *THIS TYPEFACE* to show words you type; and *THIS TYPEFACE* to show words displayed by the system.

After pressing your Return key, CP/M should display a list of words on the screen. These words are the *names* of files. Information is stored in *files* just like a paper filing system, and the names are like file folder labels. If such a list appeared on your screen, all is well. If not, try typing *DIR* and pressing Return again, and if you still don't get a display like the one in figure 1, ask your dealer for help.

Switching Drives

If you have two disk drives, find a suitable disk (one that already works with your system) to insert into the second drive, known as drive B. (If you don't have a suitable disk, you will have to prepare one by *formatting* it — skip to the instructions on formatting a disk).

If you don't have two disk drives, *do not try* this example! You will simply "hang up" your computer, which will try to find this mythical "drive B" until you kindly rescind the order by pressing the RESET button. Note that we recommend that you have at least two disk drives to do any serious work with a CP/M system (one of the drives could be a hard disk, in which case you do not have to "insert" or "format" anything but the floppy disk).

With a disk in drive B, type the following command (a *B* followed by a colon and the Return key):

A>B:↵
B)

The prompt changed to B). You have awakened drive B, and if your drives have LED indicators (red lights), the light for drive A probably went off and drive B went on. You may hear some whirring and clicking noises as drive B wakes up. The whirring and clicking noises of your disk drives will soon become a familiar sound pattern.

Now that you are in the world of drive B, you must tell

CP/M that a new disk has been inserted. Don't ask why — this is customary procedure for introducing a disk to CP/M. Hold down your Control key (sometimes marked CTRL, CNTL or ALT) and type a C. Your screen should display ↑C (the ↑ stands for the Control key). This is explained further in "Changing Disks."

While in the world of drive B, type another *DIR* command and press Return. This command should display another file-name list like the one in figure 1-1. If it doesn't, try it again, making sure you spelled *DIR* correctly and pressed your Return key. If it still doesn't work, don't go any further without consulting your dealer.

We keep saying this: go back and ask your dealer. Why? Computers contain delicate circuits that can easily be damaged by improper handling and shipping. Sometimes the computer you buy is "DOA" (dead on arrival) and circuits need to be replaced because they were damaged. If there is anything wrong with the mechanical disk drive assembly, or if there is anything wrong with the floppy disk (for example, if you didn't prepare it by *formatting* it), the CP/M commands won't work. If this is the case, you won't really know what's wrong until your dealer has a chance to look at your system.

To continue with our examples, go back to drive A by typing the following command:

B>A:↵
A)

Remember to press the Return key! The ↵ symbol stands for the Return key in all examples. The *A:* command is similar to the *B:* command in the previous example — it shifts the computer's attention from one disk drive to another. The prompt (A)) signifies that CP/M is now ready to use drive A.

The DIR Command

You have already used the DIR command twice (type *DIR* and press Return).

The DIR command displays a directory listing of *filenames*. CP/M finds information in a file by using its name. (Think of a paper filing system with file folders. You find information by reading the labels on the folders.)

The three letters following each filename indicate the type of each file. For example, "COM" (or "CMD" in CP/M-86 systems) tells you that the file contains a program that can be used as a command. These three letters are called the *file type* or *filename extension*.

The three-letter extension is actually part of the file's name, and is used to differentiate types of files. For example, you may have files with the "COM" extension (programs used as commands), files with the "TXT" extension (files holding the text of documents), files with the "DOC" extension (files holding entire documents), etc. Typical file types are explained later in this article.

CP/M-80

A) DIR ↵

A:ASM	COM	:ED	COM	:PIP	COM
A:COPY	COM	:FORMAT	COM	:STAT	COM
A:DDT	COM	:LOAD	COM	:SUBMIT	COM
A:DUMP	COM	:MOVCPM	COM	:SYSGEN	COM

CP/M-86

A) DIR ↵

A:ASM86	CMD	:FUNCTION	CMD	:STAT	CMD
A:CONFIG	CMD	:GENCMD	CMD	:SUBMIT	CMD
A:DDT86	CMD	:HELP	CMD	:TOD	CMD
A:DSKMAINT	CMD	:PIP	CMD		

Figure 1. CP/M-80 and CP/M-86 versions of the DIR command, which displays the filename directory.

Figure 1 shows two DIR commands — one in regular CP/M-80 and one in CP/M-86.

Your DIR display may look different, since your disk may have different filenames. We are showing the master disks we received with our CP/M-80 and CP/M-86 systems. Most of the filenames shown above should be on your system disk (the disk in drive A).

For example, you should have a file named "PIP" (followed by "COM" for the CP/M-80 version, or "CMD" for the CP/M-86 version). This file holds a utility program called PIP, which is used in subsequent examples.

The DIR command by itself displays the entire directory list of files on disk. You can also use the DIR command to display only one specific file in the directory, by specifying the filename with DIR.

If you specify a filename with DIR, you must specify the *entire* filename, including the *file type* (also known as *filename extension*). To type the entire name with the file type extension, type the name, followed by a *period*, followed by the extension. For example, to type the filename of the PIP utility, you would type *PIP.COM* (CP/M-80) or *PIP.CMD* (CP/M-86).

To see if the PIP utility program is stored on the disk, type the following DIR command in either CP/M-80 or CP/M-86, and be sure to include the file type (a period, followed by the file type), which is "COM" for CP/M-80 systems and "CMD" for CP/M-86 systems:

CP/M-80

A) DIR PIP.COM ↵

CP/M-86

A) DIR PIP.CMD ↵

NOTE:

You get the message NO FILE if you do not have a file named PIP.COM (PIP.CMD in CP/M-86) on the disk in drive A. Try looking for a file named STAT.COM (STAT.CMD). Both are utility programs usually supplied with CP/M.

CP/M-86 users can also have special files called *system* files that are not displayed with ordinary DIR commands. You must use the DIRS command (substitute the keyword "DIRS" for "DIR" in the examples) to display filenames of system files.

Formatting Disks

Most versions of CP/M require that you prepare a new or recycled disk before using it with your system. Nearly every computer manufacturer has a proprietary disk format making it almost impossible to use the same formatted disk in a different computer without re-formatting the disk.

You can, of course, buy the right kind of blank disk from your local computer disk supplier, and then *format* the blank disks for use with your system. You may also be able to use the disk in a different computer, depending on the format you choose for the disk (if you are given a choice — again, these formatting options depend entirely on the brand of computer you're using).

The disk formatting program is usually supplied with your computer. CP/M-86 for the IBM PC includes the formatting program with the copying program called DSKMAINT, which we describe below. CP/M-80 for the Osborne has a COPY program that includes formatting.

Check your system's documentation for a disk formatting, initializing or preparing program (usually called FORMAT or INIT in CP/M-80 systems).

A reminder: check to see that your disk is not "write-protected" before you try to format it. Floppy disks that are eight-inch in diameter usually require a piece of tape covering a notch on the disk jacket (see figure 2) to make them usable (otherwise they are "write protected"). Floppies that are five-inch in diameter are the opposite: they require the notch to be uncovered.

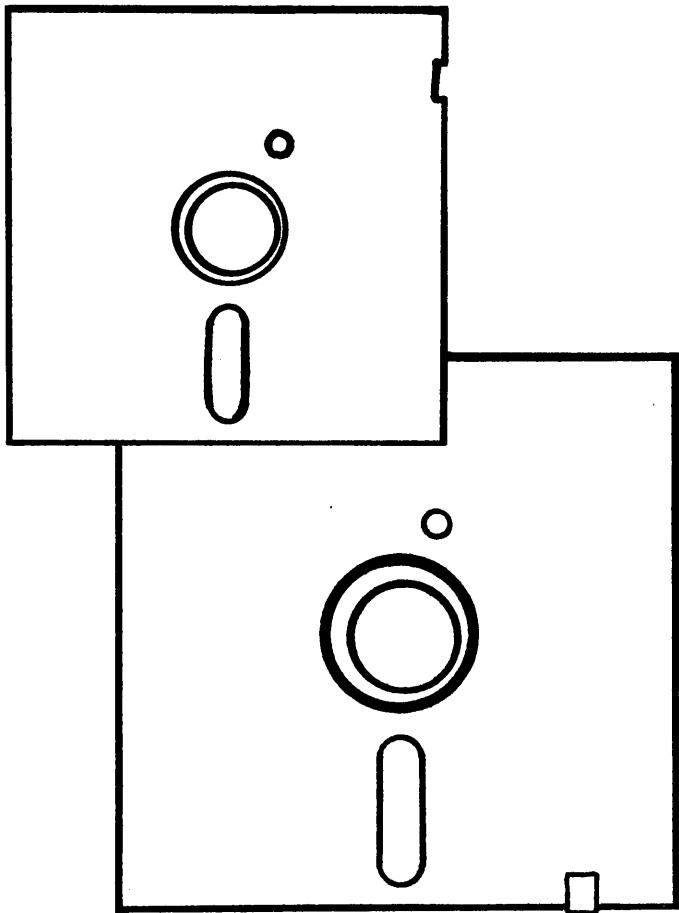


Figure 2. To remove the "write-protection" that keeps you from changing the data on a disk, eight-inch disk and five-inch disks have opposite instructions. For eight-inch disks, use special tape to cover the notch; for five-inch disks, remove any tape covering the notch.

When you format a disk, the system wipes out any information already on the disk and prepares the disk to receive new information (organizes the disk's sectors and tracks). After formatting, the disk is a CP/M disk that cannot be used in a non-CP/M system unless it is re-formatted for *that* system.

NOTE

For eight-inch disk users: If you prepare the new eight inch disk in the standard CP/M single-density single sided format, it should be usable in other CP/M systems that use eight-inch disk drives. This format is also known as the "IBM 3740" format (128 bytes per sector). Most systems offer both the standard format *and* their own unique double-density and double-sided formats that are not compatible with other CP/M systems (they are offered for greater data capacity per disk).

Generic Formatting

Each computer manufacturer's FORMAT or INIT program is different, but there are many similarities. Most FORMAT/INIT programs let you specify either drive A or drive B to hold the disk to be formatted. This is important — you don't want to inadvertently format a working disk with important information on it! You will lose that information if you do. We suggest that you always use drive B to format disks, with the system disk containing the FORMAT or INIT program in drive A. Specify drive B for the format operation.

Most FORMAT/INIT programs also perform a verification to check for bad sectors on the disk (a bad sector is one that cannot hold information). At the end of the formatting session, the program usually asks you to insert a regular system disk to start (or "boot") the system.

Most computer manufacturers provide their own proprietary formats that cannot be used with other computers (usually a double-density or quad-density format). These formats pack more data on the disk than "single-density" formats, and are regularly used for system disks, work disks and data archives.

However, to transfer data to other computers with different double-density or quad-density formats, you typically use a "least common denominator" format. The single-density format for eight-inch disks is considered a standard CP/M format that can be used with any CP/M system using an eight-inch disk drive. The IBM PC format, and the single-density Xerox 820 (also Kaypro) format are two quasi-standards for five-inch disk drives.

For specific information on your particular FORMAT or INIT program, consult your manual, or ask your dealer.

IBM PC Formatting

CP/M-86 for the IBM PC comes supplied with the DSKMAINT program for disk formatting *and* copying. To start DSKMAINT, type the following command:

A) DSKMAINT ↵

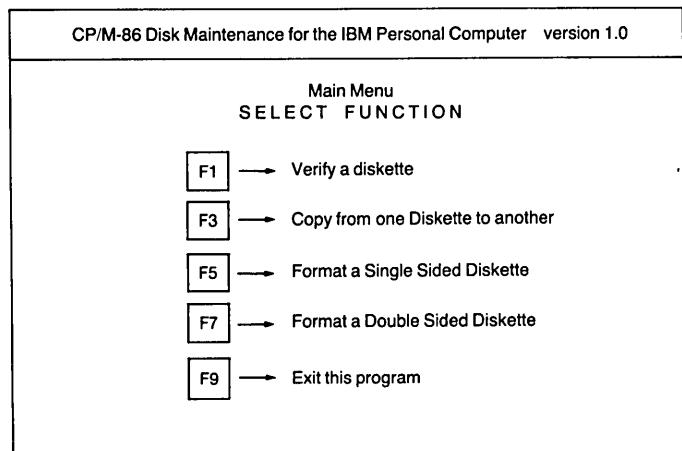


Figure 3A. The IBM PC's DSKMAINT main menu for formatting or copying a disk.

The DSKMAINT "main menu" appears on your screen (shown in figure 3A). On the right side are the names of the IBM PC function keys (F1, F3, F5, F7 and F9). Press the F5 key to format a single-sided disk or the F7 key to format a double-sided disk.

The screen then shows a selection (figure 3B). You pick drive A or drive B to use for the formatting operation. If you pick drive A (the F2 key), remember to remove the system disk and put the disk to be formatted in drive A. Otherwise, put the disk to be formatted in drive B and select drive B (the F4 key).

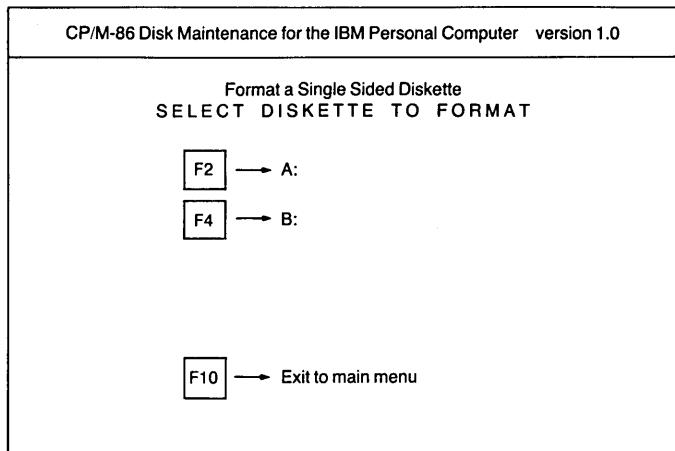


Figure 3B. Select the drive to use for the formatting operation on the IBM PC.

After selecting the drive, the system asks for confirmation, and you must type a *Y* or *y* to continue the formatting operation. Be sure you have the right disk in the right drive before confirming. Type *N* or *n* to stop.

The DSKMAINT program formats your disk track by track, then verifies that the tracks have been formatted correctly. When it finishes, it displays the drive selection menu again. You can select a drive and format another disk if you like, or leave the formatting operation by pressing the F10 key.

To continue using DSKMAINT to copy your system disk (next IBM PC example), leave the DSKMAINT menu on your screen. Otherwise, to quit DSKMAINT, press the F9 key to leave the program and return to CP/M-86.

Copying the System Disk

If you haven't already done so, you must make a backup copy of your master system disk. It is good practice to make a new backup disk after 80 hours of use (using your old backup disk as the "source" and the new disk as the "destination" of the copy). If possible, format a new disk for the new backup, or recycle a good disk that contains data no longer needed.

Attach a label to the disk before formatting it. The label should identify the disk as a system disk, perhaps with the date and an id number to show that it is a backup of another disk.

CP/M-86 on the IBM PC: DSKMAINT Utility

CP/M-86 for the IBM PC comes with a utility program called DSKMAINT (the DSKMAINT.CMD file), which copies all tracks from one disk to another disk. DSKMAINT also formats disks. Part of DSKMAINT's operation is to copy the system itself to the "destination" disk.

CP/M-86 stores part of itself on the first two tracks of the disk with no filename, and the rest of itself in system files. Since DSKMAINT automatically copies the first two tracks of the disk as well as the rest of them, it copies the system itself to the new disk, thus creating a new system disk that is an exact duplicate of the original system disk.

If you have a two-drive system, be sure you have a formatted disk in drive B. If you have only one drive, keep the formatted disk ready.

With the main menu (figure 2) on your screen, and the system disk in drive A, press the F3 key to start the copy operation. You then make a drive selection (figure 4).

The source drive in this case is drive A, which holds the system disk to be copied. You can use DSKMAINT to copy

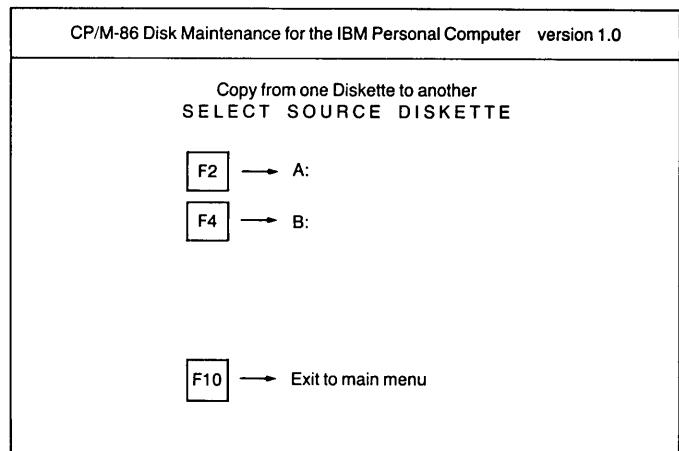


Figure 4. Using DSKMAINT on the IBM PC: selecting the "source" drive holding the disk to be copied.

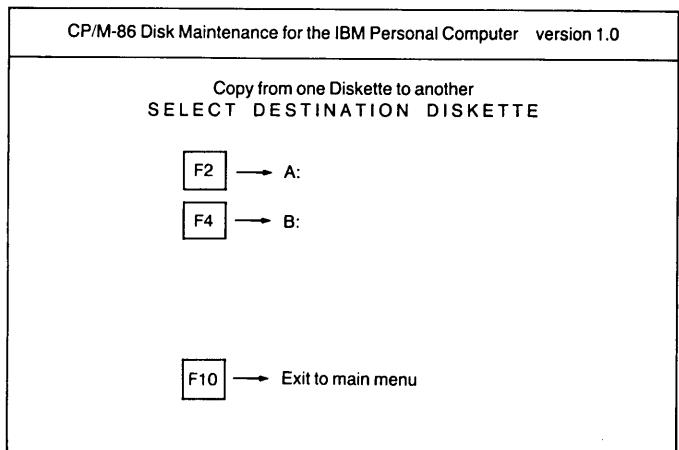


Figure 5. Using DSKMAINT on the IBM PC: selecting the "destination" drive holding the disk to receive the copied information.

any disk *from* any source drive *to* any destination drive, including the same drive. Of course, if you use one and only one drive for both the source and destination, you will be switching disks a lot, performing what we call the "floppy shuffle."

You select source drive A with the F2 key (as before), and the screen shows another drive selection for the destination file (figure 5). Use the F2 or F4 key (as before) to select the destination drive.

As with the formatting operation, DSKMAINT asks for confirmation, and you must type a *Y* or *y* to perform the copy, or type *N* or *n* to stop. Be sure you have the right disk in the right drive before confirming. The disk in the destination drive will lose whatever information it had on it, and become a duplicate of the disk in the source drive.

The DSKMAINT program copies the disk track by track, and when it finishes it displays the source drive selection again. You can copy the disk again if you like, inserting a fresh formatted disk into drive B and copying from drive A to drive B (or using only drive A in single-drive systems).

To leave the copying operation and quit DSKMAINT, press the F9 key first, and then the F10 key to leave the program and return to CP/M-86.

CP/M-86: COPYDISK Utility

Early CP/M-86 systems, including the early version for the IBM PC, come with a utility program called COPYDISK (the COPYDISK.CMD file), which copies all tracks from one disk to another disk. Part of COPYDISK's operation is to copy the system itself to the "destination" disk.

CP/M-86 stores part of itself on the first two tracks of the disk with no filename, and the rest of itself in system files. Since COPYDISK automatically copies the first two tracks of the disk as well as the rest of them, it copies the system itself to the new disk, thus creating a new system disk that is an exact duplicate of the original system disk.

If you have a two-drive system, be sure you have a formatted disk in drive B. If you have only one drive, keep the formatted disk ready. Type the following command:

```
A)COPYDISK▷  
Enter Source Disk Drive (A-D) ?A▷ (original system disk)  
Destination Disk Drive (A-D) ?B▷ (new copy)
```

```
Copying disk A: to disk B:  
Is this what you want to do (Y/N) ? Y▷ (answer yes)
```

If you have a single-drive system, the COPYDISK program will tell you to replace your "source" disk (the original) with the "destination" disk (your new copy). At the end of the COPYDISK operation, the program asks if you want to make another copy. Answer *Y* if you do, or *N* if you want to return to CP/M.

CP/M-80: Custom Copy Programs

Customized CP/M-80 systems usually include customized programs for copying disks. Examples are COPY.COM

for Kaypro computers and COPY.COM for Osbornes. Many are called COPY to distinguish them from the CP/M-80 PIP utility, which also copies files and disks.

If you have a single drive system, you *must* have such a program (the PIP utility cannot handle single disk drives without modification).

There are two kinds of custom programs:

- Programs that copy everything on one disk to another disk, including the system tracks that make the disk a system disk. Follow the specific instructions for your program. (DSKMAINT for the IBM PC, and COPYDISK are such programs.)
- Programs that copy data file and program tracks, *but not* system tracks. Follow the instructions presented here.

CP/M-80: SYSGEN & PIP For Double Drive Systems

Most CP/M-80 systems have at least two disk drives. If you have a system with only one, skip to "Single Drive Systems" first before reading these instructions.

Insert into drive B the new disk to receive the copy, and *format* the new disk if your CP/M system requires disk formatting.

The SYSGEN program supplied only with CP/M-80 systems (SYSGEN.COM in the DIR listing for drive A) will place a copy of the system onto your new backup disk. Some computers are supplied with a customized SYSGEN program by another name, such as SYSTIK, CCSGEN, GENSYS, and so on. Check your manuals for the name of the program and its instructions. Many of them look and act like the regular SYSGEN.

Run the SYSGEN program by typing SYSGEN followed by the Return key:

```
A)SYSGEN▷
```

SYSGEN asks for the "source" drive with the system disk you are using. Since your system disk is normally in drive A, you can type *A* followed by the Return key.

(Note to more advanced users: if you modified your system and the modified version is running (i.e., it is in memory) but not yet stored on the disk in drive A, *you must skip this question* by pressing only the Return key.)

SYSGEN then asks for the "destination" drive with the disk to receive a copy of the system. Type *B* for drive B (the drive with the disk to hold the copy):

```
A)SYSGEN▷  
SOURCE DRIVE NAME (OR RETURN TO SKIP):A▷  
SOURCE ON A:, THEN TYPE RETURN ▷  
FUNCTION COMPLETE  
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):  
B▷  
DESTINATION ON B:, THEN TYPE RETURN ▷
```

When SYSGEN completes its function, it displays this message:

FUNCTION COMPLETE

If you want to make more copies, insert another new disk into drive B and type *B* to the following question. If you are finished copying the system, press RETURN to "reboot" the system:

DESTINATION DRIVE NAME (OR RETURN TO REBOOT):

▷

A>

The SYSGEN program places a copy of the CP/M operating system on the first two tracks of the new disk. You can use SYSGEN as shown above to make a copy of the system as it is, without change, and place it on disk.

There is one more important step. SYSGEN copied only the *system* software to the backup disk. Now you have to copy the *utility programs* and other files from the system disk to your new backup copy. The easiest way to do this (in the absence of a customized COPY program) is to use the following PIP command:

A>PIP B:=A:*. * ▷

This command copies all the files on the disk in drive A to the disk in drive B. If you employ user areas, this command only copies the files in user area 0. We get to user areas later.

CP/M-80: SYSGEN For Single-Drive Systems

In the absence of a custom program from your dealer or computer manufacturer that copies the system tracks with the rest of the disk, use SYSGEN as described above, with the following changes to the procedures:

After typing *A* for the "source" drive, and the Return key twice, the FUNCTION COMPLETE message should appear, followed by the question about your "destination" drive. Take out your system disk and replace it with the new disk to be the backup. Answer by typing *A* as the "destination" disk, followed by two Return keys, and SYSGEN should copy the system onto the new backup disk.

To copy all files from the system disk to your new backup disk, you need a special customized program for your system, since PIP (described above) only works with systems with more than one disk drive.

If this procedure does not work, consult your dealer or computer manufacturer — they must know a way to make backup copies of your master system disk!

NOTE:

CP/M Plus (CP/M 3.0) has more utility programs that occupy disk space than regular CP/M 2.2. Some are expanded versions of CP/M 2.2 commands, and you may not be used to

reserving space for them on system disks. Each time you make a new system disk you have to remember to copy the files corresponding to these commands. Use a track-by-track COPYDISK or COPY program if you have one, or use the PIP command described previously, to copy an *entire* system disk to a new disk, then delete files on the new disk that you do not need.

Changing Disks

In most CP/M systems, you use a system disk in drive A to hold your system and application programs, and a data disk in drive B to hold your data and text files. These disks must be *formatted* to be used with your system; otherwise, your system will not recognize the disk, and the computer will probably "hang" as if in a daydream, waiting for you to insert a proper disk (or to reset the system).

In most cases, when you insert a formatted disk in a drive, or replace a disk in a drive with a different disk, you should warn CP/M by typing a Control-C (hold down your Control key and type a *C*). This tells CP/M how to put data on the new disk.

If you try to put data on a newly-inserted disk that CP/M is not prepared for, you may get the error message Bdos Error On B: R/O. You should then type a Control-C. The Control-C (displayed as ↑C) tells CP/M where data should be stored on the disk.

There are times, when using programs like PIP or FORMAT, when you must change disks without typing Control-C. Some application programs like WordStar and dBASE II will let you change disks while using the program, if you follow the rules (both programs have commands to "reset" the new disk, which essentially performs a Control-C for you).

Remember that whenever you change disks in drive A, immediately type a Control-C (unless you know CP/M well and you have a good reason *not* to, such as fixing a disk problem). When you change disks in drive B, C, etc., change to that drive by typing the drive name as a command (*B:▷*, *C:▷*, etc.), then type a Control-C.

Control Key Combinations

Now that you've used the Control key to type a Control-C, you are ready to learn other Control-key combinations that help you when typing commands.

The Control key (sometimes called CTRL, CNTL or ALT) can be used in combination with another key to perform *command line editing* or other functions.

Line editing commands help you type command lines and correct mistakes. If you make a typing mistake, use the Rubout (sometimes called Delete) key. If you're not sure what you've typed (some terminals re-display the rubbed-out characters when you use Rubout or Delete), try this line editing command: hold down the Control key and type *R*. This combination re-displays your command line without the rubbed-out characters.

To delete a line (and not send it to CP/M), use Control-X or Control-U. We abbreviate these as $\uparrow X$ and $\uparrow U$.

Commonly-Used Control-key Commands

The Return, Rubout (or Delete), Backspace and Tab keys are found on most computer keyboards and are commonly used in CP/M operations. If you don't have one of these keys, read on to see if the key is imitated by a Control-key combination.

Return key \Rightarrow

Send the line to CP/M as a command to be acted upon, and move the cursor down to the beginning of the next line.

Rubout or Delete key

Delete a character and re-display the "rubbed-out" character.

Tab key

Move the cursor right one tab space (eight or less spaces, to the next "tab stop"). You use this key when typing into a file using a text editing program like ED (supplied free with CP/M) or a writing program like WordStar. Writing and word processing programs often let you change the size of a tab space.

$\uparrow R$ Repeat the command line without rubbed-out characters.

$\uparrow U$ or

$\uparrow X$ Delete the command line without sending it to CP/M.

$\uparrow C$ Alert CP/M to the fact that you just inserted a new disk or replaced a disk in a drive. You also use Control-C to stop ("abort") some programs (WordStar is an exception). Control-C restarts CP/M or performs a warm start for a newly inserted disk. In CP/M-86, one Control-C while a program is running aborts the running program. Without a program running, Control-C restarts CP/M-86 and resets all disk drives.

$\uparrow S$ Stop long displays on your screen (often used with the TYPE command). Continue displaying ("scrolling") by typing any key except $\uparrow C$.

The following are Control-key combinations that imitate other keys on the keyboard (for computers with limited keyboards):

$\uparrow H$ Delete one character and erase it from the screen (move cursor left over the previous character). The back-arrow or Backspace key usually does this. The operation works in version 2.0 and newer versions, but not in version 1.4.

$\uparrow I$ Same as the Tab key (move the cursor right one tab space). Most keyboards have a Tab key that does this, but you can also use Control- I .

$\uparrow J$ Same as Return (it is actually a "Line Feed").

$\uparrow M$ Same as Return (Carriage Return).

Other Control key combinations perform useful CP/M functions:

$\uparrow P$ Turn on your printer, so that your printer prints everything that occurs on your screen and everything you type. Use $\uparrow P$ to turn off this function after turning it on with $\uparrow P$.

$\uparrow E$ Move the cursor down to the beginning of the next line without performing a Return. This is useful for typing long command lines. The Return key automatically sends the command to CP/M and moves the cursor to the next line; a Control-E simply sends the cursor to the next line so you can continue typing a long command.

$\uparrow Z$ Use with the ED or PIP programs to terminate a list of characters or inserted text (used to mark the end of a text file).

Handling Files

In typical applications of personal computers you regularly create files, rename them, delete them, copy them, and keep track of disk space. The computer helps you manage files using one, two, or several floppy disk drives or hard disks.

CP/M provides several built-in commands for handling files:

DIR

You've already seen DIR's display. The directory display helps you remember what files are on what disks.

ERA

This command erases files from any disk in any active drive. This is perhaps the most dangerous command to use. Although both public domain and commercial programs are available for un-erasing erased files, CP/M provides no un-erase program.

REN

This command renames files. When you rename a file, you are not creating a copy of it — you are merely changing the original file's name.

TYPE

This command displays the contents of a file. The file's contents must be readable (that is, text) for you to be

able to see characters on the screen. You should not try to TYPE a file that has the ".COM" file type.

USER

This command sets the current "user area" for your files on the disk. Files can be split into user areas within one directory on large capacity disks where they'd otherwise be lumped together into one large directory.

In addition CP/M provides several *utility programs*, also known as *transient commands*, that handle files:

DIR

Enhanced DIR command to display file sizes and attributes in an alphabetically-sorted directory. CP/M Plus only.

ED

Text editing program, used to enter text into a new or existing file, or change text in an existing file.

PIP

File copying program. PIP can make a copy of one file, copy files or the entire disk to another disk, and copy files to the printer or to other devices connected to your system.

SHOW

Display disk information, including the amount of disk space available and the active user areas. CP/M Plus only.

STAT

Display file sizes (use DIR in CP/M Plus), and display the amount of disk space available (use SHOW in CP/M Plus).

We show you some typical operations using a sample file we create from scratch. Take a break and prepare your "scratch" floppy disk (a newly formatted blank disk for drive B of a two drive system, or a system disk with room to add more files for a single drive system) for use in the following examples.

Filenames

You've already used the DIR command, which displays a directory listing of *filenames*. CP/M finds a file by using its name. The three letters following each filename indicate the type of each file. For example, "COM" (or "CMD" in CP/M-86) tells you that the file contains a program that can be used as a command, as in PIP.COM (or PIP.CMD). These three letters are called the *file type* or *filename extension*.

The three-letter extension is actually part of the file's name, and is used to differentiate types of files. For example, you may have files with the "COM" extension (programs used as commands), files with the "TXT" extension (files

holding the text of documents), and files with the "DOC" extension (files holding entire documents).

Filename Rules

A complete filename can take the following form (the *italic* parts are optional):

d:filename.ext

The filename is a unique name for the file using up to eight letters and/or digits. The optional *.ext* is a typical three-character extension used to indicate the type of file. You can use fewer than eight characters for the name and fewer than three characters for the extension. You can name a file with no extension, or with an extension and no name; the unnamed portion is set to blanks.

You can also specify with the filename the optional *d*: — a disk drive letter followed by colon — to specify a file on a disk other than the current disk drive indicated in the prompt. For example, you would use the filename *B:SAMPLE.TXT* to refer to the SAMPLE.TXT file on drive B. Without the *B*: CP/M would search the *current* drive for the file.

The current drive is the drive indicated by the prompt. Drive A is indicated by the prompt *A*), drive B is indicated by the prompt *B*), and so on. If you have a file named SAMPLE.TXT on the disk in drive B, you could type the following command (while the *A*) prompt is displayed) to see a directory listing of it:

A)DIR B:SAMPLE.TXT ↵

You get a disk error message (DRIVE B NOT READY) if you have no disk in drive B. You get the message NO FILE if you do not have a file named SAMPLE.TXT on the disk in drive B.

File Naming

The basic idea is to use names that describe the file well enough to tell you what is in the file. As with file folders and descriptive labels, you use a name that identifies the file and makes it unique.

You can use letters, numbers, dashes, slashes, plus signs, dollar signs, pound signs, etc. For example, we use the following filenames for files that hold the text of a book:

CHAP1-1.TXT — Part one of chapter one.
CHAP1-2.TXT — Part two of chapter one.
CHAP2-1.TXT — Part one of chapter two.
-OUTLIN.TXT — Outline, not full document.
08/02/82.TXT — Entry for an on-going diary.

Many of the popular filename extensions, or file types, were invented by programmers from the forgotten years of timesharing and batch programming. Many have found their way into personal computer systems. To conform with these conventions, you should use these filename extensions for the purposes they were intended, not for other purposes. It is bet-

ter to invent unique extensions rather than conflict with the ones presented here.

We present a list of some of the extensions we've found on a variety of CP/M systems. You may not have a need for more than a few of them:

.ASM	Source file of an assembly language program.
.BAK	Backup copy of a text or data file.
.BAS	Source file of a BASIC program.
.COM	File containing an executable program or transient command.
.CMD	File containing an executable program or transient command for CP/M-86 system.
.DAT	File of character or numeric data.
.DOC	File of messages or documentation.
.HEX	File containing hexadecimal values (Intel format, created by the ASM program).
.INT	File containing a CBASIC executable program (created from a ".BAS" file).
.LIB	File (library) containing source routines for programs.
.LST	File containing a printable listing of a program.
.MAC	Source file of an assembly language subroutine.
.MSG	File containing one or more messages.
.PAS	Source file of a Pascal program.
.PCO	File containing a Pascal executable module.
.PRL	Page-relocatable MP/M file.
.PRN	Printable file prepared by text formatter or other program.
.REL	Relocatable MBASIC program file.
.SAV	System file in CP/M version 2.0 and newer.
.SRC	Source file from the CP/M User's Group.
.SUB	Source file of commands for the SUBMIT program.
.SYM	Symbol table generated by MAC program.
.TEX	Text file to be formatted by the TEX program.
.TXT	General purpose text file.
.WRK	Temporary "work" file created by some programs.
\$\$\$\$	Temporary file created by some programs.

Don't worry — unless you intend to do a lot of programming, you will probably never use most of these extensions. You will want to use ".TXT" and ".BAK" for word processing files. You may also use ".SUB" to create files of commands for the SUBMIT program. Otherwise, you should know about these extensions in order to identify strange files. Some application programs you use may require you to use other filename extensions not listed here.

Creating a File

In order to understand files, you may want to create one for use in examples and to use in experiments with CP/M commands. Most of the time you will be using an application program such as WordStar, SuperCalc, or dBASE II, or a programming language like BASIC, to create files. However,

to create one quickly and fill it with text for use in the following examples, you can use CP/M's PIP or ED utilities.

PIP lets you type text directly into a file (usually one line) without any changes. Whatever you type is stored in the file, until you type a Control-Z to signal the end of the text.

Type the following PIP command:

```
A>PIP SAMPLE.TXT=CON: ↵
```

Now type a line of text such as *Hello little friend*, and at the end, hold down your Control key and type a Z. Control-Z signals the end of the text. PIP should copy what you typed into the file SAMPLE.TXT and then return you to CP/M.

To see that SAMPLE.TXT has really been created, type the DIR ↵ command and look for its name in the directory listing.

Creating a File Using the ED Program

Another way to enter text directly into a file is with the ED text editing program, which lets you change text as well as type many lines. ED is supplied with all CP/M systems, but it is by design a primitive text editing program, useful mostly to programmers. The assumption is that you would buy a "real word processing program" for serious writing and word processing.

If you have neither the time nor inclination to use another word processing program or to learn ED, try this simple exercise to create an empty file, which can then be used in subsequent examples. Type the following ED command:

```
A>ED SAMPLE.TXT ↵  
NEW FILE  
:*
```

Type the i command (lower case "i") followed by Return to start inserting text into the file. Type a line of text and press Return:

```
:i ↵  
1:Hello little friend ↵  
2:
```

Hold down your Control key and type a Z. Control-Z signals the end of the text for ED as well as for PIP:

```
2:(Control-Z)  
2:*
```

You can now type the letter E (followed by Return) to leave the ED program and save SAMPLE.TXT:

```
2:*E ↵  
A>
```

Once you have a file named SAMPLE.TXT, you can use the examples in this tutorial (you can substitute any file's

name for the name SAMPLE.TXT in these examples). Using CP/M you will make a copy of the file, rename its copy, display the file's contents on your screen, print the file, and finally erase it.

Copying a File

The PIP program can copy one or more files, and do many other things which are described later. You may have already used PIP to copy an entire disk. We'll use PIP now to copy the SAMPLE.TXT file to another file on the same disk, then we'll use it to copy SAMPLE.TXT to another disk.

To copy a file to another file on the same disk, decide a name for the copy and type this command:

```
A)PIP COPY.TXT=SAMPLE.TXT ↵
```

The PIP command line is funny, but you'll get used to it. The *destination* is typed first, then the equal sign, then the *source* of the copy, followed by Return. This convention is repeated in other CP/M commands.

This command copied SAMPLE.TXT and called the copy COPY.TXT. If a file named COPY.TXT already existed, the contents of SAMPLE.TXT would replace COPY.TXT's previous contents.

You have a copy of the file on the same disk, but this type of backup is not safe enough — if the disk itself fails, you have no way of recovering the data. You should always place copies of files on separate disks.

Also, you cannot use the same name for two files on the same disk (unless the files are in separate user areas, which we discuss later). Therefore, if you want to make a copy using the same name, you must put the copy on another disk. A file's copies on other disks usually have the same name as the original file, to make it easy to keep track of them. When you change the original file, you should replace the old copies of the file with new ones.

Now we'll copy the file SAMPLE.TXT to a disk on drive B, using the same name for the copy. You can do this if you have two drives, and a disk to receive the copy in drive B:

```
A)PIP B:=A:SAMPLE.TXT ↵
```

Again, the destination, *B:*, is typed first, then the equal sign (=), then the source of the copy. We specified the *A:* disk drive with SAMPLE.TXT for clarity. It is not necessary because PIP would otherwise search the current drive, which is drive A (as indicated by the A) prompt).

Renaming Files

To rename a file, use the built-in REN command, typing the *new name first*, followed by an equal sign, then the old name, followed by a Return:

```
A)REN NEWNAME.TXT=COPY.TXT ↵
```

This command changes the name of the file COPY.TXT to NEWNAME.TXT.

If the file to rename is on drive B, you can type the *B:* command and then use the REN command, or you can use the *B:* drive prefix with the oldname (e.g., *B:COPY.TXT*). You cannot use a different drive for the new name.

Displaying and Printing Files

To see the contents of a text file, use the TYPE command:

```
A)TYPE SAMPLE.TXT ↵
Hello little friend
```

If you have a printer connected to your system, turn it on now, put paper in it, and watch what happens after typing a Control-P and the TYPE command:

(First, hold down Control and type *P*.)

```
A)TYPE SAMPLE.TXT ↵
Hello little friend
```

The printer should print the entire TYPE command and the contents of the file SAMPLE.TXT. If you type another command, such as DIR, the printer will print the directory listing. The printer prints everything typed and displayed, until you type another Control-P.

Now type another Control-P to *turn off* the printing operation.

Another way to print a file is to use the PIP command to copy the file to a special name reserved for the printer:

```
A)PIP LST:=SAMPLE.TXT ↵
```

This PIP command copies the contents of SAMPLE.TXT to the special *LST:* name which is reserved for the printer or "list device" connected to your system. You don't have to turn the print operation off in this case — just type the PIP command. When PIP reaches the end of the file, the print operation ends and returns you to CP/M.

User Areas

CP/M systems provide the USER command to let you separate your disk files into user areas within one disk directory. This is provided as a convenience for separating files on a large hard disk.

Floppy disk system users probably do not need this command. Even single-user systems with hard disks rarely need the extra feature of storing files in different user areas. User

areas are very common in multiple-user systems (such as MP/M II, MP/M-86 and some hybrid CP/M-80/CP/M-86 systems like the Zenith Z-100 and the CompuPro 8:16).

User areas are numbered from zero to fifteen. User area zero is the assumed user area for all files, unless you change the current user area with the *USER* command, and create files in the other user area.

To change the current user area, type *USER* followed by the number of the user area:

A)USER 1▷

CP/M Plus systems and some MP/M systems display the usual A) prompt for user area 0 but change it to 1A) for user area 1.

Type the *DIR* command, and the system should display the message NO FILE. That is because there are no files stored in user area 1 — all the files are in user area 0.

User areas are useful as dividers in large hard disks. Each disk directory of a hard disk can have up to sixteen distinct user areas (many hard disk systems use drives A, B and C for the hard disk, with sixteen user areas in each drive).

User areas were first introduced in CP/M-80 (version 2.0), but were enhanced by some vendors of CP/M systems. One major enhancement shared by many systems (including CP/M Plus) is the use of user area zero as a “common area” for programs.

Common Area

The *SYS* file attribute (described with the *STAT* utility) makes it possible to “hide” files from regular *DIR* displays. In CP/M Plus, CP/M-86, MP/M-II, MP/M-86, and in some hybrid CP/M-80/86 systems, you can use this file attribute in conjunction with user area zero to keep one copy of all programs (files with the “.COM” filename extension) in drive A, user area 0. This is known in multiple-user systems as the “common area.” A program file with the *SYS* attribute stored here can be executed from any user area of any drive. (Note that in many such systems the “.CMD” program files stored in this common area cannot be run from another drive — you must store the program in user area 0 of the drive you are using.)

In CP/M Plus systems (and in customized CP/M-80 systems with user area 0 acting as a common area), you usually keep a copy of *PIP.COM* (with the *SYS* attribute) in the common area (user area 0) to use from any user area. In CP/M-86, MP/M-86 and hybrid CP/M-80/86 systems, you keep *PIP.CMD* in the common area (user area 0) of each drive. With *PIP* in the common area, you can use it to copy files from one area to another.

Copying To/From User Areas (not CP/M-80 version 2.2)

In all CP/M systems except CP/M-80 (version 2.2 or

older), you can type this *PIP* command to copy a file from your user area to user area 1:

A)PIP A:[G1]=SAMPLE.TXT▷

The [G1] option copies the file SAMPLE.TXT to user area 1 on the same disk. The two files can have the same name on the same disk only because they are in different user areas.

You can also use *PIP* to copy from one user area to another, regardless of which user area you are currently using:

A)PIP A:SAMPL4.TXT[G4]=SAMPLE.TXT[G0]▷

In this example we copied the file SAMPLE.TXT in user area 0 to a file in user area 4 with the name SAMPL4.TXT.

In systems where user area zero is not functioning as a common area, the *PIP* utility must be in the current user area in order to use it to copy files from one user area to another. With *PIP* in the current user area, you can copy a file from the current user area to another user area in CP/M Plus, CP/M-86 and CP/M-68K, but not in CP/M-80 version 2.2.

Copying Into the Current Area Using CP/M-80 Version 2.2

In CP/M-80 version 2.2 (or older versions), to copy a file into a user area you must first select the *destination* user area as the “current user area” with the *USER* command as shown in a previous example, then use a *PIP* command. (Note that ZCPR, a public domain “replacement” program for part of CP/M-80 2.2 systems, makes it much easier to copy files between user areas.)

In non-customized systems where there is no common area, you must have *PIP* in each user area you are using to store files. In fact, to make it possible to copy a file into a user area in the first place, you must perform a special operation with the *DDT* utility and the *SAVE* command.

Use the *DDT* utility to load *PIP.COM* into memory by typing:

A)DDT PIP.COM▷

DDT Vers. 2.x
NEXT PC
1E00 0100
—

With the *USER* command, select the user area to receive the *PIP.COM* file:

A)USER 1▷

With user area 1 as the current user area, type this *SAVE* command to save *PIP.COM* (the “29” is the number of *memory pages* occupied by *PIP.COM*):

A)SAVE 29 PIP.COM▷

Assuming you have done this and you have PIP.COM in the current user area, you can copy a file into the current user area from user area 0 using the PIP command with the [G0] option:

```
A>PIP SAMPL1.TXT=SAMPLE.TXT[G0] ↵
```

The PIP command copies *from* another user area to the current user area. If you type the DIR command now, you should see SAMPL1.TXT in the directory listing. To see what the current user area is, type the USER command by itself.

Displaying User Area Status

The USER command by itself tells you what user area you are in. CP/M-80, CP/M-86 and CP/M-68K systems also offer the STAT utility to show you the number of user areas that contain files, as well as the current user area. (CP/M Plus users have the SHOW utility, described in *User's Guide* issue 5.)

If you have the STAT.COM file in the current user area (or in the common area of a hybrid CP/M-80/CP/M-86 or customized MP/M system), type this command:

```
A>STAT USR: ↵
```

Active User: 1
Active Files: 0 1

This display shows that the current "active" user area is user area one, and that user areas zero and one are "active" on this disk — i.e., they have files.

User areas are "logical" separators, not physical ones. The user area number acts as a prefix to the filename. As a result, you can have files by the same name in different user areas of the same disk. Also, there are no space restrictions or limitations to user areas other than the limitations of the disk itself.

File Size and Disk Space

One crucial activity you must perform is the constant monitoring of the amount of disk space you have available for new data. Some application programs have no graceful way of letting you know that your disk is full, and some actually "bomb-out" when the disk fills, leaving your data stranded in memory and not stored properly on disk. The only answer is to be aware of how much disk space you have.

Disk space is measured in kilobytes (1024-byte chunks). A single-density eight-inch disk can hold about 243 kilobytes (243K); double-density disks can hold more than twice this amount.

Since one byte is equivalent to one character of information, you can store one double-spaced typed page of text in two kilobytes of disk space. Therefore, if you are using single-density eight-inch disks that hold 243K, you could store at least 100 double-spaced typed pages of information on that disk.

For all CP/M systems except CP/M Plus, use the STAT utility to display the sizes of files and disk information. (CP/M Plus users have the SHOW utility, described in other issues of *User's Guide*.)

The STAT utility is stored in a file called STAT.COM (STAT.CMD in CP/M-86). Type STAT and press Return, and STAT displays the amount of disk space used and the amount still available:

CP/M-80

```
A>STAT ↵  
A:R/W, Space: 76k
```

CP/M-86

```
A>STAT ↵  
A:RW, Free Space: 76k
```

To see the amount of space on drive B, use the B: prefix by itself with the STAT command like this:

CP/M-80

```
A>STAT B: ↵  
Bytes remaining on B: 196k
```

CP/M-86

```
A>STAT B: ↵  
B:RW, Free Space: 196k
```

To know the amount of space you have available on a disk is not enough information. You also want to know the sizes of individual files. STAT can show the size of each file you name.

For example, to display the size of the file SAMPLE.TXT, type the following command:

```
A>STAT SAMPLE.TXT ↵  
Recs Bytes Ext Acc  
5 2k 1 R/W A:SAMPLE.TXT
```

Bytes remaining on A: 76K

A>

The file size is "2K" or two kilobytes. We typed only the words "Hello little friend," but the amount of space taken up so far by the file is two kilobytes.

This is because whenever you create a file with ED or another text editor, the file occupies a minimum of two kilobytes even if there is only one character in the file. CP/M allocates disk space in 1K chunks as you need it, starting with a minimum of 2K.

The STAT utility can also show you the size of files on another disk. If SAMPLE.TXT is on the disk in drive B, you can type this command:

A)STAT B:SAMPLE.TXT ↵

Recs	Bytes	Ext	Acc
5	2k	1	R/W B:SAMPLE.TXT

Bytes remaining on B: 178K

A)

The "RW" in the display is the file's "read-write" attribute, described with other details of the STAT utility later in this article.

Erasing Files

To erase the sample file we created, use the ERA command:

A)ERA SAMPLE.TXT ↵

This command erases the directory entry for the file. There is no way to recover the file unless you have a program such as UNERA (available from user groups), Disk Utility (DU, also available from user groups), Disk Doctor (Supersoft Associates) or other disk data recovery program. With these "disk editing" or "doctoring" programs you can "un-erase" the file; otherwise, the file is lost.

(*User's Guide* issue 4 presents a reference guide to the Disk Utility (DU), and issue 2 has an article on Disk Doctor.)

To erase files in another user area, you must change from the current user area to that area with the USER command, and then use the ERA command. If you copied a file to user area 1 as described in a previous example, type the following sequence of commands to erase it:

A)USER 1 ↵
A)ERA SAMPL1.TXT ↵
A)USER 0 ↵

You can also erase a file on drive B by typing the *B:* prefix before the filename:

A)ERA B:SAMPLE.TXT ↵

Be sure you are erasing the right file before you actually erase it.

PIP Utility: Copying Non-System Disks

The PIP utility is provided in every version of CP/M. "PIP" stands for Peripheral Interchange Program. The program transfers data from one location to another.

You use PIP mostly to copy files to another disk. You can also use PIP to copy entire disks. One of the more perplexing problems has always been: how do you copy an entire data disk if you only have two disk drives? With the system disk in drive A and the data disk to copy in drive B, where do you put the blank disk to receive the copy? We provide specific instructions below.

Some CP/M systems have a customized copying program that copies your disks faster or easier than the conventional way using PIP. If you have only one disk drive, you must have such a program. Consult your manual.

NOTE: CP/M-86 for the IBM PC has the DSKMAINT program, and other versions of CP/M-86 have the COPY-DISK utility. Both programs copy all the information on one disk to another disk, including the system tracks if they are present on the disk being copied.

Using Three Disk Drives

The following procedures assume that you have three floppy disk drives: drives A, B, and C. If you have only two drives, skip to the next section. If you use a hard disk, skip to the "Hard Disk" instructions.

1. Leave your CP/M system disk in drive A.
2. Insert the disk to be copied into drive B (the original, or source disk).
3. Insert the receiving disk (the one to hold the backup copies) into drive C (your third drive). Be sure that this disk is not write-protected.
4. If your receiving disk is new (never used before with CP/M), it needs to be *formatted*.
5. After formatting the new disk in drive C (if it needed to be formatted), type the command *C:* and press your Return key.
6. When you see the *C>* prompt, hold down the Control key and type a *C*. The *C>* prompt should reappear.
7. Type the command *A:* (followed by Return), wait for the *A>* to appear, and then type this command (followed by the Return key):
A>PIP C:=B:. * ↵*
8. When PIP finishes, take your new disk out of drive C (you're done). Put a label on the new disk to show that it is a backup of the disk in drive B.

NOTE:

You should never write directly onto the floppy disk, because too much pressure from a ball point pen or pencil will destroy the data. Write on the label before attaching the label to the disk.

Using Two Disk Drives

The following procedures assume that you have two floppy disk drives: drive A and drive B. If you use a hard disk, skip to the "Hard Disk" instructions.

1. Leave your system disk in drive A.
2. Insert the receiving disk (the one to hold backup copies) into drive B (figure 6). Be sure that the receiving disk is not write-protected.

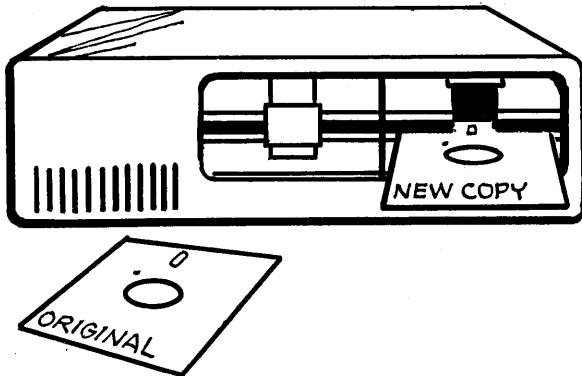


Figure 6. Insert the receiving disk into drive B.

3. If your receiving disk is new (never used before with CP/M), it probably needs to be *formatted* now.
4. What about the original (source) disk to be copied? Put it aside for a moment.
5. Assuming the receiving disk is formatted, type the command *B:* and press your Return key.
6. When you see the *B>* prompt, hold down the Control key and type a *C* (Control-C). The *B>* prompt should reappear.
7. Type the command *A:* (followed by Return), wait for the *A>* to appear, and then type the command *PIP* (followed by Return). An asterisk (*) should appear.
8. Take your system disk out of drive A and replace it with the original (source) disk to be copied (see figure 7).

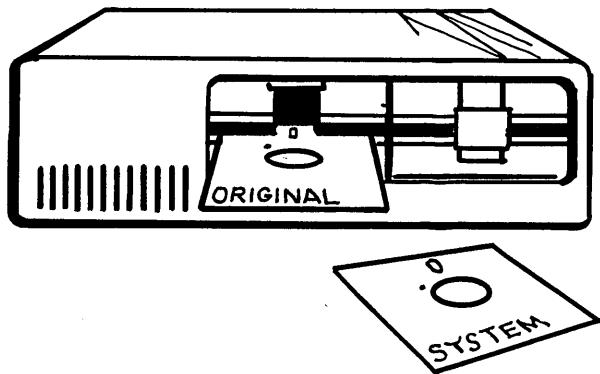


Figure 7. Take out the system disk and replace it with the original disk to be copied.

9. Type the following command (followed by Return):
**B:= *. *→*
10. Watch the names of the files go by. They are all being copied from drive A to drive B. Be patient.
11. When the copy operation finishes, take your receiving disk out of drive B. Put a label on it to show that it is a backup of the disk in drive A.

Note:

You should never write directly onto the floppy disk, because too much pressure from a ball point pen or pencil will destroy the data. Write on the label before attaching the label to the disk.

12. Take the original disk out of drive A, and replace it with the system disk. Don't type anything until you've inserted a system disk in drive A.
13. After inserting the system disk, press the Return key. The PIP program stops, and the familiar *A>* prompt should reappear.

Using a Hard Disk

Systems with a hard disk can make the hard disk act as any drive or set of drives. For these instructions, we assume the hard disk is acting as drive A, and that a floppy disk drive is acting as drive B. This makes sense, because the hard disk should be the most active one, and all system files should be located on it, as well as all application programs. The floppy disks used in drive B (or whatever drive is assigned to floppy disks) are archival disks used to store copies of programs and data files.

To copy files from the hard disk, format a new or recycled disk in drive B and use PIP:

A) PIP B:= *. * ↵

This command will copy *only the files in your current user area* to the same user area number on drive B. If you don't separate files into user areas, all files are considered to be in user area zero (the default).

(You can use the USER command to switch to another user area. For example, *USER 2* followed by Return will put you in user area 2 if the system allows you to be there. In multi-user systems, another terminal may be using user area 2.)

To copy an entire disk where files are grouped into user areas, use the *[Gn]* option, substituting for *n* the number of the user area containing the source files. Here's the PIP command for copying from user area number 2 on drive A to the current user area (user 0) of drive B.

B) PIP B:= A: *. * [G2] ↵

CP/M Plus and CP/M-86 versions of PIP let you copy *to* a different user area, using the *[Gn]* option on the left side of the equal sign:

B) PIP B: [G3] = A: *. * [G2] ↵

This PIP command copies all of the files from user area 2 on drive A to user area 3 on drive B.

Filename Matches (Ambiguous Filenames)

You typed **.** in place of complete filenames in the above examples. You did so to specify *all* files on the disk at once. This is called a *filename match* or *ambiguous filename*. Using a filename match with PIP makes it possible to copy many files at once.

A filename match is composed of special symbols and actual characters of filenames. The special symbols are *** to match any number of characters, and *?* to match one character. For example, the ambiguous filename *FRE?.** would match the filenames FRE1.ASM, FRE2.ASM, FRET.TXT, FRET.BAK and FREE.BAS.

You can use filename matches with other CP/M commands and utilities as well as PIP. The following DIR command displays only the files on drive B containing chapters (CHAP1.TXT, CHAP2.TXT, and so on):

A) DIR B:CHAP?.TXT ↵

An asterisk substitutes for many characters or blanks; a question mark substitutes for one character or blank. All filenames consist of eight characters or blanks in the primary name, and three characters or blanks in the extension or file

type. Here are examples of filename matches:

Ambiguous

Name Matching Filenames

SAMPLE.*	SAMPLE.ASM SAMPLE.TXT SAMPLE.T	SAMPLE.COM SAMPLE.BAS SAMPLE
TA*.COM	TAPE.COM TACK.COM	TANGENT.COM TA.COM
TA???.COM	TACK.COM	TAPE.COM
*.COM	All filenames with ".COM" extensions.	
. or ??????????.???	All filenames.	
* or ????????	All filenames without extensions.	

NOTE:

An asterisk in the first character position automatically substitutes question marks for every character position in the primary name field. This is why "**TA.COM*" matches all filenames with ".COM" extensions. An asterisk used as the first character matches any characters up to the extension, even if you include characters between the asterisk and the extension.

You can use filename match characters in filenames with the ERA command, but you must be careful. We suggest you use the filename match with DIR first, before erasing, to make sure you are erasing the right files. Here are examples of using ERA with ambiguous filenames to erase several files at once:

A) ERA *.BAK ↵ (Erase all ".BAK" files.)
A) B: ↵ (Move to drive B.)
B) ERA *.* ↵ (Erase *all* files on B.)
ALL FILES (Y/N)? Y ↵ (ERA asks for confirmation first.)

NOTE:

While using ERA to erase a lot of files, if you get the error message File is R/O, the file you are trying to erase is set to have the "read-only" attribute and must be reset to "read/write" before you can erase it. File attributes are described later with the STAT Utility.

PIP Examples

The PIP utility provides many ways to transfer information from one file to another, and from one disk to another. You can also use PIP to transfer information to a device like a printer or modem.

Most PIP operations involve copying a file from one disk to another (second example below); however, some users need to make a copy of a file *on the same disk*, so that experiments with the file do not endanger the only copy. Remember, two files on the same disk should not have the same name unless they are in different user areas (otherwise CP/M may only be able to find one of them).

To make a copy of a file on the same disk, you must give the new copy a different name. The following example (#1) shows PIP being used to make a copy of SAMPLE.TXT called SAMPL1.TXT.

Example 1.

```
A>PIP SAMPL1.TXT=SAMPLE.TXT ↵
```

PIP forces you to name these files in an unusual manner. You must name the *new copy* first (SAMPL1.TXT), before typing = and the filename of the original file.

It is more likely that you will want to copy SAMPLE.TXT to the disk in drive B (if it is not already there). Example 2 shows the PIP command copying a file from the disk in drive A to the disk in drive B, using the same name for the copy.

Example 2.

```
A>PIP B:=A:SAMPLE.TXT ↵
```

You can also copy a file to another disk and use a *different* name for the copy:

Example 3.

```
A>PIP B:NEWCOPY.TXT=A:SAMPLE.TXT ↵
```

The PIP command in Example 3 resembles the one in Example 1. Both use a new name for the new copy, but Example 3 transfers the copy to another disk. It is easy to make a mistake with PIP — for example, if you forgot the *B:* prefix to NEWCOPY.TXT, the file would have been created on the disk in drive A, not drive B as intended. To correct this mistake, you could use PIP again to copy the file to drive B and ERA to erase the file from drive A.

Copying Several Files

You can use PIP to copy an entire disk if you use the *.* expression to match all filenames:

Example 4.

```
A>PIP B:=A:*.* ↵
```

The PIP command in Example 4 copies all files on the disk in drive A to the disk in drive B, keeping the same names for the copies. You can also select a group of files with a filename

match. The following example copies all files with the ".TXT" extension from drive B to drive A:

Example 5.

```
A>PIP A:=B:*.TXT ↵
```

Multiple PIP Commands

You can run several PIP operations without having to repeat the keyword *PIP*. Type *PIP* by itself, followed by Return, and the program takes over and displays its * prompt:

Example 6.

```
A>PIP ↵  
* ↵
```

At the * prompt display, you can type many PIP commands without typing the keyword *PIP*. Example 7 shows several PIP commands. To leave the PIP program, press the Return key alone as a command to PIP. Be sure you have a system disk in drive A when you leave PIP.

Example 7.

* A:=B:SAMPLE.TXT ↵	(Copy SAMPLE.TXT from drive B.)
* A:=B:*.OVR ↵	(Copy all ".OVR" files.)
COPYING-	
WSOVLY1.OVR	
WMSGNS.OVR	
MAILMRGE.OVR	
* A:=B:WS.COM ↵	(Copy WS.COM from B.)
* ↵	(Stop PIP by typing a Return.)

This multiple PIP technique was used previously in this article to copy the contents of an entire disk to another disk in a two-drive system where neither disk is a system disk. With the PIP program activated and in memory, you can remove the system disk and use drive A to hold the original disk to be copied. You must put the system disk back in drive A before leaving PIP.

Copy With Confirmation

CP/M Plus provides an option that lets you specify all files on a disk and *confirm* which files to copy on a file-by-file basis. For example, this command causes PIP to ask for a confirmation before copying each file with the ".TXT" extension:

Example 8.

```
A>PIP B:=A:*.TXT[C] ↵
```

With each confirmation message, type *Y* to copy the file or *N* to skip the file and go to the next one.

Joining Files

You can join (*concatenate*) one or more files to the end of a source file and copy the result to a destination file. The following example adds the contents of FILE3 to the end of FILE2, and FILE2 to the end of FILE1, and stores the joined contents in RESULT without disturbing FILE1, FILE2 or FILE3:

Example 9.

A) *PIP RESULT=FILE1,FILE2,FILE3* ↵

Copy Files to the Printer

By now you are familiar with the PIP command structure:

PIP destination = source ↵

A CP/M system pretends to have certain devices, whether or not you actually have those devices connected to your system. For example, you may not have a printer, but CP/M "logically" assumes that you do have one. If you tell CP/M to send a file to the printer, CP/M will send it to the "logical" printing device. If you have no printer, or if the printer is not connected properly, CP/M may either send the data into oblivion and return for the next command, or "hang" until you use your RESET button (or key) to restart CP/M.

Most application programs control the printing operations for you. It is most likely that you will print files using programs like WordStar or SuperCalc, and not using the PIP command. However, PIP provides a simple way to print a file, and even gives you several options to use to control the printing.

To send a copy of a file to your printer, you pretend that the printer is the *destination* file by using a special *device name* in the PIP command: *LST:* Example 11 shows the PIP command transferring the file SAMPLE.TXT to the printer, and then transferring B:CHAP1.TXT to the printer.

Example 11.

A) *PIP LST:=SAMPLE.TXT* ↵
A) *PIP LST:=B:CHAP1.TXT* ↵

NOTE:

If the file you send to the printer is not a printable file (i.e., it is a program, or file that does not contain straight text), or if the file has special control characters that are not familiar to your printer, you may not be able to print the file using PIP. The system will "hang" if such problems occur — simply restart the system, and check your manuals or check with your system dealer.

Options such as *[F]* (filter form-feeds), *[Pn]* (set page length) and *[Tn]* (expand tabs to *n* spaces) may be useful in print operations. We describe these options later in this section.

Copy To/From Other Devices

PIP makes it possible to transfer the contents of files to devices like modems, paper-tape punchers or specialized output devices, and to transfer data from input devices like modems, paper-tape readers or special reading devices into CP/M files. You should consult your manuals before trying these operations (i.e., you should already know what to do before using special device names in PIP commands).

The simplest device-transfer operation, using PIP, is the one shown in Example 12. In this example PIP transfers a line of text you type at your keyboard (*CON:* device) to the file SAMPLE.TXT. This method works well for typing a single line. To type more than one line, you must type both a Carriage Return (Return key) and a Line Feed (Control-J) to end each line.

To stop typing text into the file, you have to signal the "end of text" by typing a Control-Z.

Example 12.

A) *PIP SAMPLE.TXT=CON:* ↵
Hello little friend. Type Return and Control-J
to move to the next line. Type Control-Z to stop.
A)

The device names used with PIP describe *logical devices* that may or may not exist in your system. Although you may be able to connect more than four devices to your computer, CP/M can only remember four logical devices at any one time: the console display and keyboard (*CON:*), the reader or modem input (*RDR:* in CP/M-80, *AXI:* in CP/M-86), the punch or modem output (*PUN:* in CP/M-80, *AXO:* in CP/M-86), and the "listing" device (*LST:*), usually a printer.

You must use these devices properly in PIP statements. Remember, PIP statements take the form:

PIP destination = source ↵

The CON: device can be a source (input) or destination (output), but the other devices are usually one or the other (*RDR:* or *AXI:* is used only as a source input device, *PUN:* or *AXO:* is used only as a destination output device, and *LST:* is only used as a destination output device).

Using PIP Options

The PIP program lets you specify options in brackets with the source filename or device, or with each source filename in

a concatenation operation. Some options let you modify the contents of the file while in transit to the destination file or device. Useful ones for typical PIP operations are the *[Gn]*, *[Nj]*, *[O]*, *[P]*, *[Q]*, *[S]* and *[V]* options.

The *[Gn]* option lets you copy a file located in another user area of the disk. Users of hard disk systems and multiple-user systems find it convenient to keep files stored in separate *user areas* on the disk, to isolate them from other users or to manage a lot of files. The USER command changes the “current” user area to a different user area. User areas are numbered from zero to fifteen.

To copy a file from another user area into your current user area, use the *[Gn]* option with the other user area number for *n*. Example 13 shows a PIP command copying SAMPLE.TXT from user area 2 of drive B to drive A.

Example 13.

```
A>PIPA:=B:SAMPLE.TXT[G2] ↵
```

The *[Nj]* option adds line numbers to each line copied to the destination file or device. This could be useful for printing text files such as contracts, manuscript drafts, screenplays, or any document that would be useful with numbered lines.

The *[O]* option tells PIP to ignore any Control-Z codes in the file; otherwise, PIP treats the file as a text file, with the Control-Z code signaling the end of the text. This could be a fatal mistake when copying *programs* that may have Control-Z codes in them for other reasons (not marking “the end”). To avoid trouble, PIP automatically ignores Control-Z codes when copying files that have the “.COM” extension. However, if you want to copy a program that was renamed to have any other extension, or if you want to copy a special file that is not ordinary text, you should use the *[O]* option with the source filename, as shown in Example 14.

The *[Pn]* option lets you force a “page eject” (the Form Feed code) every *n* lines, which can be useful for printing a file on a printer that uses different settings than the printer you’re used to using. Simply substitute the lines-per-printed-page for *n* in the *[Pn]* option (see Example 14).

The *[V]* option verifies that the copy made is a correct one. The *[V]* option compares the copied data with the memory image of the source file before finishing the copy operation.

Example 14 shows two PIP operations: the first copies a file ignoring any Control-Z codes in the file and verifying that the copy is accurate, and the second sends a file to the printer and changes the lines-per-printed-page to 50 lines (otherwise, PIP uses 60 lines per page).

Example 14.

```
A>PIP B:=A:FRAGILE.OBJ[OV] ↵
A>PIP LST:=TEXT101.TXT[P50] ↵
```

The *[Q]* and *[S]* options make it possible to split a large file into smaller files. The *[Qstring↑Z]* option tells PIP to

copy the file *stopping at* the string of text you specify, and the *[SString↑Z]* option tells PIP to *start copying* the file at the string you specify.

For example, if you have a large file containing two chapters of a book, and you want to split the file into two files (each with a single chapter), you would first determine the stopping and starting *string* in the file to use with the options. This string would be one that starts the second chapter; e.g., “CHAPTER 2:” might be the string to use to stop the copy operation of the first chapter and to start the copy of the second chapter.

If so, you would type these two PIP commands to split the file SAMPLE.TXT into two files: CHAP1.TXT and CHAP2.TXT:

Example 15.

```
A>PIP CHAP1.TXT=SAMPLE.TXT[QCHAPTER2:↑Z] ↵
A>PIP CHAP2.TXT=SAMPLE.TXT[SCHAPTER2:↑Z] ↵
```

In these examples, you type a Control-Z (*↑Z*) to end the *string* in the *[Q]* and *[S]* options. Some editing may be required to make the two new files look good in print; however, this method may save you some trouble when trying to split a very large file into two smaller files. Remember that the options will start or stop copying as soon as it finds the first instance of the *string* you specify, so specify one that occurs only where you want the split to occur.

If PIP Stops Abruptly...

You may, at some time, get a nasty message like PIP ABORTED or DISK FULL, and PIP stops with a crash. You may get no message at all, especially if the power fails in the middle of a PIP operation. Do not worry. PIP never alters the source file, nor does it change a pre-existing destination file until the entire copy operation is finished.

PIP does this by creating a temporary file, with the “.\$\$\$” extension, to hold the copied data until the copy is finished. PIP’s “.\$\$\$” file is not deleted until the copy is finished and the destination file is updated (or created). Therefore, when you are updating an old file by copying a new version into it, you need to have *more than twice the size* of the new version of available space on your destination disk before you can do the operation.

If PIP is aborted for any reason, the “.\$\$\$” file will most likely be on your destination disk. It may be empty, but it may also contain a partial copy. Either way, you should try the PIP operation again, after checking to make sure you have enough space on your destination disk for *at least one extra copy* of the file you are copying. If a “.\$\$\$” file still exists after multiple PIP operations, check to make sure the PIP operations were successful.

In short, you can delete any “.\$\$\$” files that may exist after aborted PIP operations, and you can re-try the operations after making room on the destination disk or after re-

storing power to your computer.

SUBMIT Utility

In the old days of mainframe computing on punch cards, you would put together a "job" that performed many operating system functions, and submit the "job" on punch cards to a system operator for "batch processing." Fortunately, over time the punch cards gave way to keyboards with display screens that let you type commands and see their results immediately. This is called "interactive mode."

The convenience of batch processing improved with this step. You can now set up a series of commands to execute while you go out for coffee. Realistic applications can be set up with repetitive commands sent into the computer without having to re-type them every time.

CP/M supplies this batch processing feature in the SUBMIT utility. You can create different "submit files" of commands with any text editing or word processing program. With a "submit file" ready to execute, you type the SUBMIT command line to run the "job."

Although some users get carried away with the concept and try to write complex programs in "submit files," the best use of the SUBMIT utility is to perform recurring activities with one SUBMIT command.

For example, one recurring activity for those who use text editing or word processing programs is to make copies of text files and erase the temporary ".BAK" files that are created by the text editing programs.

If your backup disk is in drive B and your text files are in drive A, you can perform this activity by typing two commands:

A>PIP B:=A:*.TXT▷

(Copy all text files to drive B.)

A>ERA *.BAK▷

(Erase all ".BAK" files in drive A.)

You can create a submit file to hold these commands, and submit the file for execution in order to execute them. Here are step by step instructions using ED, the text editor supplied with CP/M:

1. Create a text file that has a ".SUB" extension (not a ".TXT" extension), and type the commands into the file as text. We recommend that you use a suitable text editing program such as WordStar; however, the following instructions show how to use the free text editor supplied with CP/M: the ED (ED.COM or ED.CMD) program:

A>ED CLEANUP.SUB▷

(ED displays the following prompt:)

:*

(Now type the / command to insert the text:)

:* /▷
1: PIP B:=A:*.TXT▷
2: ERA A:*.BAK▷

(Now press the Control key and type Z to stop inserting text:)

3: ↑Z
2: *

(Now use B#T to display the edit buffer:)

2: * B#T▷
1: PIP B:=A:*.TXT
2: ERA A:*.BAK
2: *

(Now type E to end the ED session:)

2: * E▷

(You now have the file CLEANUP.SUB in drive A.)

2. With the SUBMIT utility (SUBMIT.COM or SUBMIT.CMD) and CLEANUP.SUB in drive A, type the following command:

A>SUBMIT CLEANUP▷

The commands now execute automatically. SUBMIT creates a temporary work file (named \$\$.SUB) on the disk in drive A; therefore, you must have enough room on drive A to accommodate another file the same size as your submit file, which must also be in drive A. SUBMIT automatically deletes the temporary work file at the end of the operation, but does not affect your submit file.

The real power of SUBMIT is the ability to use *parameters* with commands that can be assigned values when typing the SUBMIT command.

For example, to make the CLEANUP.SUB program work for any type of file, including all files on the disk, you would substitute the parameter \$1 for the filenames in the CLEANUP.SUB file:

PIP B:=A:\$1.TXT
ERA A:\$1.BAK

Here are the instructions to do this:

A>ED CLEANUP.SUB▷ (Start the ED program.)
:*

(Type the #A command to bring in the contents of CLEANUP.SUB:)

:* #A▷
1:

(Now type the #S command to substitute new text for old text throughout the file:)

```
1:*#S*↑Z$1▷
```

(The above ED command substitutes “\$1” for “*”. Now use the ED program’s B#T command to display the edit buffer:)

```
1:*B#T▷  
1:PIP B:=A:$1.TXT  
2:ERA A:$1.BAK  
2:*
```

(Now type E to end the ED session:)

```
2:*E▷
```

(You now have an edited version of the file CLEANUP.SUB in drive A.)

When submitting this file to the SUBMIT utility, you also type the name of the file, or a filename match, to be substituted for \$1 in the CLEANUP.SUB file:

```
A)SUBMIT CLEANUP SAMPLE▷
```

SUBMIT creates a temporary file called \$\$.SUB on the disk in drive A to hold the commands with the substitution performed, and then executes the commands automatically:

```
PIP B:=A:SAMPLE.TXT (“SAMPLE” replaces “$1”)  
ERA A:SAMPLE.BAK
```

You could SUBMIT the CLEANUP file with a filename match rather than a single filename, and perform the cleanup operation on all the “.TXT” and “.BAK” files on the disk:

```
A)SUBMIT CLEANUP *▷
```

The asterisk replaces the “\$1” parameter, performing the same function as the first submit file we created.

One convenient use of SUBMIT is to perform a complicated “program patch” using the DDT utility. You can put the DDT patching commands in a submit file and perform them in one easy step. Submit files are also useful in setting up an application like SuperCalc, which can be executed from a submit file in a way that starts a specific SuperCalc operation. Here’s an example of such a submit file:

```
PIP A:=B:*.CAL  
SC DEMO
```

This submit file copies the latest versions of SuperCalc worksheets (“.CAL” files) from drive B to drive A for use with SuperCalc. It then starts SuperCalc, which executes the

file DEMO.XQT (a SuperCalc “execute file”) that starts the SuperCalc application.

SUBMIT won’t let you do many things you may think of doing in “batch mode.” For example, you can’t start a program such as WordStar and perform automatic editing changes. In nearly all versions of the SUBMIT utility (except the newest version in CP/M Plus), you can’t terminate a multiple PIP operation because you can’t send a simple Return to PIP. You have to perform such operations using separate PIP command lines (which in most cases is easy to do). Also, you can’t perform a Control-C from a submit file in any version except the CP/M Plus version of SUBMIT.

There are several public domain programs that can do more than SUBMIT. The latest version of SUPERSUB, for example, will do many of the things SUBMIT won’t do, like sending a Return or a Control-C from a submit file. (Some of these utilities are described in books on public domain software.)

STAT Utility

CP/M-80 (version 2.2) and CP/M-86 provide the STAT utility for displaying disk space information, setting file attributes, and assigning device names.

Using a personal computer often involves managing files and disks in a way that conserves space. The STAT program (STAT.COM supplied with CP/M-80, or STAT.CMD supplied with CP/M-86) displays statistics on disk size, file size, attributes, and devices.

The STAT displays differ slightly from CP/M-80 to CP/M-86. The original CP/M-80 versions are shown beside the new CP/M-86 versions.

The simplest form of STAT is:

CP/M-80

```
A)STAT▷  
A: R/W, Space: 76k
```

CP/M-86

```
A)STAT▷  
A: RW, Free Space: 76k
```

This information tells you that the disk in drive A is a disk you can read or write to (it has the R/W or RW attribute), and that it has 76K bytes of space available for more data.

One byte is the equivalent of one letter, number, or punctuation symbol. For example, if chapter one of your novel contains 1300 characters, it would occupy approximately 1300 bytes of storage.

Disk and File Space

The “K” (or “k”) is your clue to the measurement of disk and memory space. “K” stands for 1024 bytes, not 1000 (computers work faster with binary numbers, and 2 is a mul-

tuple of 8 and 16, which in turn are multiples of 1024). Therefore, 64K bytes is actually 64 times 1024 bytes. In our example above, we have 76 times 1024 bytes of space left on the disk in drive A.

You don't have to calculate file size by counting characters. A version of the STAT command will tell you the size of any file:

CP/M-80

A)STAT SAMPLE.TXT▷

Recs	Bytes	Ext	Acc
5	2k	1	R/W A:SAMPLE.TXT

Bytes remaining on A: 76K

CP/M-86

A)STAT SAMPLE.TXT▷

Recs	Bytes	FCBs	Attributes	Name
5	2k	1	Dir RW	A:SAMPLE.TXT

A: RW, Free Space: 76K

For simple file calculations, use the Bytes figure (2k) and compare it to the number of bytes remaining on disk — 76k. We could increase the size of SAMPLE.TXT to be 30 times larger than its present size, and it would still fit on the disk in drive A.

The other figures tell you other things:

Recs is the number of 128-byte *records* in the file (a *record* is a logical collection of bytes). CP/M always stores data in 128-byte records, even if your file has less than 128 bytes.

Ext tells you the number of *extents* occupied by the file. Extents are 16k bytes long, and correspond to the number of directory entries for the file. CP/M-86 labels this column with FCBs, which stands for File Control Blocks, which also correspond to the number of directory entries for the file.

If you type the \$S option (*SIZE* in CP/M-86), STAT will also display a column labeled Size. This figure is the number of virtual records (filled and unfilled) in the file. This figure will be the same as Recs in a sequential file, but may differ in a random file.

File Attributes

The Acc (or Attributes) column tells you the access attribute of the file. In CP/M versions 2.0 and newer, and in CP/M-86, you can assign *attributes* to files that prevent inadvertent deletions or overwrites.

For example, you can use STAT to assign the \$R/O (read-only) attribute to a file, which prevents you from deleting the file or writing new information to the file (including copying to the file). The \$R/W attribute allows both deleting and writing operations.

Once again, there are differences in nomenclature between CP/M-80 and CP/M-86. The attributes in CP/M-80

are \$R/O, \$R/W, SYS and DIR. The corresponding attributes in CP/M-86 are RO, RW, SYS and DIR.

The \$SYS or SYS attribute makes the file a *system* file, whose name does not appear in a DIR command (CP/M-86 provides DIRS to see names of system files). The \$DIR attribute is the opposite of \$SYS, used to make a system file a normal file whose name does appear in a DIR command.

When user areas are used, a program with the \$SYS attribute in user area 0 can be run from other user areas.

The following example shows two attribute assignments in both CP/M-80 and CP/M-86 — SAMPLE.TXT is set to read-only, and WS.COM is set to be a system file:

CP/M-80

A)STAT SAMPLE.TXT \$R/O▷

SAMPLE.TXT SET TO R/O

A)STAT WS.COM \$SYS▷

SAMPLE.TXT SET TO SYS

CP/M-86

A)STAT SAMPLE.TXT RO▷

SAMPLE.TXT set to RO

A)STAT WS.COM SYS▷

SAMPLE.TXT set to SYS

SAMPLE.TXT is now a "read only" file that cannot be deleted or written to without an error message. We recommend that you use the read-only attribute for ".COM" or ".CMD" files (command files or program files). WS.COM is set as a system file so that it does not show up in DIR displays. It can also be stored in user area 0 of a disk, and be used from different user areas of that disk.

Disk Attributes

STAT can display information about disks in other drives. For the disk in drive B, type the following command:

CP/M-80

A)STAT B:▷

Bytes remaining on B: 196k

CP/M-86

A)STAT B:▷

B: RW, Free Space: 196k

STAT with the DSK option displays disk characteristics:

CP/M-80

A)STAT DSK:▷

A: Drive Characteristics

65536: 128 Byte Record Capacity

8192: Kilobyte Drive Capacity
128: 32 Byte Directory Entries
0: Checked Directory Entries
1024: Records/Extent
128: Records/Block
58: Sectors/Track
2: Reserved Tracks

CP/M-86

A)STAT DSK:♂

A: Drive Characteristics
65536: 128 Byte Record Capacity
8192: Kilobyte Drive Capacity
128: 32 Byte Directory Entries
0: Checked Directory Entries
1024: 128 Byte Records/Directory Entry
128: 128 Byte Records/Block
58: 128 Byte Sectors/Track
2: Reserved Tracks

You can also assign the *R/O* or *RO* (read-only) attribute to an entire disk using STAT. To make the disk in drive B read-only (so that no one can delete files or copy new files to it), type this command:

CP/M-80

A)STAT B:=R/O♂

CP/M-86

A)STAT B:=RO♂

After setting an entire disk to read-only with *R/O* (or *RO*), any PIP or write operation to the disk causes the error message BDOS ERR ON d:R/O. If you press any key in CP/M-80, the disk reverts back to being a normal readable and "writeable" disk (in CP/M-86, use Control-C to change the disk back to a "writeable" disk).

The read-only attribute for a disk does not protect the disk in the same way as the write-protect feature on the floppy disk itself. In CP/M-80, the disk automatically reverts back to being a read-write disk after you press any key. Obviously, this mechanism is simply a reminder that you once used STAT to set this disk as read-only. In CP/M-86 you can easily change the read-only attribute to read-write by simply resetting the system or using a Control-C ($\uparrow C$) command.

If you want to protect a floppy disk more than temporarily, use the physical write-protect features of the disk. Eight-inch floppy disks have a notch that must be covered in order to write to the disk (or copy to the disk); therefore, eight-inch disks are protected if the notch is uncovered. Most five-inch floppy disks have a write-protect notch that must be *covered* in order to protect it from writes. If you are confused, ask

your floppy disk dealer for the right procedures to protect and un-protect your disks.

Device Assignments

CP/M can remember four devices at any one time: the CON: (console and keyboard) device, the RDR: (AXO:) device (usually a modem), the PUN: (AXI:) device (usually a modem), and the LST: (printer) device.

CP/M lets programmers create more than four *physical device drivers* that can control the actual devices. However, since CP/M can only remember four at a time when running, the programmer must choose four physical device drivers by name, and assign them with the STAT command to the logical names CON:, RDR: (or AXI:), PUN: (or AXO:), and LST:.

The following STAT command assigns the physical device driver for a special printer (*UL 1:* for user-defined list device #1) to the logical *LST:* device:

A)STAT LST:=UL 1:♂

To see what physical devices are assigned to the logical devices in your currently-running version of CP/M, type the following command:

A)STAT DEV:♂

To see what physical device names can be used in STAT assignments, substitute the word *VAL:* for *DEV:* in the above example.

Ordinarily your system is supplied with the appropriate device names already assigned. Use STAT when you want to change these assignments temporarily to perform some activity.

End of Lesson

It's not hard to believe that most of you beginners made it this far. Many critics blast CP/M for being hard to use, and we admit that the PIP command is rather peculiar, but once you get used to it, you discover that CP/M commands are not so hard, and they take less time to use than most "menus" that make CP/M "friendly."

You really do not have to learn everything about CP/M to run it or use it to run application programs. You are now armed with enough information about PIP and other utilities to handle computer operations.

Your experience is also enhanced with shortcuts and techniques for performing complex system operations. In no time you'll be "batching" your commands into SUBMIT files, "PIP-ing" files to and from far away places, RENaming and ERAsing files and programs, checking disk and file STATistics, and searching DIRectories for important files.

As an experienced user you may find the other articles, "The Impatient User's Guide to CP/M" and "CP/M Summary" of use next to your computer. ☐

The Impatient User's Guide To CP/M

A no-frills sketch of important CP/M operations.

by Tony Bove & Cheryl Rhodes

CP/M (Control Program/Microcomputers) is an operating system from Digital Research, Inc. (Pacific Grove, CA) that can run on many different computers. CP/M is available in different versions for different computers. A computer that runs the version for "eight-bit" computers cannot run the same software designed for the "sixteen-bit" versions.

Eight-bit versions of CP/M are:

CP/M-80 (version 2.2)

For computers based on the Zilog Z80, Intel 8080 and 8085 processors.

CP/M Plus (CP/M-80 version 3.0)

An enhanced version for computers based on the Zilog Z80, Intel 8080 and 8085 processors. CP/M Plus "banked" version runs in systems with more than 64K internal memory (it performs disk sector buffering); the non-banked version runs in less than 64K.

CP/M Plus is described in *User's Guide* issues 4, 5 and 7.) This article covers CP/M-80 version 2.2 and CP/M-86, one of the "sixteen-bit" versions:

CP/M-86

A version for computers based on the Intel 8086 and 8088 processors (also 80186 and 80188).

CP/M-68K

A version for computers based on the Motorola 68000 processor, to be covered in a future issue.

The primary use of CP/M is to control your computer in order to run application programs. CP/M is supplied on one floppy disk, which can also contain other programs that run in a CP/M system. This floppy disk is called the system disk. The system software resides on the first two tracks of the system disk, and other programs, including some CP/M commands, occupy other tracks.

Typesetting Conventions

Throughout this article we use *THIS typeface* to show exactly what you should type at your keyboard, with the special symbols ↑ for the Control key (CTRL, CNTL or ALT on some keyboards), and ↵ for the Return key (RET, CR or Carriage Return on some keyboards).

Since computer activities nearly always involve typing, you'll see *THIS typeface* used a lot to show commands, with letters in all upper case to distinguish commands from regular text. You may not have to type in upper case — we use it to emphasize commands. We also use *this typeface lower case* for text that varies with the specific command (e.g., *D/R filename* tells you to type the *D/R* command with any filename). We use *This Typeface* to show messages displayed by the system or by programs.

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The XT represents the first major trend to break away from typical CP/M environments. The computer comes with a built-in ten megabyte hard disk, which makes it capable of more sophisticated tasks. The operating system has a new file structure to organize files on the hard disk in a logical way. This trend will bring users closer to UNIX-type systems used in minicomputers. AT&T will formalize this trend in 1984 with the announcement of a commercial UNIX system for personal computers.

The Apple Macintosh represents the next major trend in personal computers. It seems inappropriate to have the eight-bit software dominate this machine as it did the IBM PC and PC compatibles. As a result of the bold design, the Macintosh era may prove to be one with real innovation in software that makes use of this design.

User's Guide's commitment to its readers (to provide the best in software tutorials and handy reference guides) has not evaporated in the winds of change. Although we have received some criticism for our decision to put "IBM" in the subtitle of the magazine with "CP/M", the content and coverage remains essentially the same as it was in issue 1. At that time the IBM PC ran nearly the same software as the Osborne — WordStar, SuperCalc, dBASE II, etc.

The difference now is that IBM PC sales drive the sales of this kind of software. New versions of this software for the IBM PC are also becoming available for machines that run CP/M Plus, CP/M-86, Concurrent DOS (Concurrent CP/M-86) and even UNIX. Therefore, our coverage of this software must include the IBM PC versions.

We have resisted the trend to outfit our offices with IBM PCs. To run our magazine, we use the state-of-the-art in both sixteen-bit systems (CompuPro 8/16), multi-user eight-bit systems (CompuPro and OSM), regular eight-bit systems (Osborne, Kaypro, Alspa), and new systems (sorry, can't describe prototypes at this time). Oh yes, we do use an IBM PC, for general office work.

As our coverage shifts its focus to new machines, we hope to get feedback from our readers in order to improve our editorial content. We look forward to a healthy and prosperous year for our magazine and for the personal computer industry.



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The DIR command displays a directory listing of filenames:

A>DIR ↵

You can also use the DIR command to find a file in the directory listing by specifying the filename with DIR. You must specify the *entire* filename, including the extension:

A>DIR PIP.COM ↵

Drive A is indicated by the prompt A>, drive B is indicated by the prompt B>, and so on. If you have more than one disk drive, your second drive is called drive B, your third drive C, etc.

CP/M Plus (CP/M-80 version 3.0) has a more enhanced DIR utility program to complement the built-in DIR command. The DIR utility with the [FULL] option displays each filename in alphabetical order, with file sizes and file attributes:

A>DIR [FULL] ↵

Inserting a Disk and Switching Drives

In most cases, when you insert a formatted disk in a drive, or replace a disk in a drive with a different disk, you must reset the drive by typing Control-C. If you try to put data on a newly-inserted disk without resetting the drive, you get the error message Bdos Error On d: R/O.

This doesn't mean your disk is "read-only." It simply means that CP/M's "map" of the disk isn't the same as the newly-inserted disk. You should type a Control-C. to change CP/M's "map" to work with the new disk.

With drive A as the current drive, CP/M looks in drive A for a file, unless you put a B: prefix on the filename to tell CP/M to look in drive B, or switch to drive B. To switch, type the drive prefix as a command: B: followed by Return.

A DIR command typed after the B> prompt displays the entire directory for the disk in drive B. To switch to drive C (if you have one), type C: followed by Return. To switch to drive A, type A: followed by Return.

Formatting Disks

A program called FORMAT or INIT (for "initialize") is usually supplied with your system. When you format a disk, the system wipes out any information already on the disk and prepares the disk to receive new information (organizes the disk's sectors and tracks). After formatting, the disk is a CP/M disk and cannot be used in a non-CP/M system unless it is re-formatted for *that* system.

If you prepare a new or recycled eight-inch disk in the standard CP/M *single-density single sided* format, it should be usable in other CP/M systems that use eight-inch disk drives.

The FORMAT and INIT programs are different for each type of computer (they may even have different names). Consult your manual, or ask your dealer.

Copying the System Disk

Customized CP/M-80 systems may have a program to use to copy all tracks of a disk. This is usually the easiest way to copy the system tracks to another disk. CP/M-86 systems provide COPYDISK for this purpose; non-customized CP/M-80 systems provide (at least) SYSGEN.COM and PIP.COM. In all cases (except customized programs), you must format a new disk to be of the same type (single or double density, single or double sided) as the disk you are copying.

CP/M-86: COPYDISK Utility

COPYDISK copies all tracks from one disk to another disk:

A) COPYDISK ↵

Enter Source Disk Drive (A-D) ?A ↵

Destination Disk Drive (A-D) ?B ↵ Copying disk A: to disk

B:

Is this what you want to do (Y/N) ? Y ↵

If you have a single drive system, the COPYDISK program will tell you to replace your "source" disk (the original) with the "destination" disk (your new copy). At the end of the COPYDISK operation, the program asks if you want to make another copy. Answer *Y* if you do, or *N* if you want to return to CP/M.

CP/M-80: SYSGEN & PIP For Double Drive Systems

Insert into drive B the new disk to receive the copy, and *format* the new disk if your CP/M system requires disk formatting.

Use SYSGEN to place a copy of the system onto your new

backup disk:

A) SYSGEN ↵

SYSGEN asks for the "source" drive; since your system disk is normally in drive A, type *A* followed by Return. Note, however, that if you modified your system and the modified version is running (i.e., it is in memory) but not yet stored on the disk in drive A, *you must skip this question* by pressing only the Return key.

SYSGEN then asks for the "destination" drive with the disk to receive a copy of the system. Type *B* for drive B (the drive with the disk to hold the copy):

A) SYSGEN ↵
SOURCE DRIVE NAME
(OR Return TO SKIP): A ↵
SOURCE ON A:, THEN TYPE Return ↵
FUNCTION COMPLETE
DESTINATION DRIVE NAME
(OR Return TO REBOOT): B ↵
DESTINATION ON B:, THEN TYPE Return ↵

When SYSGEN completes its function, it displays the message:

FUNCTION COMPLETE

To make more copies, insert another new disk into drive B and type *B* to the following question. If you are finished copying the system, press Return to "reboot" the system:

DESTINATION DRIVE NAME
(OR Return TO REBOOT): ↵
A)

SYSGEN copied only the *system* software to the backup disk. Now you have to copy all of the *programs* and other files from the system disk to your new backup copy, using PIP:

A) PIP B:=A:*. * ↵

This command copies all the files on the disk in drive A to the disk in drive B. If you employ user areas, this command only copies the files in user area 0.

CP/M-80: SYSGEN For Single-Drive Systems

In the absence of a custom program from your dealer or computer manufacturer that copies the system tracks with the rest of the disk, use SYSGEN as described above, with the following changes to the procedures:

After typing *A* for the "source" drive, and the Return key twice, the FUNCTION COMPLETE message should appear, followed by the question about your "destination" drive. Take out your system disk and replace it with the new disk to be the backup. Answer by typing *A* as the "destination" disk, fol-

lowed by two Return keys, and SYSGEN should copy the system onto the new backup disk.

To copy all files from the system disk to your new backup disk, you need a special customized program for your system, since PIP (described above) only works with systems with more than one disk drive.

Control Key Combinations

The Control key (sometimes called CTRL, CNTL or ALT) can be used in combination with another key to perform command line editing or other functions:

- ↑A Move the cursor one character to the left. CP/M Plus banked system only.
- ↑B Move the cursor from one end of the command line to the other without changing the command. CP/M Plus banked system only.
- ↑C Alert CP/M to the fact that you just inserted a new disk or replaced a disk in a drive. Also used to stop ("abort") some programs (WordStar is an exception). Control-C restarts CP/M or performs a warm start for a newly inserted disk. In CP/M-86, one Control-C while a program is running aborts the running program. Without a program running, Control-C restarts CP/M-86 (without a disk access) and sets all disk drives to read-write status.
- ↑E Move the cursor down to the beginning of the next line without performing a Return. Useful for typing long command lines.
- ↑F Move the cursor one character to the right. CP/M Plus banked system only.
- ↑G Delete one character at the current cursor position if in the middle of a line. CP/M Plus banked system only.
- ↑H Delete one character and erase it from the screen (move cursor left over the previous character). All versions of CP/M except CP/M-80 version 1.4.
- ↑I Move the cursor right one tab space (eight or less spaces, to the next "tab stop").
- ↑J Same as Return (line feed).
- ↑K Delete character at cursor and all characters to the right of the cursor. CP/M Plus.
- ↑M Same as Return (carriage return).
- ↑P Turn on (or off) your printer to print everything that occurs on your screen and everything you type. Use ↑P to turn off this function after turning it on with ↑P.

↑R Repeat the command line without rubbed-out characters. In banked CP/M Plus, ↑R re-types the characters to the left of the cursor on a new line. This changes the command line buffer by erasing unwanted characters to the right of the cursor.

Return key

Send the line to CP/M as a command to be acted upon, and move the cursor down to the beginning of the next line.

Rubout key

Delete a character and re-display the "rubbed-out" character.

↑S Stop long displays on your screen (often used with the TYPE command). Continue displaying ("scrolling") by typing any key except ↑C.

↑U or
↑X

Delete the command line without sending it to CP/M.

↑W Recall the previous command line if current line is empty; otherwise move the cursor to the end of the line. ↑J, ↑M, ↑R, ↑U or the Return key updates the command line for recall with ↑W. CP/M Plus Banked system only.

↑Z Use with the ED or PIP programs to terminate a list of characters or inserted text (used to mark the end of a text file).

Filename Rules

Here's a summary of the rules governing filenames:

d:filename.ext

The filename is a unique name for the file (up to eight characters).

The optional .ext is a typical three-character extension used to indicate the type of file. You can use fewer than three characters.

A filename can have a name with no extension, or an extension with no name; the unnamed portion is set to blanks.

The optional *d:* is a disk drive letter followed by a colon — to specify a file on a disk drive other than the current disk indicated in the prompt.

In CP/M Plus (banked version) you can have passwords associated with filenames:

filename;password

The optional password of 0-8 letters and/or numbers is preceded by a semicolon.

The following symbols can't be used in filenames or passwords (CP/M 3.0): ! \$ & * () - + _ × [] : ; < > , . ? /.

If you do not include a disk drive letter and colon, CP/M automatically searches the current drive for the file.

Creating a File:

Type the PIP command to copy from the console keyboard directly into the file SAMPLE.TXT:

```
A) PIP SAMPLE.TXT=CON: ↵
```

After typing text, type a Control-Z to signal the end of the text.

Another way to create a file is to use the ED utility:

```
A) ED SAMPLE.TXT ↵
```

NEW FILE

:*

Type *i* followed by Return to start inserting text into the file. Type a Control-Z to stop inserting:

```
:*i ↵  
1:Hello little friend ↵  
2: (Control-Z)  
2:*
```

Now type *E* (followed by Return) to leave the ED program and save SAMPLE.TXT:

```
2:*E ↵  
A)
```

Copying Files

To copy a file to another file on the same disk:

```
A) PIP COPY.TXT=SAMPLE.TXT ↵
```

To copy a file from user area zero to the current user area:

```
A) PIP SAMPL1.TXT=SAMPLE.TXT[G0] ↵
```

To copy a file to another disk, using the same name for the copy:

```
A) PIP B:=A:SAMPLE.TXT ↵
```

Renaming and Erasing

To rename a file, type the REN command with the new name first, then an equal sign, then the old name:

```
A) REN NEWNAME.TXT=COPY.TXT ↵
```

To erase a file, type the name:

```
A) ERA B:SAMPLE.TXT ↵
```

Displaying and Printing

To see the contents of a file on the screen, type this command:

```
A) TYPE SAMPLE.TXT ↵
```

To print the file's contents, connect your printer, turn it on, load the paper, then press Control-P to turn on printing, and use the above TYPE command to send the contents to the screen and to the printer at the same time. Turn off printing with another Control-P.

Another way to send the contents of a file to the printer is to use the PIP command with the LST: device name:

```
A) PIP LST:=SAMPLE.TXT ↵
```

User Areas

User areas are used to logically separate files on the same disk.

```
A) USER 1 ↵
```

(Switch to user area one.)

User areas are numbered 0 through 15. The STAT USR: command displays the number of files in each active user area. The current user area is always zero unless you change it.

In CP/M-86, CP/M Plus and CP/M-68K you can type the following PIP command and copy from one user area to another, regardless of which user area you are using:

```
A) PIP SAMPLE.TXT[G2]=SAMPLE.TXT[G3] ↵
```

In CP/M-80 version 2.2 (or earlier versions), to copy a file into a user area you must first select the *destination* user area as the "current user area" with the USER command, then use PIP to copy the file *from* its user area to the current user area:

```
A) PIPA:=SAMPLE.TXT[G4] ↵
```

CP/M-80, CP/M-68K and CP/M-86 systems have the following STAT utility to check active user areas:

```
A) STAT USR: ↵
```

In CP/M Plus, CP/M-86, CP/M-68K, MP/M-II and MP/M Plus (and in some customized versions of CP/M-80 version 2.2), you can store a program file ("COM" file or ".CMD" file) with the SYS file attribute in user area 0 and be able to execute that program from any user area.

File and Disk Space

To see the amount of space left on disk (CP/M-80 version 2.2 and CP/M-86), type this command:

A)STAT ↵

To see the amount of space left on the disk in drive B, type this command:

A)STAT B: ↵

To see the size of a disk file, type this command with the name of the file (and with a drive prefix to see a file on another disk):

A)STAT B:SAMPLE.TXT ↵

To check the active user areas:

A)STAT USR: ↵

Filename Matches

CP/M provides a way to specify several files at once in some commands. A *filename match* is a partial filename with special symbols to match arbitrary characters of a filename. They are also known as *ambiguous filenames*.

The special symbols are * to match any number of characters, and ? to match one character. For example:

A)DIR *.TXT ↵

(The above command displays all names with the ".TXT" extension.)

A)DIR SAMPL?.TXT

(Displays SAMPLE.TXT and SAMPL1.TXT.)

Copying Non-System Disks

Using Three Disk Drives

Insert the disk to be copied into drive B, and the receiving disk into drive C. Format the disk in drive C.

After formatting, type C: and press Return. When you see the C) prompt, type Control-C. The C) prompt should reappear. Type the following commands (each followed by Return):

C)A: ↵

A)PIP C:=B:*.* ↵

Using Two Disk Drives

Insert the receiving disk into drive B and format it. Type B: and press Return. When you see the B) prompt, type Control-C. The B) prompt should reappear. Type A: (followed by Return), wait for the A) to appear, and then type PIP (followed by Return). An asterisk (*) should appear.

Take your system disk out of drive A and replace it with the original disk to be copied. Type the following command (followed by Return):

B:=.* ↵

When it finishes, take your receiving disk out of drive B. Take the original disk out of drive A, and replace it with the system disk. After inserting the system disk, press the Return key. The PIP program stops, and the familiar A) prompt should reappear.

Using a Hard Disk

To copy files from the hard disk, format a new or recycled disk in the floppy drive (we assume drive B for this example) and use PIP:

A)PIP B:=*.* ↵

This command will copy *only the files in your current user area* on the current drive to the same user area number on drive B. If you don't use *user area numbers* to segregate files on disk, files are all considered to be in user area zero (the default).

To copy files from one user area to another, add the [Gn] parameter, where n is the user area you are copying from. Move to the user area to receive the copies (with the USER command), and then use PIP:

0B)USER 1 ↵
1B)PIP A:=B:*.*[G0] ↵

This example copies the files from user area 0 on drive B (using the [G0] parameter) to user area 1 on drive A, because the PIP operation was started from user area 1.

NOTE:

CP/M-86 lets you specify the [Gn] parameter on the destination side of the = sign, so that you can copy *to* another user area from the current user area.

Copying Files and Disks

You can type a transfer expression following the keyword PIP on the command line, or you can execute PIP by typing PIP by itself, and when you see PIP's * prompt, you type several PIP transfer expressions to perform several operations in a row.

```
d>PIP d:destiny=d:source▷
d>PIP▷
* d:destiny=d:source▷
* d:destiny=d:source▷
*▷
d>
```

quired line feed code to move the cursor to the next line. Stop input by typing a Control-Z ($\uparrow Z$):

```
A>PIP TEXT.TXT=CON▷
```

Erase Many Files

The following examples erase all “.BAK” files on drive A, and then all files on drive B:

```
A>ERA *.BAK▷
A>B:▷
B>ERA *.*▷
ALL FILES (Y/N)?Y▷
```

If you get the error message File is R/O, the file you are trying to erase is set to “read-only” and must be reset to “read/write” before you can erase it (see STAT command, or SET if you’re using CP/M Plus).

SUBMIT Utility

To use SUBMIT with a file of commands, follow these steps:

1. Create a text file that has a “.SUB” extension and type each command line into the file:

```
PIP B:=A:*.TXT
ERA A:*.BAK
```

2. With CLEANUP.SUB in drive A, type the following command:

```
A>SUBMIT CLEANUP▷
```

To make the CLEANUP.SUB program work for any type of file, including all files on the disk, you would substitute the parameter \$1 for the filenames in the CLEANUP.SUB file:

```
PIP B:=A:$1
ERA A:$1
```

When submitting this file to the SUBMIT utility, you would also type the name of the file, or a filename match, to be substituted for \$1 in the CLEANUP.SUB file:

```
A>SUBMIT CLEANUP SAMPLE.TXT▷
```

SUBMIT creates a temporary file called \$\$.SUB to hold the commands with the substitution performed (SAMPLE.TXT for \$1), and then executes the commands automatically.

This ends our impatient user’s guide to CP/M-80 version 2.2 and CP/M-86. For a summary of CP/M commands and utilities, see the “Summary” in this issue. For a summary of CP/M Plus utilities, see *User’s Guide* issue 4. Tutorials on CP/M Plus are presented in two parts: issues 5 and 7. ☐

Copying Files

Copy the *original* file to the *copy* file on the same disk:

```
A>PIP COPY.TXT=ORIGINAL.TXT▷
```

Copy SOURCE.BAS on the disk in drive A to DESTINY.BAS on the disk in drive B, creating a new DESTINY.BAS or overwriting the old one:

```
A>PIP B:DESTINY.BAS=A:SOURCE.BAS▷
```

Copy ORIGINAL.TXT in drive A to drive B, using the same filename for the copy in drive B:

```
A>PIP B:=A:ORIGINAL.TXT▷
```

Copying An Entire Disk

Copy the entire disk in drive A to drive B (user areas not used):

```
A>PIP B:=A:*.*/
```

To copy an entire disk where files are grouped into user areas, use the [Gn] parameter, substituting for each n the number of each user area in use on the source disk. Here’s the PIP command for copying from user area number 2:

```
A>PIP B:=A:*.*/[G2]▷
```

Copy Files to the Printer

Copy text files to your LST: device (usually a printer):

```
A>PIP LST:=B:SAMPLE.TXT▷
```

Concatenate Files

Add the contents of FILE3 to the end of FILE2, and FILE2 to the end of FILE1, and store in RESULT without disturbing FILE1, FILE2 or FILE3:

```
A>PIP RESULT=FILE1,FILE2,FILE3▷
```

Copy Typed Input to File

Copy text as you type it into a file. Use of the Return key does not stop input to the file, nor does it transmit the re-

CP/M Summary

CP/M-80 and CP/M-86 Commands and Utilities

by Tony Bove & Cheryl Rhodes

Typesetting Conventions

Throughout this article we use *THIS typeface* to show exactly what you should type at your keyboard, with the special symbols \uparrow for the Control key (CTRL, CNTL or ALT on some keyboards), and \rightarrow for the Return key (RET, CR or Carriage Return on some keyboards).

We use *this typeface* to show what you should type, with *UPPERCASE* letters for keywords and *lower case* letters for words or values you must supply when typing the commands. The *italic lowercase* letters show optional words or values you can supply. Finally, we use *THIS TYPEFACE* to show messages displayed by programs or by the system.

Control Key Combinations

- $\uparrow C$ Re-start CP/M or perform warm start for a newly inserted disk. Sometimes used to abort programs. In CP/M-86, one Control-C while a program is running aborts the running program. Without a program running, Control-C re-starts CP/M (without a disk access) and sets all disk drives to read-write status (RW).
- $\uparrow E$ Move cursor to beginning of next line for long command lines.
- Backspace
or $\uparrow H$
Delete one character and erase it from the screen (CP/M versions 2.0 and newer).
- $\uparrow I$ Add 8 spaces (tab to next 8th column: 8, 16, 24 ...).
- Line Feed
or $\uparrow J$
Same as the Return key (CP/M versions 2.0 and newer).
- $\uparrow M$ Same as the Return key.

- $\uparrow P$ Turn on printer to print everything typed or displayed (LST: device is usually your printer). Type $\uparrow P$ again to stop printing.
- $\uparrow R$ Repeat the command line.
- $\uparrow S$ Temporarily stop display; continue by typing any character.
- $\uparrow U$ or
 $\uparrow X$
Cancel the current line (do not transmit it to CP/M).
- $\uparrow Z$ End input from keyboard during ED or PIP session.
- \rightarrow The Return, ENTER, or CR (Carriage Return) key, used to transmit a command line to CP/M and to perform a carriage return and line feed to move cursor to next line.
- RUBOUT or
DELETE
Delete one character and redisplay it. To display corrected command line without rubbed-out characters, use $\uparrow R$.

CP/M Commands

The following “built-in” commands do not require program files on disk, since they exist within CP/M itself. You must supply a regular CP/M filename for any *filename* (or optional *filename*) below, or an ambiguous filename (using * and/or ? symbols) for any optional *filenmatch*.

d: Change current disk drive to drive *d*. Type a drive letter for *d* followed by a colon (:).

DIR d:filename

<i>d:filename</i>	Display one or more files.	<p>your <i>filename</i>), put the assembled version in <i>filename.H86</i>, create an annotated listing of the program called <i>filename.LST</i>, and produce a symbol table called <i>filename.SYM</i>. These files are stored on the current disk unless you type one or more of the following & options after <i>filename</i> in the ASM86 command line. To type one or more options, you start by typing the symbol \$. The options are:</p> <ul style="list-style-type: none"> <i>Ad</i> Look for the source file on drive <i>d</i>, not the current drive. <i>Hd</i> Put the assembled “.H86” file on drive <i>d</i>, not the current drive. <i>Pd</i> Put the listing “.LST” file on drive <i>d</i>, not the current drive. <i>Sd</i> Put the symbol table “.SYM” file on drive <i>d</i>, not the current drive. <i>Fd</i> Select format <i>d</i> of hexadecimal file: <i>D</i> for Digital Research, or <i>I</i> for Intel. <i>X</i> An <i>X</i> for the <i>d</i> value in any option above (except <i>Ad</i>) causes the output to go to the screen, not to a file. <i>Y</i> A <i>Y</i> for the <i>d</i> value in any option above (except <i>Ad</i>) causes the output to go to the printer, not to a file. <i>Z</i> A <i>Z</i> for the <i>d</i> value in any option above (except <i>Ad</i>) causes the output to go to the “byte bucket” (also known as “zero output”), not to a file.
<i>DIRS d:filename</i>	<i>d:filename</i>	
	Display one or more system files (files with the SYS attribute). CP/M-86 only.	
<i>ERA d:filename</i>	<i>d:filename</i>	
	Erase one or more files.	
<i>REN newname=oldname</i>	Rename <i>oldname</i> to <i>newname</i> .	
<i>SAVE n d:filename</i>	Save <i>n</i> pages to <i>d:filename</i> . CP/M-80 only.	
<i>TYPE d:filename</i>	<i>d:filename</i>	
	Display contents of one or more text files.	
<i>USER n</i>	Set current user area to user number <i>n</i> .	

System Programs (Transient Commands)

These programs must reside in files by the same name with a “.COM” (CP/M-80) or “.CMD” (CP/M-86) extension on the current disk drive (usually the disk in drive A). For example: PIP.COM for the PIP program in CP/M-80, or PIP.CMD in CP/M-86, should be on the disk in drive A or the current drive.

ASM Assembler (CP/M-80)

ASM *filename.ahp*

Assemble the program in *filename.ASM* in the current drive or drive specified by *a*, put the assembled program (*filename.HEX*) in the current drive or drive specified by *h*, and put the listing (*filename.PRN*) in the current drive or drive specified by *p*. If you type *Z* for *h* or *p*, ASM will not generate *filename.HEX* or *filename.PRN* respectively. If you type *X* for *p*, the listing will appear at the console only (no *filename.PRN*).

ASM-86 Assembler (CP/M-86)

ASM86 *filename \$Ad Hd Pd Sd Fd*

Assemble the program in *filename.A86* (“.A86” is assumed unless you supply an extension as part of

COPYDISK Utility (CP/M-86)	<p><i>COPYDISK</i> Copy all tracks from one disk to another disk.</p>
DSKMAINT Utility (IBM PC CP/M-86)	
DDT Debugger (CP/M-80)	<p><i>DDT d:filename.HEX</i> <i>d:filename.COM</i> Load <i>filename.HEX</i> or <i>filename.COM</i> into the program area to debug with DDT commands. If you do not specify <i>filename.HEX</i> or <i>filename.COM</i>, DDT commands act on whatever is already in the program area.</p>
DDT Commands	
<i>As</i>	Enter assembly language at address <i>s</i> .
<i>Ds,f</i>	Display memory at current address or address <i>s</i> and continue for 16 lines or to address <i>f</i> .
<i>Fs,f,c</i>	Fill memory with hexadecimal byte <i>c</i> from address <i>s</i> to address <i>f</i> .

DDT Commands

<i>As</i>	Enter assembly language at address <i>s</i> .
<i>Ds,f</i>	Display memory at current address or address <i>s</i> and continue for 16 lines or to address <i>f</i> .
<i>Fs,f,c</i>	Fill memory with hexadecimal byte <i>c</i> from address <i>s</i> to address <i>f</i> .

<i>Gs,b,c</i>	Start execution at address <i>s</i> , with optional breakpoints at addresses <i>b</i> and <i>c</i> .
<i>G,b,c</i>	Start execution at the current address, with optional breakpoints at addresses <i>b</i> and <i>c</i> .
<i>G0</i>	Properly terminate DDT session, readying program for a SAVE.
<i>Ifilename</i>	Insert <i>filename</i> into the file control block (005CH) for an <i>R</i> command.
<i>Ls,f</i>	List “disassembled” code from current address or address <i>s</i> , and continue for 12 lines or to address <i>f</i> .
<i>Ms,f,d</i>	Move block starting at <i>s</i> and ending at <i>f</i> to destination <i>d</i> .
<i>Rb</i>	Read file inserted by an <i>I</i> command into program area, with optional bias <i>b</i> .
<i>Ss</i>	Examine or alter memory starting at address <i>s</i> . For each value, type another value to replace it, or Return to keep it, or a period to stop the <i>S</i> command.
<i>Tn</i>	Trace execution and display all registers and flags for one or <i>n</i> execution steps.
<i>U</i>	Untrace (same as the <i>T</i> command, without display of registers).
<i>Xr</i>	Examine all CPU registers or examine or alter register <i>r</i> , where <i>r</i> is one of the following CPU registers: <i>C</i> (carry flag), <i>Z</i> (zero flag), <i>M</i> (minus flag), <i>E</i> (even parity flag), <i>I</i> (interdigit carry), <i>A</i> (accumulator), <i>B</i> (BC register pair), <i>D</i> (DE register pair), <i>H</i> (HL register pair), <i>S</i> (stack pointer), or <i>P</i> (program counter).

DDT-86 Debugger (CP/M-86)

DDT86 *d:filename.CMD*

Load *filename.CMD* into the program area to debug with DDT commands (“.CMD” assumed if you specify no extension). If you do not specify a *filename*, you cannot use the *G*, *T*, or *U* commands until you load a program to debug (usually with the *E* command). DDT-86 cannot load a program in hexadecimal format (“.H86” files) — convert them first with the GENCMD utility.

DDT-86 Commands

As Enter assembly language statements at starting address *s*.

Bs,f,s1 Compare blocks of memory (starting address *s*, finishing address *f*, second starting address *s1*).

Ds,f Display memory (in hexadecimal and ASCII) at current address or address *s* and continue for 16 lines or to address *f*.

Efilename
Load *filename* for execution.

<i>Fs,f,wc</i>	Fill memory with hexadecimal byte <i>bc</i> from address <i>s</i> to address <i>f</i> .
----------------	---

<i>Gs,b,c</i>	Start execution at address <i>s</i> , with optional breakpoints at addresses <i>b</i> and <i>c</i> .
---------------	--

<i>G,b,c</i>	Start execution at the current address, with optional breakpoints at addresses <i>b</i> and <i>c</i> .
--------------	--

<i>Hwc1,wc2</i>	Hexadecimal sum and difference.
-----------------	---------------------------------

<i>Icommand tail</i>	Set up input command line with <i>command tail</i> .
----------------------	--

<i>Ls,f</i>	List “disassembled” code from current address or address <i>s</i> , and continue for 12 lines or to address <i>f</i> .
-------------	--

<i>Ms,f,d</i>	Move block starting at <i>s</i> and ending at <i>f</i> to destination <i>d</i> .
---------------	--

<i>Rfilename</i>	Read disk file into program area.
------------------	-----------------------------------

<i>Ss</i>	Set memory values (bytes) starting at address <i>s</i> .
-----------	--

<i>SWs</i>	Set memory values (words) starting at address <i>s</i> .
------------	--

<i>Tn</i>	Trace program execution for one or <i>n</i> execution steps.
-----------	--

<i>TSn</i>	Trace program execution and display all registers and flags for one or <i>n</i> execution steps.
------------	--

<i>Un</i>	Untrace (same as the <i>T</i> command, except that the CPU state is displayed only before the first instruction is executed, rather than before every execution step).
-----------	--

<i>USn</i>	Untrace (same as the <i>TS</i> command, except that the CPU state is displayed only before the first instruction is executed, rather than before every execution step).
------------	---

<i>V</i>	Display information about the last file loaded with the <i>E</i> or <i>R</i> commands.
----------	--

<i>Wfilename,s,f</i>	Write contiguous block to disk file <i>filename</i> . Optional <i>s</i> is the 20-bit starting address of block, <i>f</i> is the finishing address (block must start on a paragraph boundary, since low four bits of <i>s</i> are ignored). Without the optional <i>,s,f</i> , it assumes the starting and finishing addresses of the last file read with the <i>R</i> command (useful for writing out files after installing patches without changing file length).
----------------------	--

<i>Xr</i>	Examine all CPU registers and flags or examine or alter <i>r</i> , where <i>r</i> is a register name or one of the following flags: <i>C</i> (carry flag), <i>O</i> (overflow flag), <i>Z</i> (zero flag), <i>I</i> (interrupt enable), <i>A</i> (auxiliary carry), <i>T</i> (trap), <i>D</i> (direction), <i>S</i> (sign) or <i>P</i> (parity).
-----------	--

DUMP in Hexadecimal

DUMP *d:filename*

Display the file's contents in hexadecimal.

ED Text Editing Program

ED d:filename d:

ED d:filename d:filename

Create and/or edit a text file (*filename*), and optionally specify another disk for the output file, or another file.

ED Commands

In all ED commands, you can substitute # for any *n* below to give *n* the highest value (65535). If you do not specify either + or -, ED assumes you mean + unless otherwise noted. "CP" in all explanations stands for the character pointer in the edit buffer. A "string" is a set of ASCII characters.

$\pm n$ Perform a $\pm nLT$ command (see *L* and *T* commands).

n: Move CP to beginning of line number *n*.

n1::n2 Substitute for any *n* or optional *n* below a range of lines beginning with *n1* and ending with *n2*. If either *n1* or *n2* is missing, ED assumes the current line.

nA Append *n* lines or one line from *filename* into the edit buffer. A # for *n* will append 65535 lines (fill the buffer), and a zero for *n* will fill half of the buffer.

$\pm B$ Move CP to beginning (+) or end (-) of the edit buffer.

B#T Move CP to beginning of buffer and display entire buffer.

$\pm nC$ Move CP forward (+) or backward (-) *n* characters.

$\pm nD$ Delete one or *n* characters in front of (+) or behind (-) the CP.

E End ED session and close files (normal end of session). A backup ("BAK") file preserves the unedited version.

nFstring $\uparrow Z$

Find *string* once or *n* times; use optional Control-Z ($\uparrow Z$) at end of *string* to type another ED command on same line.

H Save and re-edit file (perform an *E* command, then run ED.COM again to edit the file).

Istring

Insert lines of text, or just *string*, moving CP to end of inserted lines or characters. If inserting lines, end the insert session with Control-Z ($\uparrow Z$). / inserts upper case characters only (see *U* command).

Istring

CP/M versions 2.2 and newer: insert upper and lower case characters, as typed. (Otherwise, same as the / command).

nJstring1 $\uparrow Z$ *string2* $\uparrow Z$ *string3* $\uparrow Z$

Find *string1*, append *string2* to *string1*, and delete all characters up to but not including *string3* (juxtapose all three strings). Use optional $\uparrow Z$ at end of *string3* to type another ED command on same line.

$\pm nK$ Delete the following (+) or previous (-) *n* lines.

$\pm nL$ Move CP to beginning of current line if *n* is zero, or move CP down (+) or up (-) *n* lines.

nMstring $\uparrow Z$

Repeat execution of the *string* of ED commands *n*

times. If *n* is zero or one, repeat indefinitely (until an error occurs). Use $\uparrow Z$ to type another ED command on same line.

nNstring $\uparrow Z$

Search for the *n*th occurrence of *string* throughout the file. Use $\uparrow Z$ to type another ED command on same line.

O Omit the ED session, and keep the original unedited file.

$\pm nP$ Display *n* pages (24 lines per page) of the buffer previous to (-) or following (+) the CP. A zero for *n* displays the current line and the following 23 lines.

Q Quit the ED session with no file alterations. Temporary and source files remain as they are, but a previous ".BAK" file of the source file is deleted (be careful — check first to see if you need the previous ".BAK" file).

Rfilename

Read *filename.LIB* or the file X\$\$\$\$\$.LIB and insert the text into the buffer, moving CP to end of inserted text.

nSoldstring $\uparrow Z$ *newstring* $\uparrow Z$

Find *oldstring* in the buffer and substitute *newstring* for it; repeat the operation *n* times if *n* is greater than one.

$\pm nT$ Display the following (+) or previous (-) *n* lines, or the current line if *n* is zero. If *n* is not specified, *T* displays the current line after (+) or before (-) the CP. The command sequence *B#T* displays the entire buffer.

$\pm U$ Translate all characters typed to UPPER case (+), or turn off translation (-).

$\pm V$ Turn on (+) or off (-) line number display for lines in the buffer.

OV Display number of free bytes left in the buffer, and the total buffer size, in decimal values.

nW Write to the temporary output file ("\$\$\$\$" file type) the following *n* lines or only the current line.

nX Copies the following *n* lines to the file X\$\$\$\$\$.LIB (retrieve them with the *R* command). If *n* is zero, this command will *delete* the file X\$\$\$\$\$.LIB.

nXfilename

CP/M-86 only. Copies the following *n* lines to *filename* or appends if previous *X* command applied to the same file. If *n* is zero, this command will *delete* *filename*.

nZ Suspend the ED session for approximately *n* seconds.

GENCMD: Convert ".H86" Files to ".CMD" Files (CP/M-86 only)

GENCMD d:filename option-list

The *option-list* can contain one or more of the following parameters which define segment groups with specific memory requirements:

8080 (8080 memory model)

CODE [An,Bn,Mn,Xn]

DATA [An,Bn,Mn,Xn]

STACK [An,Bn,Mn,Xn]

EXTRA [An,Bn,Mn,Xn]

Convert hexadecimal “.H86” file into an executable “.CMD” file. In optional parameters controlling the type of memory model, specify addresses (*n*) that are paragraph boundaries. *An* loads the group at absolute location *n*. *Bn* specifies beginning of group at address *n* in hexadecimal file. *Mn* specifies requirement of minimum of (*n* x 16) bytes. *Xn* specifies that the group can address up to (*n* x 16) bytes.

LOAD: Convert “.HEX” Files to “.COM” Files (CP/M-80 only)

LOAD d:filename

Convert *filename.HEX* to an executable program called *filename.COM*.

MOVCPM: Reconfigure For Memory Size (CP/M-80 only)

*MOVCPM * **

n

Prepare a new copy of system to utilize *nK* bytes of memory or all available memory (substitute * for *n*). An asterisk (*) after *n* (or after the first asterisk) prepares the copy for a SYSGEN. In versions 1.3 and 1.4, *n* can be from 16 to 64; in versions 2.0 and newer, 20 to '64.

PIP: Copy Files To Disks and Devices

PIP destination=source ↳

Run the PIP program with one transfer expression.

PIP ↳

* *destination=source ↳*

* *destination=source ↳*

* ↳

Run PIP to perform several operations. End PIP session by pressing Return. Transfer expressions can take any of the following specific forms (*d*: is a required disk drive prefix with colon, *d*: is an optional drive prefix with colon, and */p* represents optional parameters shown at the end of this section).

d:newcopy=d:original/p

d:newcopy=d:original/p,d:original/p ...

Copy one file to another using new name for the copy, or concatenate the contents of several files into a new file with the name *newcopy*.

d=d:original/p, ...

d=d:filename/p, ...

Copy one or more files to another disk, using the same

filenames. You can use a *filename* such as *SAMPLE???.TXT* or *.**. The first *d*: is required, since another disk must be specified.

dev:=d:filename/p, ...

Send the contents of one or more source files to an output device.

d:filename=dev:/p, ...

Transfer the input from an input device to a destination file.

PIP Device Names: CP/M-80

CON: Console display and keyboard (input and output)

RDR: Reader device (input only)

PUN: Punch device (output only)

LST: List device, usually a printer (output only)

The following special PIP “devices” are not actual devices: they perform special functions associated with devices. They are:

NUL: Send 40 “nulls” (ASCII value of 0) to file or device.

EOF: Send an “end of file” mark (ASCII 1AH, or ↑Z) to file or device.

OUT: A custom device for data output. PIP must be modified for it.

INP: A custom device for data input. PIP must be modified for it.

PRN: A special form of LST: which handles tabs and page breaks and numbers lines.

PIP Device Names: CP/M-86

CON: Console display and keyboard (input and output)

AXI: Auxiliary input device (input only)

AXO: Auxiliary output device (output only)

LST: List device, usually a printer (output only)

The following special PIP “devices” are not devices: they perform special functions associated with devices. They are:

NUL: Send 40 “nulls” (ASCII value of 0) to file or device.

EOF: Send an “end of file” mark (ASCII 1AH, or ↑Z) to file or device.

PRN: A special form of LST: which handles tabs and page breaks and numbers lines.

PIP Parameters

In all forms of PIP expressions, optional (*/p*) parameters

can be specified to perform special functions. Letters for *p* are:

- B* Block mode transfer, used to read data from paper tape (CP/M-80 only).
- Dn* Delete any characters after the *n*th column; used to send wide lines to a device that only handles narrow lines.
- E* Display (“echo”) copy operation as it is performed.
- F* Filter out form feeds (ASCII value 0CH, or “FF” or ↑L).
- Gn* Get file(s) from user area *n* (CP/M version 2.0 or newer).
- H* Check for proper Intel hexadecimal format records.
- I* Ignore any null records in transfers of Intel hexadecimal records.
- L* Convert UPPER case letters to lower case letters.
- N* Add line numbers to each line copied; lines end with the ASCII “CR” and “LF” characters produced by pressing the Return key.
- O* Ignore ↑Z end of file marker for copying non-text files. The *O* parameter is not necessary for copying “.COM” files.
- Pn* Add a form feed (ASCII value 0CH, or “FF”) after the *n*th line.

Qstring↑Z
Copy portion of a file, stopping on *string*. If used on PIP command line rather than following PIP’s * prompt, the *Q* parameter looks for all UPPER case version of *string*; otherwise, it looks for actual *string*.

R Copy “system” files (with SYS attribute).

Sstring↑Z
Copy portion of a file, starting on *string*.

- Tn* Set tab stops at every *n*th column, so that ↑I(TAB key) characters are replaced with spaces to position the next character at column divisible by *n*.
- V* Verify copy by comparing it with the source file.
- W* Copy into a read-only file overriding read-only attribute.
- Z* Set the unused 8th bit (parity bit) of each character to 0.

STAT: System Statistics

STAT d:

By itself, *STAT* tells you the space used and the available space on disk. With a disk drive prefix *d*: *STAT* tells you the space available on the disk in that drive.

STAT d:filename atr

d:filenmatch atr

Display size and attributes of *filename* or files that match *filenmatch*. You can change the attributes of one or more files by specifying one of the optional *atr* attributes below. A file can have two non-opposing attributes.

CP/M-80 Attributes:

\$R/O Read-only: file can not be written to or erased.

\$R/W

Read-write: opposite of *\$R/O* (default).

\$\$SYS System file: does not appear in DIR displays (you must use the /R parameter with PIP to copy them).

\$/DIR Directory file: opposite of *\$\$SYS* (default).

CP/M-86 Attributes:

RO Read-only: file can not be written to or erased.

RW Read-write: opposite of *RO* (default).

SYS System file: does not appear in DIR displays (you must use DIRS to display them, and the /R parameter with PIP to copy them).

DIR Directory file: opposite of *SYS* (default).

STAT USR:

Display user numbers.

STAT d:DSK:

Display disk information for current drive or drive *d*:

STAT d:=R/O

Assign read-only attribute to disk *d*: (CP/M-80).

STAT d:=RO

Assign read-only attribute to disk *d*: (CP/M-86).

STAT DEV:

Display physical device assignments.

STAT VAL:

Display possible device assignments and STAT summary.

STAT log:=phy:

Assign physical device to logical device name.

Logical Device Names: CP/M-80

CON: Console display/keyboard for input and output

RDR: Reader device for input only

PUN: Punch device for output only

LST: List device (printer) for output only

Logical Device Names: CP/M-86

CON: Console display/keyboard for input and output

AXI: Auxiliary input device (input only)

AXO: Auxiliary output device (output only)

Continued on page 54

Using CompuServe

Electronic mail, newspapers, data bases, financial quotations, flight schedules, tele-shopping, tele-banking and videotex.

by Cheryl Rhodes & Tony Bove

For some desktop computer users, data communications is the major reason for buying the computer. A computer can be much "smarter" than a "smart" terminal in communicating with large "host computers" and information services like The Source and CompuServe.

You must equip your computer with a program to handle data communications. In addition, you will need a device called a "modem" with a cable that connects your computer to a telephone line to call CompuServe.

Computer Communications

Computers can be connected together, physically by cable or other means, to transfer data from one to the other (and back). You can also connect a computer to a telephone, and make a call to another computer also connected to a telephone, and exchange data as if the computers were having a conversation.

Computer-to-computer conversations follow certain rules known as *data communications protocols*. Unfortunately there is no single standard for all computers; however, there are recognized standards adhered to by most computers and information services. CompuServe will listen and respond to your requests if your computer can send and transmit regular (ASCII) characters.

What equipment do you need to communicate? At minimum, you need a *modem* — a device that changes data into telephone line signals for transmission, and receives such signals for changing back into electronic form.

Typesetting Conventions

Throughout this article we use *THIS typeface* to show exactly what you should type at your keyboard, with the special symbols ↑ for the Control key (CTRL, CNTL or ALT on some keyboards), and ↵ for the Return key (ENTER, RET, CR or Carriage Return on some keyboards). We also use This Typeface for messages and menus displayed on your screen while using CompuServe.

You also need a connecting cable known as an RS-232-C cable or *serial data port* cable (usually in the same package with the modem device). Ask your dealer to verify that the connections on each end of the RS-232-C cable match those expected by your modem and computer (if the computer is at home, bring its documentation with you when you decide to buy a modem).

You must also equip your computer with a program to handle data communications. There are many fine programs available, but be aware that prices aren't always tied to the number of features. MODEM7, for instance, is available for the cost of the floppy disk you receive it on, and many CP/M user groups can help you configure it for your system. To get cost effective results from an information service like CompuServe, your modem software should have a "downloading to disk" storage feature.

To use the CompuServe service, you need a CompuServe account number and password. You can sign up at your local computer store, or contact CompuServe (an H & R Block Company) directly at: CompuServe Information Service Division, 5000 Arlington Centre Blvd., Columbus, OH 43220 (614) 457-8650.

Modems

The term "modem" is short for "modulator/demodulator" which describes a device that changes computer signals into phone transmission signals and back again into computer signals. There are two kinds of modems: *direct-connect* modems that plug directly into your telephone line jack and require registration with the phone company, and *acoustic coupler* modems that have fittings for the handset of your standard telephone, and need no phone company registration.

What kind should you use? Direct-connect modems offer a better connection, with less errors in the transmitted data. Some direct-connect modems also offer automatic phone dialing, automatic phone answering, and other useful features. However, direct-connect modems are more expensive, and

they supposedly require phone company approval (which is not hard to get). Although most homes and offices now use the modular jacks for "plug-in" extension phones, some direct-connect modems require special connectors, and some telephones (including pay phones) do not provide access to the line directly.

Acoustic coupler modems are less expensive and do not require a special phone jack or phone company approval. Acoustic couplers transmit through your phone's handset, and can be used with pay telephones and others without direct access to the line. However, princess telephones and some home models may not fit properly in the coupler.

Although acoustic coupler modems do not provide the features of direct-connect modems, they are adequate for communicating with the CompuServe service.

Your modem should have its own instructions and settings. CompuServe expects you to communicate in "full duplex" mode (a switch on your modem sets this mode) and at 300 baud (approximately 30 characters per second, a Bell Telephone standard speed for acoustic couplers and most other modems). 1200 baud service is also available (approximately four times faster than 300 baud), but you must pay over three times more per hour.

Acoustic coupler modems are connected to the telephone only when used to communicate (using the telephone handset), but direct-connect modems are usually connected to the phone line for indefinite periods. Some users dedicate one phone line for long-term modem connection and use.

Communications Software

You also need a program that transmits data through the serial data port (modem port) of your computer. There are a variety of such programs available for CP/M systems. We use the public-domain (free) MODEM7 program, which is available through users' groups and from CP/M bulletin board systems, as well as some stores that sell modems (for a nominal charge). We have also used other excellent commercial programs that provide more features (AMCALL and COMMIX on a variety of CP/M systems, and Micro-Link on the Osborne 01). We intend to compare these and other modem programs in a future issue of *The User's Guide*.

One problem for newcomers: the modem program you get should be already configured for your computer, and be supplied on your computer's disk format. MODEM7 must be tailored for most systems, so you may want to purchase a customized version, or a commercial package (all will work with CompuServe). If your software cannot "download to disk," you can still use the CompuServe service, but you cannot save the results, unless you set up your computer to print everything that happens on your screen (using the CP/M Control-P command).

CompuServe's Services

CompuServe provides informative services like Standard & Poor's data base and the MicroQuote program to keep

abreast of daily stock prices and financial transactions. CompuServe also offers the MicroNet personal computing service, instant "electronic mail" message delivery to any other user, an "electronic bulletin board" for messages to all users, and a "CB Simulator" that lets you "talk" (by typing messages) to any number of people over thirty-six different channels.

CompuServe's latest electronic offerings include banking, shopping at home, several daily newspapers, AP world news, world weather, and special flight planning services for pilots of private planes.

Some CompuServe services are quite expensive, and others are surprisingly inexpensive and very useful. As you learn more about CompuServe, you will also learn to be more thrifty with the service. CompuServe offers a free first hour to all users. Use it wisely to learn about the system and how to avoid the high costs of some services.

Starting a CompuServe Session

A *CompuServe account* consists of a unique ID number and secret password. CompuServe uses the number to keep track of your use of the information service and to charge you for certain services. You use the secret password to "log on" (turn on the services) with your unique ID number.

Keep your password secret, so that someone else cannot use your number without your help (otherwise, you'd have to pay the charges). You can change it as often as you like by typing *GO CIS-175* and following the instructions. Don't use your name or initials as your password, since someone could easily guess them.

Most CompuServe accounts give you permission to use the service between the local hours of 6PM to 5AM weekdays and all day Saturday, Sunday, and holidays. Business accounts may use CompuServe during regular business hours, but the service is far more expensive during these peak hours.

You can look up the CompuServe number for your local area using the list of phone numbers provided. The phone numbers marked "C" in the list are direct lines to the CompuServe computers. CompuServe adds more of these direct lines as the number of subscribers grows.

Others (marked "T" on the list) are lines through a supplemental network known as Tymnet. To access CompuServe through Tymnet, you pay an extra \$2 an hour (in addition to CompuServe's \$5 per hour). However, some areas have only Tymnet numbers. Using a local Tymnet number may be less expensive than using a long-distance CompuServe number. All numbers are available for use by all users. You should choose a 300 baud number if you are using a 300 baud modem, or a 1200 baud number if you are using a 1200 baud modem.

Calling CompuServe Through Tymnet

Turn on your modem and computer, start your modem program, and dial your local Tymnet number. Listen (while it rings and after Tymnet answers) until you hear a high-pitch

whine signaling data transmission. If you are using an acoustic coupler, place your telephone handset firmly in the coupler; if you're using a direct-line modem, set it for data transmission (some have a "data" switch to set).

If Tymnet doesn't immediately recognize your terminal or computer signal, the following message should appear on your screen:

PLEASE TYPE YOUR TERMINAL IDENTIFIER

If the message is garbled, check your modem's setting and set it to "Full Duplex" and "300 baud." If you still do not have a coherent message as shown above, hang up and try calling Tymnet again. Make sure you are dialing a 300 baud phone number if you are using a 300 baud modem.

CompuServe customers who live outside Ohio can call (800) 848-8990 from 8:30 AM to midnight (Eastern Daylight or Standard Time) for assistance. From within Ohio or outside the continental U.S., call (614) 457-8650 for help. If a human doesn't answer, you will be able to leave a taped message (do not reveal your password if you decide to leave a taped message).

With the above message on your screen, type the letter "A" (this is the most popular terminal identifier). Tymnet responds with another message:

PLEASE LOG IN

Respond by typing the CompuServe "log-in" word:

C/S \rightarrow

At this point Tymnet performs the CompuServe "log in" key sequence, the Control-C sequence, so you don't have to type it yourself. You should see a $\uparrow C$ displayed on your screen, followed by the CompuServe User IDG: message shown below. If you don't see the User ID: message, type a Control-C command (hold down your Control key and type C).

Calling CompuServe Directly

Turn on your modem and computer, start your modem program, and dial your local (or long-distance) CompuServe number. Listen (while it rings and after CompuServe answers) until you hear a high-pitch whine signaling data transmission. If you are using an acoustic coupler, place your telephone handset firmly in the coupler; if you are using a direct-line modem, set its switches for data transmission.

With the modem set for data transmission (or telephone handset firmly set in the coupler), hold down your Control key and type C. The Control-C command should appear on your screen as $\uparrow C$, and after a second or two, the following message should appear on your screen:

User ID:

If the message is garbled, check your modem's setting and set it to "Full Duplex" and "300 baud." Try the Control-C

key sequence again. If the message is still garbled (or if there is no message), try calling CompuServe (make sure you are dialing a 300 baud phone number, if you are using a 300 baud modem) again.

Logging On to CompuServe

With the above message on your screen, type your user number, usually a five-digit number, followed by a comma, another three-digit number, and the Return key:

User ID: 00000,000 \rightarrow

(Use your ID number.)

CompuServe should respond with the following message:

Password:

Type your secret password and press your Return key. *You will not see your password as you type it!* It is invisible for your protection (to keep others from seeing it as you type it).

If you misspell your password, CompuServe will print the following message and give you a second try:

?? LOGINE - Invalid entry - try again

If you typed your password correctly, you will be welcomed into the CompuServe network.

Using The System

On your first call to CompuServe, you will be asked to sign up for continued services. Do so immediately, since you have only one free hour before you lose the account. When a menu with numbered choices is displayed, CompuServe tells you to "key" a number, which means type the number you want and press the Return key.

CompuServe tells you to press your ENTER key, which is a reference for Radio Shack computers and terminals whose ENTER keys function as Carriage Return/Line Feed (known as Return). In other words, CompuServe's ENTER key is the same as the typical Return key on computers that run CP/M.

CompuServe asks for personal billing information, including your complete name and address, your Mastercharge or VISA card number (to bill you directly for CompuServe charges), and the expiration date of your card. Answer each question by typing an answer and pressing your Return key.

If you charge the service to your VISA or Mastercharge card, CompuServe charges are detailed on your usual VISA or Mastercharge monthly statements, and you do not get a separate statement from CompuServe.

If you don't want to pay by VISA or Mastercharge, CompuServe will bill you directly or you can establish credit with VIP, but you pay extra for the statements CompuServe sends you regularly. To find out more about the VIP account, write to: CompuServe VIP Account, Attn: Kathy Gallagher, Box 629, Dept. 0585, Columbus OH 43271.

If you want to use CompuServe during business (daytime) hours, you should first establish service as a personal (evening) user. There is a minimum monthly charge of 2 hours per month (2 HOURS = \$45 for 300 baud, \$70 for 1200 baud) on daytime accounts. There is no monthly minimum for evening service.

At the end of your sign-up session, CompuServe displays a page of "what's new" in the service, and in a moment you'll be given a chance to go directly to these topics. Skip to the next CompuServe page by pressing your Return key. The TOP menu page of selections should appear:

CompuServe

Page CIS-1

CompuServe Information Service

- 1 Home Services
- 2 Business & Financial
- 3 Personal Computing
- 4 Services For Professionals

- 5 User Information
- 6 Index

Enter your selection number,
or H for more information.

!

CompuServe's menus consist of a *page* showing selections and an exclamation point (!), called a *prompt*, telling you that CompuServe is now "listening" and awaiting your typed response.

You can select an item by typing its number and pressing the Return key, or you can simply press Return to see the next page of information. You can also type H for help, followed by the Return key, to get the following summary of CompuServe commands:

IHD

Brief	Command	Summary

T - TOP menu page		
M - previous MENU		
F - FORWARD a page		
B - BACK a page		
H - HELP		
R - RESEND a page		
S n - SCROLL from item "n"		
G n - GO directly to page "n"		
N - display NEXT menu item		
P - display PREVIOUS menu item		
OFF or BYE - logs you off		

KEY S OR (ENTER) TO CONTINUE

!

You can see the next page of information by pressing the Return key, and you can read page by page by pressing Return each time you reach the end of a page. You can also "scroll" more quickly through pages by typing S at the end of a page. You may reach the end of a set of pages and see the following message:

Last page. Key M for menu

At this point, you can type an M followed by Return to go back to the TOP menu page shown previously, or you can type the following command (a good idea if this is your first time on the system today) to see what's new on the system:

!GO NEW

The GO command (or type G) lets you move directly to almost any page in the CompuServe data bases. You can use the GO command from any menu page to go quickly to any other page if you know either the data base name or the page number.

Names of data bases are available if you type H (or HELP), followed by the Return key, and scroll through all the messages. Each page in each data base has a page name and number in its upper right corner. We show CompuServe menus with the page numbers they occupied in September, 1982 (how often they change pages and menus is an ongoing mystery; they are trying to incorporate data base supplier and subscriber feedback for an easy to use and constantly expanding service).

You can select items from menus to get to any page in the CompuServe data bases and never use the GO command; however, users who want to save time (and money) can use the GO command to move to specific pages.

With the GO command you type a page number or just the name of the data base (the name of the "what's new" data base is NEW). The preceding GO NEW command displays the What's New menu shown below.

CompuServe

Page NEW-1

* * * * * What's New * * * * *

Current Week's Announcements

- 1 The New Tech Times Debuts
- 2 New Car Prices in AutoNet
- 3 Democrat & Republican SIGs
- 4 ADD-Venture Game Available
- 5 IRS On-line Tax Information
- 6 News-A-Tron Market Quotations
- 7 Price Changes in Value Line
- 8 Shop With Micro Shoppe

Input a number or key
(ENTER) for more choices

!

You can select an item by typing its number, followed by Return. This will give you the item's pages one at a time (you have to press Return for the next page).

You can also select an item and scroll through the pages by typing *S*, a space, the number of the item, and the Return key. The *S* command saves time by scrolling pages without asking for a response from you. Once you've located the menu you're looking for, use the *S n* command to select an item and scroll through its pages.

To return to the What's New menu, type an *M* followed by the Return key. Another *M* command from the What's New menu page will put you in the previous menu (the TOP menu).

The TOP menu shows the major selections in the Videotex service, as well as the MicroNet Personal Computing selection for the computing service. You can pick any Videotex selection and explore the possibilities of, say, home services or financial services and still return to the TOP menu by using the *T* command followed by Return.

Financial Services

If you are using CompuServe for financial business, you won't want to waste any time: select number 2 from the TOP menu to get this menu of selections:

CompuServe Page FIN-1

BUSINESS AND FINANCIAL SERVICES

- 1 News & Financial Analysis
 - 2 Investments & Quotations
 - 3 Communications
 - 4 Brokerage & Banking
 - 5 Reference Library
 - 6 Discussion Forums
 - 7 Travel Services
 - 8 Personal Finance

Last menu page. Key digit
or M for previous menu.

1

For financial news and reports, select number 1.

12

CompuServe Page FIN-10

***** NEWS/REPORTS *****

- 1 Business Information Wire
 - 2 The Business Wire
 - 3 MMS Financial Analysis
 - 4 News-A-Tron Commodities

- 5 Stevens Business Reports
 - 6 Evans Economics, Inc.

Last menu page. Key digit
or M for previous menu.

!

The Business Information Wire service from Canadian Press (a cooperative of 111 daily Canadian newspapers, founded in 1911), carries news stories under 18 categories (like agriculture, banking, economy, environment, forestry, manufacturing, mining, transportation, etc.). International news is provided by the Associated Press, Reuters and Agence France-Presse. An historical data base called Newstex dates back to January 1974, and contains about a million stories.

Like most other CompuServe business and financial data bases, the BIW service costs extra (\$5) per hour of connect time during standard (evening) hours. Daytime subscribers pay an extra connection fee of \$22.50 per hour, plus a monthly subscription fee of \$50.

By typing an *M* (followed by Return) from within a report or financial news feature, you return to the menu above that pointed you to the report or news feature. By typing an *M* (followed by Return) *again*, you return to the previous menu — BUSINESS AND FINANCIAL SERVICES — the one that pointed you to the menu of financial news features and reports.

From the BUSINESS AND FINANCIAL SERVICES menu, you can select the INVESTMENTS & QUOTATIONS menu (number 2):

12

CompuServe

Page FIN-20

***** INVESTMENTS & QUOTATIONS *****

- 1 MicroQuote
 - \$ 2 Quick Quote
 - \$ 3 Standard and Poor's Analyses
 - 4 Value Line Data Base II
 - 5 News-A-Tron Commodities
 - 6 Rapaport ((Diamond System))

\$ Indicates charges in addition to connect time may be incurred.

Last menu page. Key digit
or M for previous menu.

1

MicroQuote gives you current and historical data on 40,000+ stocks, bonds and options including NYSE prices, AMEX prices and OTC stock prices. Select item 1 from the

above menu for MicroQuote, but first you should order the MicroQuote User's Guide (\$4.95, Order Code: CS-447) from FEEDBACK (type *G CIS-4*).

Standard & Poor's "premium" data base (item 3) contains financial statistics and other information about 3000+ publicly held corporations. For more information, write to: Standard and Poor's Corporation, 25 Broadway, New York NY 10004.

Home Services

CompuServe's home services include electronic mail and the CB Simulator (with the Communications selection), games (with the Entertainment selection), newspapers, home management programs, special services like national weather for the public, or marine and aviation weather data, or ski-slope weather forecasts, etc. To get the HOME SERVICES menu, select number 1 from the TOP menu:

!1▷

CompuServe

Page HOM-1

HOME SERVICES

- 1 News/Weather/Sports
- 2 Reference Library
- 3 Communications
- 4 Home Shopping/Banking
- 5 Discussion Forums
- 6 Games
- 7 Education
- 8 Home Management
- 9 Travel
- 10 Entertainment

Last menu page. Key digit
or M for previous menu.

The News/Weather/Sports menu (page HOM-10) gives you access to *The Columbus Dispatch*, *The Washington Post*, the *St. Louis Post-Dispatch*, the NOAA Weather Wire, and the PGA Golf Data Base.

The Communications selection (page HOM-30) gives you several user-to-user communications facilities: Electronic Mail for sending a message to another user, the CB Simulator for "talking" with one or more users (simulating Citizen Band radio channels), and the National Bulletin Board for posting and reading messages.

Lobby Letters of America offers a service to send letters to members of congress and other federal officials and agencies, as well as national corporations, organizations, products and services, national TV stations and shows, newspaper and magazine editors, and foreign leaders and officials.

The Reference Library menu (page HOM-20) offers electronic magazines on gardening, fashion, satire, science, golf,

sexuality, wine, bibliographic services, Information on Demand and U.S. Govt. Publications.

The Shop/Bank at Home menu (page HOM-40) offers the following services:

CompuServe

Page HOM-40

HOME SHOPPING/BANKING

- 1 Comp-U-Store
- 2 Electronic Banking
- 3 The Athlete's Outfitter
- 4 Music Information Service
- 5 Fifth Avenue Shopper
- 6 Primetime Radio Classics
- 7 AutoNet/AutoBase
- 8 Savings-Scan
- 9 Magazine Entree

Last menu page. Key digit
or M for previous menu.

!

With this menu you can purchase goods at the Comp-U-Store, charging purchases to your VISA or Mastercharge account. You can also do your banking electronically (Tell-A-Pay bill payment service, or view current checking/savings account statements) with Financial Interstate Services Corp. in Knoxville Tennessee (call (615) 637-2035 for an ID number). The United American Bank of Knoxville (615) 971-2265, and the United American Bank of Memphis Tennessee (901) 766-2717 are participating in this electronic banking service.

A demonstration of home banking begins on page HOM-6. Although the home banking service was initially limited to those customers using TRS-80 Color Computers, it has recently been expanded to include most other microcomputers as well.

The Discussion Forums include clubs for HAM radio hobbyists, "CB Simulator" users (CBIG), and other special interest groups such as those interested in sports, photography and music (Photo-80/Orchestra-80), gourmet cooking (hosted by Better Homes and Gardens staff), and even a group with an interest in networking (Netwits).

NOTE:

Computer clubs and user groups are *not* listed here. For computer-related information, clubs, newsletters and user groups, try the Personal Computing Service menu.

Professional Services

For professionals, CompuServe offers a flight planning service for aviators, full communications, a health care special interest group and other data bases in the Services For Professionals menu:

Continued on page 54

Acronym	Database Name	Topic
ACR	Archer Commodities	Financial
AJC	Atlanta Journal	Newspaper: Atlanta GA
APN	AP Wire Sports News	News
ASI	Aviation Safety Institute	FAA reports
ATR	Atari Newsletter	Manufacturer's newsletter
BHG	Better Homes and Gardens	Nutrition, meal planning
CBM	Commodore's Information Network	Manufacturer's newsletter
CDP	Columbus Dispatch News	News summary: Columbus OH
CIS	CompuServe's Main Menu	CompuServe's Top (see T in CIS command summary) Menu
CNS	Commodity News Service	Financial, Intl. weather, news
CUS	Comp*U*Star	Shopping at home
CVP	CompuServe Viewpoint	Videotex views, Filge (File generator and editor) instructions
EMA	Electronic Mail	Electronic messaging
FED	Investor Protection Report	Financial
FIN	Futures Industry News	Financial services main menu
GAN	Gandolf's Fashion Report	Clothing design news
GPO	Government Publications Office	Consumer news, tips
HOM	Home Information	Home services main menu
IND	Index	CIS index, AP world, financial news access
INV	Investment News & Views	Financial commentaries
LAT	Los Angeles Times	Newspaper: Los Angeles CA
MCS	MicroSoft News	Manufacturer's newsletter
MDN	Middlesex Daily News	Newspaper: Framingham MA
MMS	MMS Financial Analysis	Financial: Securities Info., Fedwatch newsletter
MST	Minneapolis Star Tribune	Newspaper: Minneapolis MN
NEW	What's New	New services on CIS
NYT	New York Times	Newspaper: New York NY
PCS	Personal Computing System	Personal computing services main menu
PEM	Popular Electronics	Personal electronics computer club news
PSC	Popular Science	Magazine
PSE	Popular Science, Energy	Magazine
PSP	Popular Science, Photography	new product news, software reviews, satellite TV news
RBO	Business Outlook	Financial
RCA	RCA News	Manufacturer's Newsletter
RFC	Financial Commentaries	Financial
SBR	Stevens Business Reports	Financial: small business reports
SFC	San Francisco Chronicle	Newspaper: San Francisco CA
SFE	San Francisco Examiner	Newspaper: San Francisco CA
SPD	St. Louis Post Dispatch	Newspaper: St. Louis MO
TCB	The College Board	choosing a college, financial aid, adult ed., SAT test info
TFF	The Future File	News features and interviews on computing, bio-engineering, telecommunications, etc.
TMA	The Micro Advisor	Micro news, software reviews
TMC	The Multiple Choice	Quizzes for enjoyment/learning for adults: also, TMC-27 for kids
TRB	The Refundle Bundle	manufacturer's coupon refund and "freebies" newsletter
TRS	Tandy/Radio Shacks News	Manufacturer's newsletter
TWP	The Washington Post	Newspaper: Washington DC
VIF	Video Information	Video newsletter for professionals
VPL	Virginian-Pilot & Ledger Star	Newspaper: Virginia
WEA	Weather Reports, National	NOAA aviation, marine and land weather (see CNS-17 for Asian, African, European, N. American, and S. American weather)

Continued from page 52

!4

CompuServe

Page SFP-1

Services For Professionals

- 1 Aviation
- 2 Communications / Data Processing
- 3 Engineering/Technical
- 4 Legal
- 5 Medical
- 6 Jewelry

Last menu page. Key digit
or M for previous menu.

EMI flight planning, in the Aviation topic, is based on aircraft navigation where pilots fly with radio signals from VORTAC stations. Navigators without special RNAV (area navigation) equipment must plan routes that pass over or near these stations (to maintain radio contact), whereas navigators with RNAV equipment can create "synthetic" VORTAC stations and possibly fly shorter distances. The EMI flight planning service is useful for pilots whether or not they have RNAV equipment. Pilots with RNAV equipment use the EMINAV flight planning, and pilots without the special equipment use the EMIVOR planning.

Continued from page 46

LST: List device (printer) for output only

Physical Device Names

TTY: Slow CON: device (teletypewriter)
CRT: Fast CON: device (cathode ray tube display)
LPT: Line printer
BAT: Batch processor
PTR: Paper tape reader (RDR: device)
PTP: Paper tape punch (PUN: device)
UC1: User-defined (custom) CON: device
UL1: User-defined (custom) LST: device
UR1: User-defined (custom) RDR: device
UR2: User-defined (custom) RDR: device
UP1: User-defined (custom) PUN: device
UP2: User-defined (custom) PUN: device

SUBMIT Utility and XSUB

SUBMIT *d:filename parameters*

Create \$\$.SUB to contain your commands in your *filename.SUB*, then execute the commands. Any *parameters* you include replace your arguments (\$1, \$2, etc.) in your submit file. Include XSUB as your first command in your ".SUB" file so that your commands/programs can query your console.

The programs also provide the two most recent weather reports for the origin and destination, and the most recent forecast for those locations, including the winds at selected altitudes and information on severe weather.

Data Bases

To help you find a specific data base without going through a long series of menus, we have compiled a table of data base acronyms (3 letter abbreviations). Type *G XXX* (substitute a specific data base acronym for *XXX*) at any ! menu prompt to go to the desired data base.

CompuServe adds new data bases often, so there may be more than we have listed here. Since some Compuserve page numbers change frequently, you don't need to give a page number with the *G(o)* command. You will go to the top menu of the desired data base if you don't specify a page.

We have unfortunately run out of space. The next installment of our CompuServe tutorials show how you can send and receive electronic mail and use the FILGE text editing program. The CompuServe Personal Computing System, useful for running programs on CompuServe's DECsystem-10 and DECsystem-20 minicomputers, will be covered in a future article. It is recommended that you buy the manuals before using the Personal Computing System services. Select Feedback from the User Information menu to order these manuals and any other documentation.

SYSGEN: Copy System (CP/M-80)

SYSGEN

Place a copy of the system on disk. SYSGEN asks for the source drive of your system disk, and the the destination drives for your copies. Type Return to restart your system. CP/M-86 users: use COPYDISK.

Common Error Messages

NO FILE or FILE NOT FOUND

Disk does not contain file you specified.

BDOS ERR ON *d:*

No disk in drive, disk is not formatted, disk is so old that CP/M can't read it, disk drive is not on, door not closed, or drive doesn't exist, or you're trying to write to a read-only disk. Type Control-C to recover.

INVALID DISK ASSIGNMENT

In a STAT command, you followed *d:* with something other than =R/O (or =RO in CP/M-86).

what you typed?

If whatever you typed was repeated followed by a question mark (?), it is probably a misspelled command, or the filename you typed does not exist as a ".COM" file on the current disk.

Preventing Computer Disasters

System care, feeding and preventive maintenance



Watch the **A>STAT** column for tips, opinions, rumors and maybe even some facts from the ever-resourceful Kelly Smith, system operator (SYSOP) of the infamous CP/M-Net system (a remote bulletin board and free software exchange for CP/M® users). Kelly brings you the collective wisdom of thousands of CP/M-Net callers and users.

This article tells how to avoid disasters with your micro system, and

how to recover from the brink of data annihilation. I feel qualified to give this advice, having poked, fiddled and thrashed around with systems for about five years. The advice is general enough to apply to almost any make and model microcomputer, and particular enough to provide the essential details that will keep your computer happy and you content.

Power Input: a Proper Diet

Consider carefully the power source for your system. If possible, use a 3-wire (protective ground) outlet that has a 15 Amp (or more) power capacity that is *directly connected* to your home main circuit breaker. It is ideal to have this circuit on its own breaker, isolated from the rest of the utility outlets used for the various ap-

pliances in your home or other machines in your office.

Your circuit breakers or fuses may be marked as to which breaker services which room. To find such an outlet, you can use a small lamp as a voltage indicator. Turn off all but one of the circuit breakers to your home, and plug the lamp into the outlet you want to use for your computer. If it does not light, turn the circuit breaker off and try another until you locate the one that services the outlet you want to use.

Make sure the power has a direct and isolated path to your system. After you've isolated the path, plug the lamp into the remaining power outlets, making note of what *else* is on the power line. This is very important, because you need to remove (or at least minimize) the number of "power hogging" and "glitch producing" appliances attached to your system's power line.

Some examples of "power hogging" appliances are electric heaters, electric ovens, stoves, refrigerators and toasters. One or more of these appliances can drop the available input line voltage to as little as 80 VAC or less. Low line voltage (especially with typically non-regulated microcomputer power supplies) will cause a localized "brown-out" effect in your system. This "brown-out" may not be readily apparent to you because other appliances around your home (e.g., radios, televisions, fluorescent lighting) may be perfectly happy working in this situation.

What about the "glitch-producing" appliances that are lurking quietly, waiting for the precise moment to raise havoc with the computer? They have the potential for not only spurious problems that clobber your work disk (and possible hours of work), but expensive damage to your system!

Remember this rule: if it has a *motor* in it, *avoid* it! Don't have mo-

tors on the same circuit as your system. "Glitch-producing" devices include refrigerators, air conditioners, washers and dryers, electric typewriters... in short, any devices with motors or solenoids. These appliances provide a double edged problem: When turned on, they can cause the "brown-out" effect, and in addition, put transient voltages (sometimes on the order of hundreds of volts) into an otherwise "clean" AC power line. Although these transient voltages are of short duration, they can show up in your computer's power supply and create havoc.

Many of the components in your computer are extremely sensitive to any sudden high voltage, which can "zap" your system and cause it to perform in strange ways. However, you may not notice these strange wonders for days and possibly weeks after the high voltage "zap" condition has passed! I had an IMSAI that suffered the voltage "Wrath of ZEUS," and bad IC components appeared daily for almost *three months afterward!* So track down these "glitch producers" and remove them from your system's power circuit.

Some small and innocent-looking appliances may also cause problems. Automatic heat-regulating soldering irons (often used next to a microcomputer) will "pop" the AC power line with voltage spikes that may not cause severe damage, but may cause erratic operation of your computer (e.g., bad disks or bad memory).

Transient voltage suppression devices are available to wire directly into the AC input of your microcomputer's power supply, or can be purchased "built-in" to a power outlet box. Be warned however, that they are limited in "trapping" various combinations of transient voltage, duration and frequency, and they are expensive. You are better off getting rid of trouble at the *source* rather than trying

to rid your microcomputer of "glitches" after the fact.

Lightning strikes — from the incoming AC power line *and* from the telephone system — are an additional hazard to your microcomputer. If you are using a direct connect modem (such as the D.C. Hayes or PMMI modems), you would be wise to disconnect them during the onslaught of a really good lightning storm. I know of two systems in the midwest (Calamity Cliffs Computer Center, and Technical CBBS), that have had repeated "hits" on their systems, and each time literally destroyed the telephone couplers attached to their systems!

S-100 Buss Systems

Many S-100 buss systems are especially prone to the localized "brown-out" effect, because the non-regulated (read "cheap to manufacture") power supply (which provides +8 VDC and +16 VDC to the system's mother-board buss) is regulated separately on each board in the computer.

The individual boards regulate the +5 VDC, and +12 VDC required by their integrated circuits and components. These regulators require (at a minimum) 3 volts of "head room" for proper operation (i.e., the on-board integrated circuits use +5 VDC and therefore require a "raw" input to the regulators of +8 VDC).

You can measure the voltage with a low cost voltmeter purchased from your local electronics or hardware store. Nothing fancy required — any meter in the \$10 to \$15 category will be fine. Refer to the manufacturer's details on the layout of each board for the regulator input/output (and ground) pin assignments, and follow the "three volt rule" to determine if your computer is being fed the proper diet of raw input voltage (measure *directly* at the INPUT and GROUND terminals).

Be aware that the DC voltage value may appear to be correct, but due to poor power supply filtering in your "raw" supply, may have an AC composite voltage (called a "ripple") that "droops" below the head-room required by the individual on-board voltage regulators. Again using your inexpensive voltmeter, switch to the lowest AC voltage range possible, and measure the input voltage once more.

Any measurable voltage means potential trouble, with the effect of "mini-brown-outs" every half-cycle of the AC line voltage (8.3 milliseconds for a 60 cycle input).

Keep in mind that your microcomputer will be executing instructions at the rate of millions per second. Eight milliseconds is a considerable amount of execution time to your system, and the system must *not screw up even once*. Murphy's Law of Frapped Program Execution states that "one bad instruction will modify other instructions (also known as The Avalanche Effect) and will *always* occur after four hours of editing a program, with *no* backup file!"

What can you do if you find trouble with the input power voltage? (1) Find an AC input line voltage source that is solid (i.e., really *is* 115 VAC), (2) purchase a pre-regulated (expensive) power source, or (3) *give up now!* There is no hope ahead for trouble free operation of your system, just frustration.

Note: some S-100 buss microcomputer systems (notably the MITS Altair 8800b computer) allowed the user to "tune" the unregulated power supply voltage by changing the power supply's transformer AC input voltage "taps" to boost the output voltage. This was done to accommodate the installation of additional boards (usually more than six) in the already power starved Altair. Check your system's hardware manual to see if it is possible to "tune" your system for a low line voltage situation.

A word of caution here: if the line voltage *does* recover and input more than nominal voltage, or you move the computer to some new location that has a solid line voltage, those same voltage regulators may have *too much* "head room" and must get rid of this extra input voltage in the form of *heat*. Computer components de-

grade drastically with any rise in temperature (beyond their normal power ratings), and will surely succumb to an early death. Watch out — on-board filter capacitors tend to turn into resistors at elevated temperatures and burst into flames (yes, *catch fire*). Of course, heat is another problem.

Keeping Your Microcomputer Cool

Perhaps the worst offender in keeping component devices from running hot in your microcomputer is the cooling system itself, or lack of it. If you have a fan, the foam filters that cover the fan inlet are trying to provide not only cool air, but *clean* air. Dust and dirt has to go somewhere, so where else but the filter? That's where the crud stays.

If you're as (gulp) tidy as I am, you should do what I do: throw'em away! Sure, dirt and dust will be sucked into the computer, but if your fan is working properly, most of it will also be *blown out* It is much better to let the internals get a little dusty than to forget to remove and clean the filter once a month.

Alright, now you will always have cool air blowing into the microcomputer. But is the cool air cooling anything? With the cover off of your computer, light a match and blow it out, and immediately place it six to eight inches downstream from the incoming air flow. Where does the smoke go? On some systems, the smoke shows that the cooling air goes right out the vent holes next to the fan! If this is so with your system, block the vent holes with some duct tape and cardboard.

Try the smoke test again. Is the flow of air actually blowing *through* the boards in your system? If not, use more duct tape and cardboard and channel the airflow directly into the boards. It may not look very sophisticated, but once you put the cover back on, who'll notice?

You may have to be clever and design a good airflow system into your microcomputer. Cooling always seems to be an afterthought in many of the "boxes" that I have seen. The IMSAI 8080 chassis has the power transformer parked directly in front of the fan blocking the airflow. How-

ever, with a little work (and duct tape and cardboard), it runs pretty cool even with fifteen cards in the system. Another method to try, if the duct tape and cardboard is inadequate, is to un-bolt the fan, pull it out of the chassis, and put it in backwards to blow air through the system.

Some microcomputers rely on convection cooling alone to keep cool (e.g., Apple II, Osborne 01, etc.). If the temperature is warm on the outside, count on it being 10 to 20 degrees hotter on the inside. The point here is: keep the room that your microcomputer is in *cool* — about 70 degrees is comfortable for the internals. Avoid placing your system in a place where it gets direct sunlight, or if it's in a cabinet with additional peripheral parts of your system (especially disk drives), mount it *underneath* all that stuff (remember, hot air rises).

Also, keep your microcomputer clear of floor heat ducts. They may help keep your toes toasty on cold winter nights as you sit in front of your terminal, but they can cause heat damage to your computer.

Radiated Disaster: Sources and Situations

You know about radiated *heat* doing nasty things, but have you considered all the potential sources (and types) of radiated energy that cause us computerists grief? Consider a telephone, such as the one you use with your modem to communicate with other systems. It seems to make a neat "bookend" to lean a stack of floppy disks against, right? *Wrong!!* The bell in Ma Bell's device is *magnetically driven*.

Read the back of one of the paper sleeves used to hold your floppy disks (What?? You *don't* keep them in their sleeves when you're not using them? Argh!). Even if you *don't like to read*, the graphics provide some pretty good clues. For example, see the giant magnet crossed out as dangerous? Your telephone has one inside it. (Why they put the "do's and don'ts" on the *back* of the floppy disk sleeve, I'll never know.)

Of course, the microcomputer itself is a good source of magnetic energy, especially if it is enclosed in a plastic case. Most of the magnetic energy comes from the transformer in

the power supply. Keep your disks away from this area of your system.

Some computer terminals also radiate magnetic energy that is strong enough to erase a floppy disk. It is an extremely bad practice to lay floppy disks on top of your terminal. The terminal's fly-back transformer and CRT yoke can radiate enough energy to cause flakey disks.

One bizarre source of magnetic damage is the X-Ray machine at the airport. The x-rays themselves will not clobber a disk, but the magnetic field used to focus the x-rays sure will!

On the other hand, EPROM (Erasable Programmable Read Only Memory) components don't mind magnetic fields, but the x-rays are excellent for a quick erase job! Hand carry these items and don't allow them to be x-rayed. I mark my boxes of disks for mailing with "DO NOT X-RAY! MAGNETIC MEDIA INSIDE."

By the way, do you live near an airport or industrial area where radar is used? High energy pulses of power can travel many miles to clobber your system. You know when this is happening, because you can set your watch by the time sweep of the dish antenna that "blips" your system. Although this is a rare situation for most home environments, it does happen (twice to me so far!).

Finally, there is the all-too-familiar static discharge. You've felt it — that spark you create by casually rubbing your feet on the carpet before touching the keyboard? The sudden sickening "oh no" feeling when WordStar® just ... goes away?

If you can, place your microcomputer system in a room without rugs. Stay away from Nylon rugs! If that is not possible, place an anti-static mat in front of your system (where you sit), and also get a can of anti-static spray (the stuff you use to keep your clothes from clinging) and apply it liberally and as often as needed to the rug around your system. Also, office chairs on rolling rubber wheels make dandy generators of static electricity. They are safe if they roll on an anti-static mat, but dangerous to your system if they roll onto a rug.

Also, when working on some of the boards in your system (even if only to change addressing on a memory

board), make sure that you do not give these boards a dishonorable discharge. Ground yourself out *prior to* yanking any boards from the system. Even discharging directly to the chassis of the system is better than through one of the computers boards (at least the discharge path is most likely to go back to the protective ground at the wall socket, *not* to some expensive components).

Confidence and Diagnostic Programs

On a weekly basis I run a set of comprehensive diagnostics on my microcomputer system, just for the confidence I get from knowing that everything is still working properly. Many diagnostic programs are in the public domain (free for the asking from user group libraries and remote software exchanges).

However, be aware that there are few tests that are *really good and exhaustive memory tests*. Don't expect these tests to find anything but "dead-duck" RAM failures. The best memory test that I have seen (commercial or otherwise) is in the public domain SIG/M disks, volume 5: MEMDIAG.ASM and MEMDIAG.DOC (you may recognize the author's name).

Most disk tests are generally adequate for simple read/write confidence, but try to find one with lots of *random seek* operations during both read and write (head positioners go sour here).

By the way, the so-called *head cleaner* diskettes should not be used (unless your floppy disk drive manufacturer recommends one, which is highly doubtful). They can wear down a read/write head by tens of micro-inches in 30 seconds of use, as compared to one year of operation with the crappiest diskette you can find. Most diskettes cause "self-cleaning" anyway, and unless you have diskettes with visible burn-out (i.e., you can *see* through them), don't worry about it. Read/write heads are better left alone, especially the double sided type with tiny little spring gimbals that are *easily bent* — don't tamper!

A "poor man's disk test" is the nonstop use of the PIP command to copy files from one disk drive to an-

other. Use PIP in a ".SUB" test file, and use SUBMIT to re-SUBMIT the ".SUB" test file itself (use CONTROL-B to end the "endless" submit operation). Try copying a lot of short files to perform the most mechanical (read/write head load and unload) operations possible, in conjunction with files scattered all over the diskette. This is usually adequate for a confidence test.

Program Backup and File Maintenance

I cannot stress enough the importance of "backing-up" (copying) all programs and data files. The most important disks to save as backups (and never use) are the original disks you purchased for your system. These "master" disks are used only once: to make a master copy!

Check to see if the master disks are *write protected* before inserting them into your disk drive. Get the *best* floppy disks that money can buy, and make *three copies* of each master disk.

After the copy operation, identify each disk using the labels supplied; however, mark the labels *before* putting them on disks. Even a slight amount of pressure through the disk's jacket will cause damage to the thin oxide coating of the internal disk itself.

If you must write over a label already attached to a disk, use a felt-tip pen and apply very little pressure. *Do not* use ball-points or pencils!

Mark your disks as (1) "Master," (2) "Master Backup," and (3) "Working Copy." Date the working copy for future reference, in order to keep track of its use. My WordStar program disk gets a real workout, and I "retire" these overworked disks to the "scratch pile" after six months of heavy use.

Don't use an eraser to change the information on labels. Erasers tend to leave particles of abrasive rubber to float around the inside of the disk jacket. To change a label, carefully peel-off the old label and stick on a new one. Don't paste a new label over the top of an old one — on some floppy disk drives, this changes the dimensional characteristics of the disk, which may cause data to be recorded poorly.

File the master disk in a metal filing cabinet (or wherever you keep important documents), preferably in a room at the opposite end of your home or office (figuring that only *half* of your house may burn down). Do *not* store disks up high in a closet where it may get warm during the summer months.

Keep the "Master Backup" accessible, but also in a safe place (e.g., filing cabinet), and use your "Working Copy" for doing the things you bought a microcomputer to do in the first place.

Why three copies? Well, consider this: you're working late one evening, and *zap!* Your disk is clobbered. Hmm, that's strange... So, you grab your (only?) available backup disk and, a minute later, *zap!* It is wiped out also! Some weird hardware failure got *both* of them!

You get the point: with a third copy, you still have your "Master" to go back to, once you have fixed the hardware problem (and not until!).

Archives are a very important part of disaster prevention and recovery. Although floppy disks are not cheap, consider your initial investment (consider the cost of WordStar for instance!). Also, consider the hours of work that you put into developing and debugging your program, or typing data into your data base, or composing paragraphs of your book. The retail cost of the floppy disk is a tiny fraction of its worth while it contains data.

To help minimize the cost of backing up software, there is a nice software package called Squeeze and Unsqueeze (actually SQ.COM and USQ.COM). The Squeeze and Unsqueeze programs save as much as 45% of the disk space occupied by a file. You guessed it — the Squeeze program squeezes the files on your disk by copying them into a "squeezed" format, to make room for more files on the disk (the originals are presumed to be on another disk). The Unsqueeze program copies "squeezed" files into the regular storage format (which takes up more room on the disk, so you would want to "unsqueeze" the files to another disk that can hold them).

The Squeeze and Unsqueeze programs (SQ.COM and USQ.

.COM) were written by Richard Greenlaw and placed in the public domain (thanks, Richard). You can find them on most RCPMs (Remote CP/M Systems). Call mine with your modem, and keep trying: CP/M-Net, 805-527-9321. Richard also wrote a program called TYPESQ (type-out squeezed files) that lets you unsqueeze the contents of a text file (document, source program or any simple ASCII file) quickly for display only (very useful for viewing lists of programs available on RCPM systems, since most large lists are in squeezed format). Richard also wrote a batch processing "parameter list builder" called FLS.

These and many other useful CP/M programs are available and free for the cost of a phone call. More public domain programs for CP/M systems are available from two user group software libraries (usually for the cost of an eight-inch disk plus mailing): CPMUG, 1651 Third Avenue, New York NY 10028, and the SIG/M, Box 97, Iselin, NJ 08830.

Here are four useful CP/M programs in the public domain:

CRCK.COM, written by Keith Peterson, generates Cyclic Redundancy Check (CRC) numbers for validation and verification of files on disk. You don't have to know the specific details of CRC numbers, just that a unique set of numbers is generated for each file you run with CRCK.COM. Before sending a file to another system, you run CRCK.COM on the file to get this unique number. After sending the file, the receiver runs CRCK.COM on the new copy to see if the unique number matches the first one. If the files are identical, they will match.

DU.COM, written by Ward Christensen, is a great "fixer-upper" for disks whose directory areas are scrambled or whose files were erased (even disks with which you performed an **ERA** *.*). The features of the handy Disk Utility are too numerous to mention here, but this is program you *must* have for really good system maintenance and disaster recovery. For further details, refer to the *CP/M-Net News*, June 1981, Number 6, Volume 1, Issue 6 (available from the CP/M-Net RCPM system).

FILE-XT2.COM, written by

yours truly, is useful for examining the detailed directory information on a CP/M 2.2 compatible disk (thanks, Kelly — the editors). This utility allows you recover all of the information required by CP/M to determine the file allocation and attributes of the individual files on a CP/M disk. This information is absolutely required (print a hard copy!) if you have to fix a scrambled CP/M disk directory at some later time.

FINDBAD.COM, written by Gene Cotton, will find bad sectors on a floppy disk, accumulate the groups holding the bad sectors, and write the bad group allocations to the disk directory as a file named [UNUSED].BAD. Since the bad sectors are already allocated to a file, CP/M cannot use them for good files. I always use FINDBAD after formatting a pile of disks, to save me from the grief of bad sector errors when I'm working.

These programs (fully compatible with any floppy disk format using CP/M Version 2.2, eight-inch or five-inch) form part of my "standard" utility set that resides on my day-to-day "work disk."

Tidiness is Happiness

A tidy computer is a happy computer. You learned this rule firsthand if you ever assembled your own microcomputer (either from "scratch" or in kit form), and carefully examined the interconnections of power supply wiring, the cabling to peripheral devices (printers, disk drives, terminal, etc.), looked for frayed wires and poor solder connections, discovered inadequate power handling capability, etc.

As you add additional boards to your microcomputer system, the ability of the power supply to provide the necessary power to the additional boards may be limited by the voltage drop across the wires trying to get power to those boards!

For example, I started out with six boards in my crusty old IMSAI computer. I added another, then another, and another, and soon I had used up most of the available 22 slot mother-board connectors and the original power supply just couldn't hack it.

I replaced the power supply

with a heavy duty supply (25 Amp/+8 VDC), but still couldn't get enough power into the mother-board because I used the original wiring. So, I got the heaviest gage wire I could find (10 AWG) and rewired the entire mother-board.

Let me tell you a secret about IMSAI S-100 mother-boards: wire the mother at *both ends* of the power distribution buss lines and use the shortest length wire path possible. This will guarantee that there is a minimum voltage drop not only in the cabling to the mother-board, but will minimize any voltage drop *across* the mother-board. While rewiring my system, I added a small 12 volt incandescent panel lamp across the power supply +8 VDC filter capacitor. Why? Consider that this filter capacitor is one heck of a storage battery for a considerable time after power is turned off. It may take as much as a minute for this capacitor to discharge, and during this minute you may be yanking or inserting another board into the mother-board... and *zap!!* Due to the clever pin assignments of the S-100 buss +8/+16 power (and just the slightest amount of "skew" inserting or removing a board), you have "zorched" not only that board but probably *all* the other boards in the system! I use the panel lamp as a "power safe" indicator. It costs less than fifty cents, and can save hundreds of dollars in costly repair or replacement.

Also, make sure that all fuses are rated for the power your system is using. There are few things more disconcerting than to see the printed circuit board power etch "curled-up" on various boards in your system, because it was not properly "fused."

Re-inspect the power wiring from time-to-time and look for nicks or cuts in the insulation. This reminds me of the time I arc-welded my IMSAI to the top of my Sanyo Monitor — a splendid pyrotechnic display to be sure, all due to a tiny nick in the +8 VDC wiring to the chassis that developed from months of inserting and removing boards in the mother-board, and the fact that I had defeated the 3-wire AC power plug (chassis ground return) with one of those "handy-dandy" adaptor plugs... Argh!!

Finally, try to minimize contaminants from getting into your system. Smoking and food (and yes, beverages such as beer) will not do good things for your system (do as I say here, not as I do). Terminals with vent holes in the tops of the cabinets for cooling pose problems for people like me who see the cabinet as a nice place to set a cup of coffee, can of beer, etc. You can make a beautiful corona (ala the "aurora borealis") by spilling the coffee or beer inside the terminal.

A truly fascinating sight, but if the "arc'n-mit-shpark'n" doesn't blow your terminal (or microcomputer) up, the acid content will rot things out, or the carbon content (sugar) eventually will short things out. Soft drinks are especially bad for terminals and computers!

If you spill something inside the terminal or computer, *don't* wash it out with any kind of solvent other than *pure distilled water*. Let it dry thoroughly before applying power again. To date, my poor old IMSAI has consumed only one beer, and lived to tell about it. There was this cherry tomato, that (somehow) wound-up wedged down inside a power supply that months later, *phfft...* well, you get the picture!

Oh Yes... Recovery!

Believe it or not, we are usually our worst enemy when it comes to causing problems with our microcomputers. CP/M is a fairly simple operating system, but there are times when we use its simple blind power to clobber a disk or two... or three! Remember, do not use your master program disks and backup data disks — with them intact, there is always hope.

However, there are those really dumb times (usually at late hours and provoked by too many cans of beer) that can really blow you into the weeds. I remember vividly the time I tried to copy 25 master disks for a friend, putting the blank disk in drive A and the master disk to be copied in drive B. Yes, you are right — I turned 25 master disks into blank disks!

Sometimes you learn the hard way. In such situations, the important thing to remember is *don't panic!* Unless there's a fire inside the chassis,

don't turn your system off if you need to recover important work that is gently nestled within the RAM of your system. It's usually still there in RAM, unless you had a "brown-out" or stroke of lightning (I told you how to avoid them). The data needs to be cajoled out of RAM and stored on disk (or tape, or *anywhere* it can be saved).

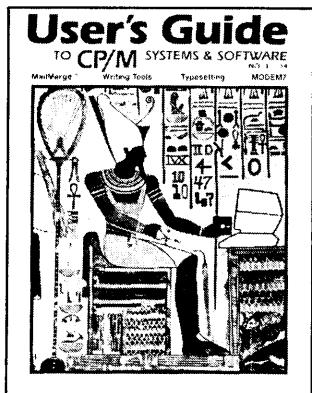
When you're in the middle of a WordStar session (or whatever word processor you use), and the program "crashes," try this: re-boot your system (preferably with a known good disk), fire up DDT (the debugging program supplied with CP/M) or SID (a symbolic debugger from Digital Research), and start dumping memory to the terminal while searching for your edited text. It's in there someplace!

Note the beginning address of the text, and find the end of the text and note that also. Then use the DDT (or SID) **H** command to get the sum and difference, and note the number of pages (256 bytes/page). Now, move the whole section down to address 100 Hex with the **M** command, leave DDT or SID by typing a CONTROL-**C** or the **GO** command) and use the **SAVE** command to save the total number of pages you noted. You may not save all of your work, but you may save most of it!

Also, take advantage of the built-in facilities offered with text editors such as ED and WordStar. Save your current editing session on disk frequently (CONTROL-**H** for ED; CONTROL-**K** and then **S** for WordStar) when working on something important. Saving while working will save you from grief later on, and takes so little time to do, as compared to retyping the last two hours worth of work.

That's all for this installment. Keep 'em cool, tidy, and fed with power properly. Get some file and disk maintenance utilities from the library of public domain software. Don't panic. Use DDT or SID to recover data from RAM. Use the saving feature of your text editor or word processor *frequently*. And keep good backups!

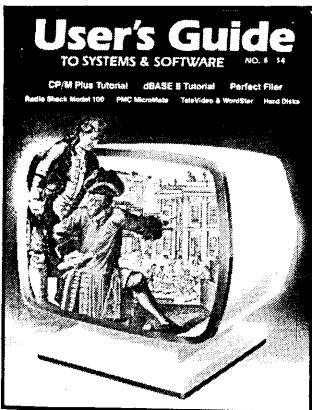
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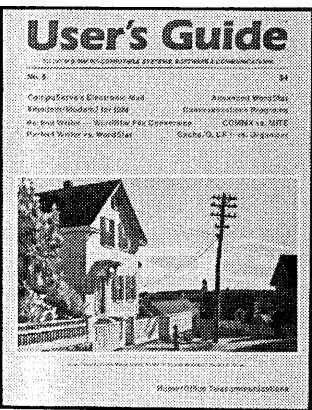
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