

# PC WORLD

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*The Personal Computer Magazine for IBM PCs  
and Compatibles*

## Modem to Modem

*How They Work & Buyer's Guide*

Getting  
Started with  
Your IBM PC

Microsoft Word  
vs. VisiWord

New Eagle  
Personal Computer

Streamlining Data  
Management

PC Goes to School



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wasn't created by IBM.

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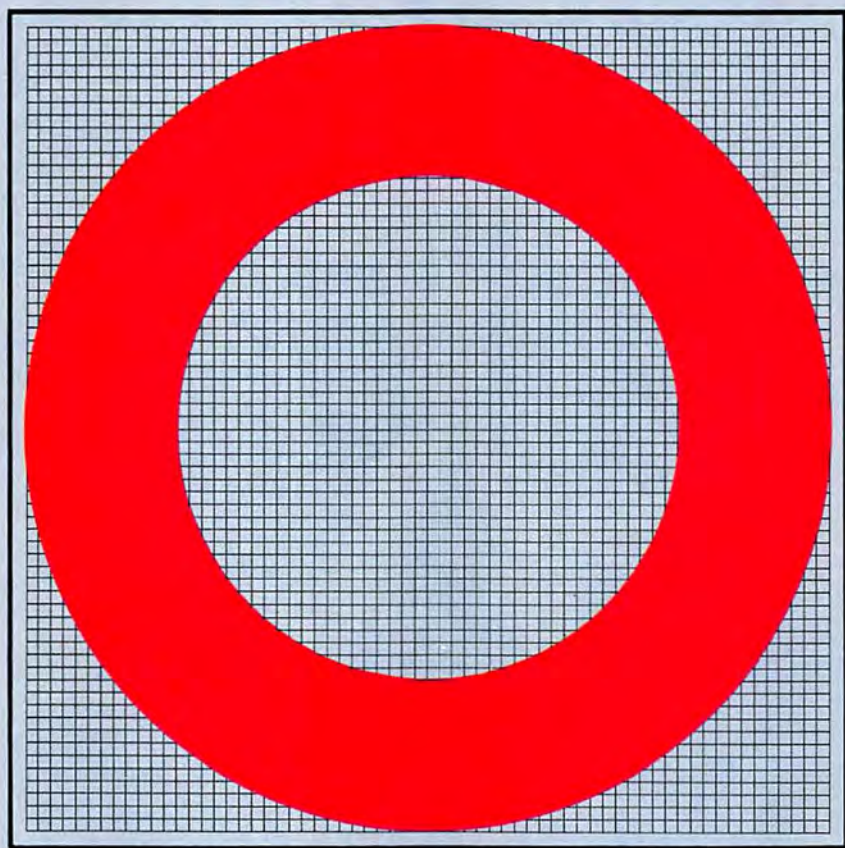
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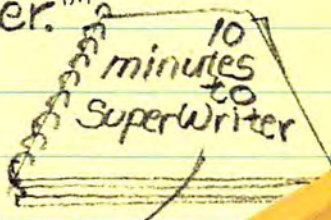
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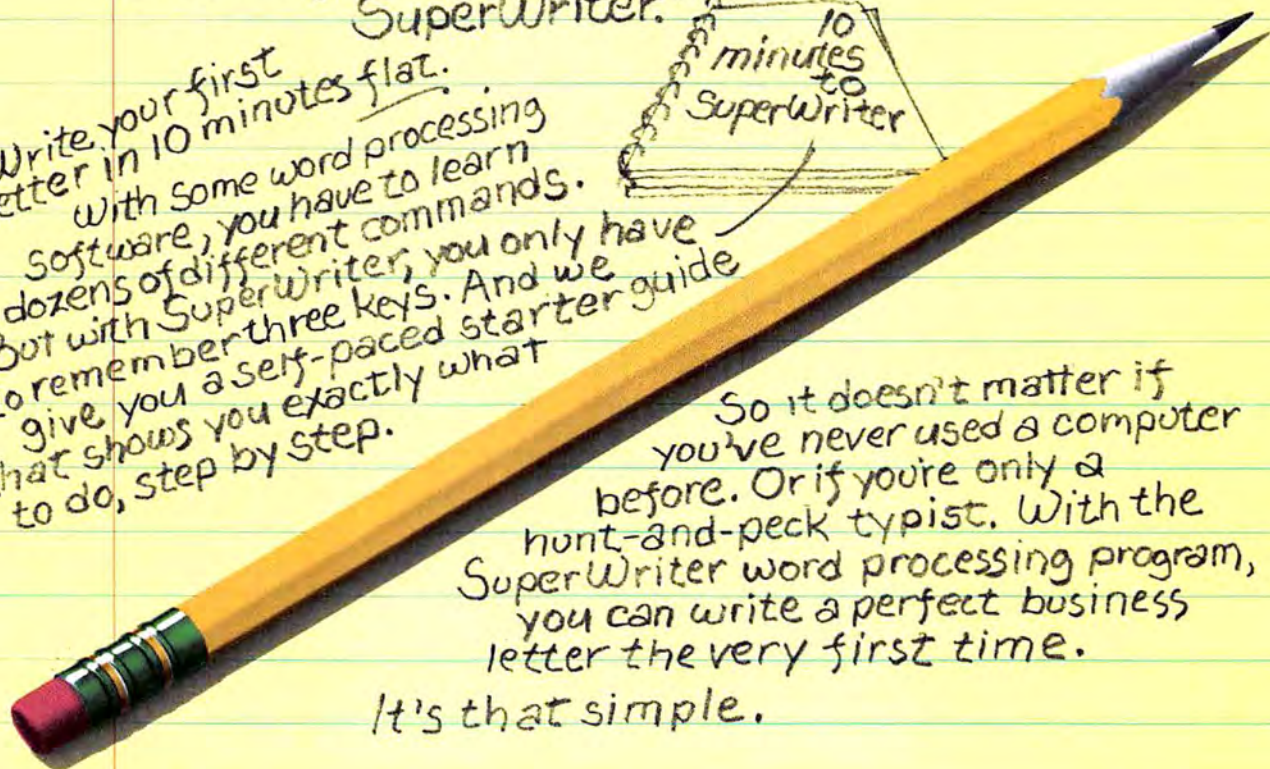
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# PC WORLD

*The Personal Computer Magazine for  
IBM PCs and Compatibles*

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There's a world of information just waiting for you. But to use it, study it, enjoy it and profit from it, you first have to get at it.

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On the other end of the phone lines are independent information services\* ready for you to access from your home, school, lab or office. So, in minutes, you can tap the resources of over a thousand data bases — and plug into a world of possibilities.

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In the lab, you can call up a wealth of mathematical and statistical programs or retrieve scientific and technological data.

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## **A tool for modern times**

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Mr. Robert A. Smith  
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Dear Mr. Smith:

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looking forward to seeing you in person.

As you requested, I have with your corporate  
letter to me the enclosed to have you to  
be able to see the project and complete all the  
details in one trip before you leave for your  
work in Boston.

Thank you for your interest in the 1000 HARRY STREET project.  
I am looking forward to seeing you in person.

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# Introducing the new TI 855. It's two of the best printers we've ever made.

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## **Easy-to-use font modules.**

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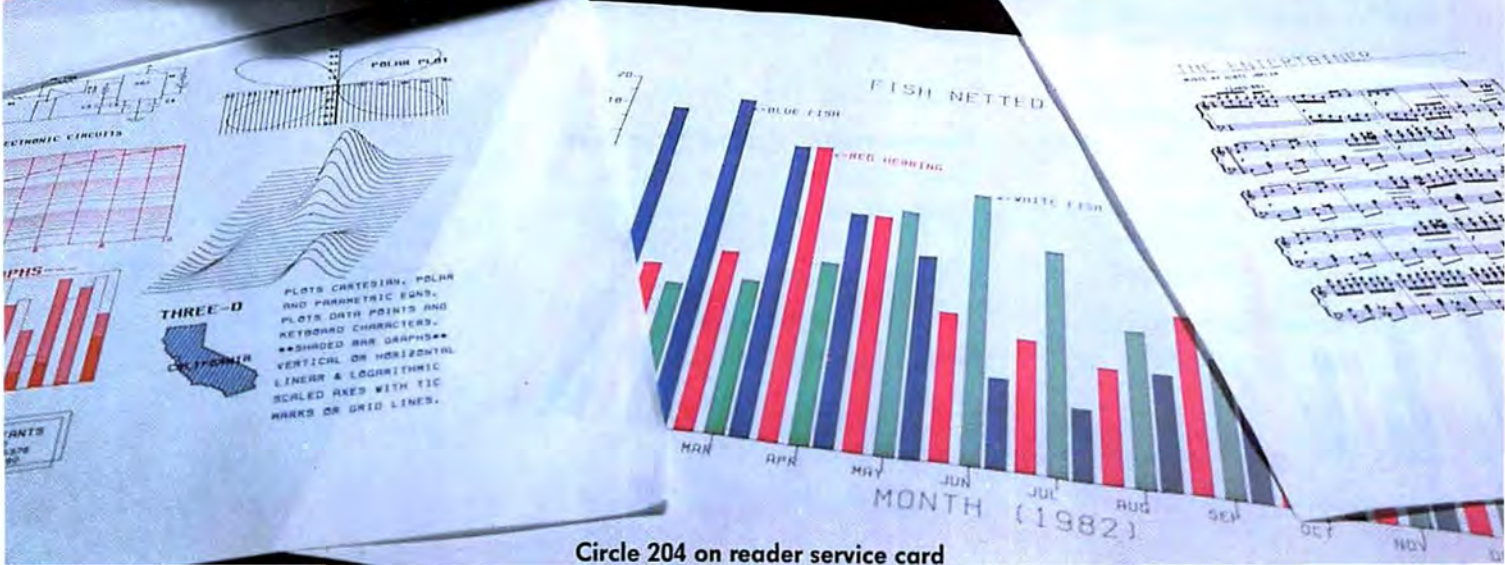
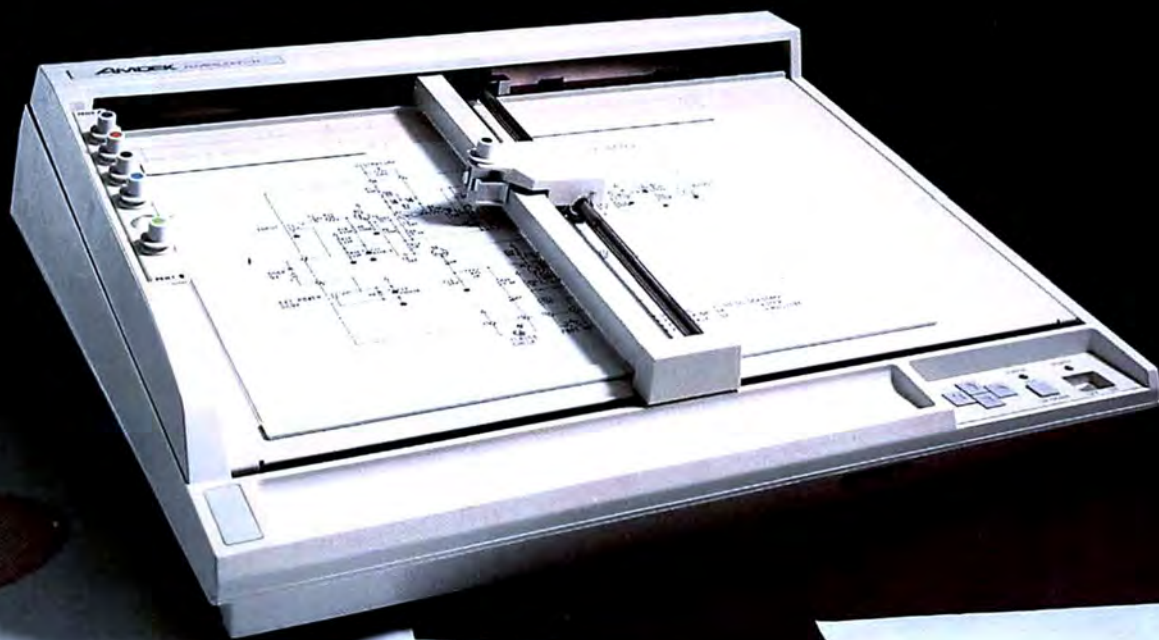
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# The First Personal Computer

Popular mythology has it that the first personal computer was the Altair 8800, introduced in January 1975 by MITS, Inc., an Albuquerque, New Mexico, hobbyist electronics firm. The Altair computer's impact on hobbyists and then businesses and the subsequent series of amazing developments that resulted from its existence in many ways created a blueprint for the more successful and numerous personal computers that were to come, including the Apple II and the IBM Personal Computer.

Like the IBM PC, the Altair had a motherboard with an open bus structure that made it very simple for MITS and third-party suppliers to provide circuit boards for extra memory, interfacing to peripherals, communications, and color graphics. And like the IBM PC, the Altair was widely imitated. At one time over 100 Altair-compatible PCs (aka S-100s) were on the market.

However, the Age of Altair was performed on a much smaller stage than today's PC Revolution. Whereas the IBM PC is distributed in the United States through more than 1000 retail outlets as well as marketed directly to corporations by IBM's massive direct sales force, Altair Computer Centers never numbered more than 20, and MITS's direct sales force was one guy in Los Angeles who worked out of his house and drove up and down the West



Coast in the company Ford station wagon.

As you'll learn from reading the Charles Simonyi interview, "From Bravo to Bandwidth," in this issue, there was at least one serious contender to the Altair throne. As Simonyi says, "In my opinion, the Alto was the first real personal computer. It had 128K of memory...a bit-mapped screen...a dedicated keyboard...and the mouse. It was all there in 1973."

The Alto was the invention of a group of computer scientists who in the late '60s and early '70s worked pretty much unrestricted at Xerox's Palo Alto Research Center. It marked the beginning of an approach to user interface design that will finally come to fruition in 1984 with Apple's Lisa and Macintosh and VisiCorp's Visi/ON.

Xerox, though it used this technology in the Star computer and in a

limited way in its 860 word processor, never really capitalized on these inventions. Xerox had no way of knowing in 1972 that it had a 10-year technological advantage in a market that wouldn't start until 1975. Never mind that they could have created that market themselves.

Technology isn't the only ingredient needed to make a technological revolution. When the Altair was first introduced, there were no personal computer stores, personal computer trade shows, personal computer magazines, or user groups. The industry infrastructure had to be created along with the products.

The Age of Altair was as much a marketing and sociological revolution as anything else. The same goes for the IBM PC—several personal computers on today's market have better technical specs.

Thus, the Alto wasn't a personal computer at all. By definition, personal computers must be available and affordable to a large number of people. Sophisticated toys in the hands of scientists don't count.

But then I am rather biased on this subject because, along with Bill Gates and Paul Allen of Microsoft and Edie Currie of Lifeboat Associates, I was at MITS during the Age of Altair. We didn't know a thing about the Alto in those days. As far as we were concerned, we were the only guys on the block. ●





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# Information Toxicity

Much has been written recently about computerphobia and the adjustment pains people experience after getting their first computer. Yet little has been said about the folks on the other side of the coin: the computerphiles who are consumed by their machines. For these people the PC becomes a combination tool, toy, and lover.

A question on computer addiction tipped me off about the seriousness of the problem. "How many pounds per week do you read?" a friend quasi-humorously asked about how much computer-related matter I consumed. He was trying to show just how addicted he had become to computer books, magazines, newspapers, press releases, and most of all, to his PC. This offhand question prodded several colleagues and me to ask others we knew about their addictions. Their replies amazed us.

One man often arrives home from work at 6 p.m. and promptly goes to his PC to dial up bulletin boards, usually until 2 or 3 in the morning (he rarely sees his family anymore). Another person, a voracious reader of computer matter, recited the exact dates that *PC World*, *PC*, *BYTE*, *InfoWorld*, and *SoftTalk* appear on the newsstand. He is at the newsstand on exactly these dates to buy these magazines. He refuses to obtain subscrip-



tions though, since "the newsstand gets them 2 or 3 days before I could get them in the mail."

Could these responses indicate that the dark side of the computer revolution is emerging? These glimpses into the lives of computer owners have alerted us to a new, insidious addiction and to an accompanying type of mental distress that we call Information Toxicity Syndrome. If you're concerned, take note: here are some of the signs and symptoms of "Infotox."

A "revved-up" state called "hypomania." It's accompanied by hyperactivity, disorganization of thoughts and physical activity, and feelings of

"grandiosity." You may continually be brainstorming the next *VisiCalc*, poring over ads in *PC World* for additions that make your PC run 2 percent faster or enable you to do 20 jobs at once (as if you could keep up with even 1) or figuring out exactly how to give up your profession of 20 years in order to make the jump into computer consulting (while it's still hot).

*Compulsive thinking about microcomputers, program applications, and code.* If you have Infotox, you may even have periods of inarticulateness or muteness while your thoughts are on loops, data base structures, recursive paths, forecasts, or your latest formatting problem.

*Distortions of personal relationships.* The computer widow phenomenon is commonly reported. Also, friends and lovers of people with Infotox tell of frustration when they try to "relate" (in the California sense of the word) to the victim. If you're afflicted with Infotox, you may be less capable of processing nonverbal and emotional cues from others.

*A feeling of never catching up with your computer work.* You may find yourself doing work you didn't do before and probably don't need to do now, but do only because so many things are possible with the computer. You may be figuring "what if"



## REMark

projections through 2083, redoing memos and manuscripts to edit out the very last typo, or putting your household accounts on the computer when, in fact, you go through a book of checks once every 5 years. If you are a computer pro, you feel compelled to attend virtually every computer show in your area (you might miss knowing about DOS 2.0005!).

Not every computerphile gets Infotox. Certainly, Infotox shares some characteristics with other addictions, to which certain people may be more susceptible than others. And as with many addictions there is an up phase followed by a crash. In the "infomania" stage of the syndrome things seem to be great, but once toxicity sets in, you may feel depleted, exhausted, or burned out. You may develop psychosomatic symptoms (I think CRT-related eyestrain is actually related to Infotox), and you may even get a bit paranoid ("Everybody wants to steal my program").

Why does Infotox occur? Several factors in the computer information revolution cause Infotox:

*The amount of information produced.* A cognitive scientist at Bell Labs recently estimated that the typical Sunday edition of the *New York Times* contains more information than the average sixteenth-century European absorbed in a lifetime. Although more information is being produced now than at any time in history, no one knows how to integrate it usefully. So we're forced to make decisions on increasingly smaller proportions of the available data.

*Confluence of work and play.* Part of the old Protestant work ethic is that you grind out work for money and then go home and play. And that keeps many of us in balance. But for those of us who have PCs, the dividing line between work and play is vague. Simply put, it becomes too easy to overwork. What implications

this may have for youngsters reared with computers—who go to summer computer camps and get degrees in computer science and jobs in computer-related fields—remain to be seen.

*Equation of information with knowledge.* A common complaint among teachers these days is that students digest information but do not learn. By using computers students are able to do much more schoolwork and homework, but are they learning how to integrate and evaluate data? Clearly, knowledge is not knowing little bits of information (binary or otherwise), but rather organizing these bits meaningfully. Mistaking knowledge for information-handling skills is a grievous error and makes students easy marks for Infotox.

*Reinforcement without reward.* Behavioral psychologist B. F. Skinner spoke of things that are reinforcing (they keep us doing things to get them) but not nutritive. The sweet tooth that in our arboreal days kept us nourished with vitamin C is now satisfied by Hostess Twinkies, saccharin beverages, and Haagen-Dazs ice cream—things that taste good but probably do not prolong life. The proliferation of TV channels provided by cable TV, along with statistics showing increased viewership, have done nothing for the continual complaint that nothing on TV is worth watching. Ditto in the computer revolution. Our PCs make producing greater amounts of information easier, but to what goal? Who will really read it all? And what will be worthwhile to read?

*Rapidity of change.* Microcomputer technology is developing so fast that a newly introduced machine is already obsolete. The same can be said for software. As a user you're forced to learn increasing amounts of information in order to stay even with developments in computers in general and your applications in particular. The need for hardware compatibility standards has been much ballyhooed, but probably more needed now are compatibility stan-

dards for software. Only when people do not have to learn new operating systems and command structures for their word processors, spreadsheets, and statistics and accounting programs will they accept new software without undue Infotox.

Data on Infotox is almost nonexistent since the malady has largely gone unrecognized. Nor do we know what kind of treatment is best. It could be that some sort of Infotox Anonymous will be necessary for intractable cases. If you're feeling the initial effects, here are a few suggestions:

- Decide before you sit down to work on a task how much time you want to spend on it. When that time elapses, stop!

- Decide ahead of time at what level of perfection or completeness you are willing to call a task finished and then stop.

- Structure small goals within a task. Then, when you reach each small goal, take a break and do something else to reward yourself—anything you enjoy that is unrelated to computers (Voltaire would have suggested gardening).

- Plan activities each day that have nothing to do with computers.

These steps can alleviate some of the acute symptoms on an individual basis. But what of the societal implications of Infotox? My own opinion is that they'll run wide and deep, that the bottleneck in the information revolution will not be hardware or software but the human being, and that we all need to do some perspective-taking as we adjust ourselves in order to fit these remarkable, infernal machines into our lives. ☸

---

*Alan J. Fridlund, Ph.D., is a clinical psychophysicologist at the Martinez Veterans Administration Medical Center in Martinez, California, and an assistant professor of psychology at the California School of Professional Psychology in Berkeley.*



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# Letters

## Standards Note

In the article "Programming Sound in BASIC" [PCW, Vol. 1, No. 4], the author seems to be giving the computer certain definitions inconsistent with those already accepted throughout the musical world.

Almost 100 years ago, in 1889, at a conference held in Vienna, A-440 was established as international or concert pitch. This standard was not adopted as standard pitch for the American musical industries until 1925. In 1936 it was adopted by the American Standards Association and 3 years later by an international commission representing the principal European countries. It is, therefore, the pitch to which all piano tuners must conform when conformity is not actually impossible. No other pitch has any standing today. The key on the piano that is tuned to 440 Hz is A<sub>49</sub>, a major sixth or nine semitones above middle C. The note number assigned to middle C is, therefore, 40 (49-9) and its frequency is

$$F_{40} = 440 \times 2^{-9/12} \\ = 261.63 \text{ Hz}$$

This, of course, assumes equal temperament. Prior to the adoption of 440 Hz as standard pitch, about 50 or more years ago, pianos were tuned to C-256, which put A<sub>49</sub> at 430.54 Hz. In fact, *The New Grove Dictionary of Music and Musicians* defines middle C as a "colloquial name for the note whose pitch is 256 Hz."

Why then should we teach our computers that middle C is 523.25 Hz, a frequency one octave above that which is generally accepted?

One might quip, So what? or Who cares? After all, it's only a matter of semantics. The point is that it is wrong. All the frequencies listed in Figure 14-1 are off by a factor of 2 as a direct consequence of that fundamental error.

Also, as long as the computer is the newcomer to the musical world, why can't it use the numbering system already assigned to the notes? For example, the C in Octave 0 that is assigned the number 1 in Figure 14-3 has already been assigned the number 4 in the standard musical world. If N<sub>s</sub> represents the standard number assigned to any given note, and N<sub>c</sub> is the computerized number assigned as shown in Figure 14-3, the relationship between N<sub>s</sub> and N<sub>c</sub> is given by  $N_s = N_c + 3$

It seems to me that with the versatility inherent in computers, the computerized numbering system should be completely arbitrary and could just as easily have been N<sub>s</sub> = N<sub>c</sub>. Why start the computer off in a new field of endeavor by giving it definitions and terminology inconsistent with definitions and terminology already widely in use and accepted as standard throughout the musical world?

Jay McElwain  
Clay, New York

## Hardware IDs for PCs

I've lost track of how many articles and letters I've read concerning the protection of copyrighted software. Charles Kelly's *REMark* column [PCW, Vol. 1, No. 3] and George Weiss's and Chet Floyd's replies [PCW, *Letters*, Vol. 1, No. 5] prompt me to offer a solution that has yet to be discussed in your magazine.

It should be apparent to everyone by now that truly viable software protection cannot be accomplished via software alone. What we need is a CPU serial number encoded into each and every PC. Think about it for a minute. Each PC would be uniquely identified to the entire world. Program authors would simply compare this ID with an encrypted version embedded in the program just prior to delivery. Consider the advantages.

Users could make as many copies as they want on whatever medium they choose. The program could reside on floppy, hard, or laser disk, bubble memory, cassette, whatever. Unauthorized distribution would no longer benefit anyone. The key to unlocking the software would reside on one machine only. How many users do you think would buy an expensive ROM-burner just to jimmy their serial number? It would be cheaper simply to buy the software.

There are a number of disadvantages to this idea. The cost of an ID would not be small. Hardware manufacturers would have to be convinced that it would be in their interests to offer this feature, even though doing so would inevitably increase the price of their machines. Though users would have the most to lose, only the dishonest would lose; the honest users gain portability and ease of backup for their programs.

The process of buying software would be completely altered, since no one could sell you any program without first knowing your serial number.



## Letters

The cost of distribution would increase somewhat, since mail-order houses and local vendors would have to be equipped with installation programs (which would be authorized to run on their machines only).

This leads us to yet another advantage. The incidence of computer theft is on the rise. But who would want a hot PC, since merely ordering any new software would expose the fact that it was stolen? A list of stolen machines could be checked before a vendor sold a program.

Since programmers would get paid for each program being used, the cost of software would drop dramatically. Programmers could concentrate on providing computing power instead of spinning their wheels trying to solve the ultimately impossible copy-protection problem.

In spite of the difficulties involved, it seems to me that the benefits of a hardware ID far outweigh the disadvantages. After all, this is how business is done on Big Blue's mainframes. Wouldn't it be better to band together to convince IBM and other manufacturers to provide this feature rather than playing the frustrating and futile game of copy protection?

Chris A. Rivers

Oakland, California

*Building an ID number into the computer may seem an ideal solution, but as with other copy-protection techniques it has several significant flaws.*

*Any programmer who has access to two or more legitimate copies of a program protected in this manner could easily compare the programs to determine the location of the ID number and replace it with a new value. Furthermore, it is only slightly*

*more difficult to modify the program to bypass the ID-checking algorithm completely. Finally, consider the impact of loss or failure of your "authorized" computer. ID-protected software would be useless on a machine that could otherwise be used as a replacement.—Ed.*

### Cross-Referenced Indexes

I am an avid and thorough reader of your magazine. I find the articles and advertisements most informative.

A major problem arises a couple of weeks after I finish reading an issue. I remember having read an article, letter, or other tidbit of helpful information, but can't remember in which issue of *PC World* it was. I can now locate the advertisements in both the Products Index and the Advertisers Index, but unfortunately no such index exists for articles, letters, and other feature columns.

I recommend that you establish an index of articles, cross-referenced in a number of ways (for example, Reviews, Spreadsheets, WordStar, Communications, Graphics, Books, etc.). The index should also classify letters and other features. The index need not be published monthly—less frequent intervals would be okay, as most memories can span at least 2 months. I think this index would be a most helpful addition to your magazine and would be a great service to readers.

Morris W. Stemp

New York, New York

*Look for PC World's first annual index in our December issue.—Ed.*

### The Best Things in Life

As a user of an IBM PC who would like to tie into large computers, I found "The Communicators" [*PCW*, Vol. 1, No. 5] interesting as well as helpful. The article did, however, leave a few questions unanswered. It stated that there are "over 20 commercially available [communication] packages and 5 public domain packages." After searching this magazine and querying a number of my colleagues, I am still at a loss for information leading to the acquisition of public domain software.

Any information that would help locate public software would be greatly appreciated.

Barry Straight

Cortland, New York

*The best contacts for public domain software are bulletin board services and user groups. See BBS Watch and User Group Dispatch for lists of resources in your area.—Ed.*

### The Perfect 10

Our small college-prep high school recently purchased 20 IBM PCs to bring our students up to computer literacy. I'd like to propose an open question to all interested readers: What topics would you recommend for us to cover in our introductory computer literacy class?

Specifically, how would you rate (10 = mandatory, 0 = no way) the importance of learning the following: PC-DOS, other DOS, BASIC, Logo, graphics, word processing, telecommunications, games, ethics (unauthorized copying of software, etc.), other?



# WordPerfect



**A word processor should be an extension of your mind.**

A good word processor should feel comfortable, and let you put your thoughts down quickly, almost effortlessly. It should have automatic everything, and include footnotes, merge, columns and math. The screen should be uncluttered and give you an honest view of your text without annoying codes.

WordPerfect does all this and has proven itself at places like Harvard, RCA, State Farm, and Texaco. The software is well documented, is guaranteed, and is available for immediate delivery.

Available on Data General, IBM PC, Victor 9000 and Zenith Z-100 — with others to be announced soon.

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Circle 165 on reader service card



## Letters

I invite all *PC World* readers to write a brief outline of topics that they wish could be taught in today's computer literacy class. Also, I invite comments on the best languages to teach in higher level courses.

I will summarize the results and report back to *PC World* within 2 months if the editors think the information is generally useful. Otherwise, if you include a self-addressed, stamped envelope, I'll mail the results to you. Thanks for the input.

*Ray Marchese  
Lick-Wilmerding High School  
755 Ocean Ave.  
San Francisco, CA 94112*

### The IBM Influence

I really get upset when I look at what is being written today about the issue of "IBM compatibility." Where does IBM get the right to be the standard? If we continue to let the IBM Personal Computer dictate what the rest of the microcomputer industry must be like, we are seriously hampering the industry. Historically, IBM has been a company not willing to listen to anyone else once they decide to do something. They tend to act like snobbish dictators, going about things in their own twisted way.

IBM doesn't seem to care if they are implementing things correctly, as long as they can make the most amount of money possible. They do not guard the interests of the industry in general. There is no reason we should allow IBM to foul up the microcomputer industry as they have yellowed mainframe computers.

IBM is not an entity that should be trusted to lead the microcomputer industry. There should be one set standard to which even the great IBM would have to conform. This standard should not be set by any one company but rather by a collection of parties industrywide. Software and hardware originators should be bound to that standard if they wish their products to be transportable throughout the industry.

Consider hi-fi: the standard is set and everyone makes phonograph records the same way. Someone could, I suppose, make a record that would play from the spindle to the outside edge, but nobody would buy it. That idea came, was tried, and is gone—in favor of the standard. Computer hardware and software should be handled the same way. Like phonograph records, programs should be totally transportable from machine to machine regardless of the type.

It is really sad to see so many computer manufacturers on the run because everyone wants to be IBM PC compatible, and IBM sitting back taking it easy, not worrying about having to conform. The computer industry ought to file an antitrust suit against IBM and dethrone its unworthy king.

Why are people so blind that they can't see what IBM is getting away with? Why are we so dumb as to let them do it? Why can't we stick up for our right to the best computers humankind can produce, instead of letting this corporation further its

profits while not having to pay for them like the other guys?

Enter my vote for a national computer standard, set by an independent group of computer experts from the widest possible backgrounds.

*Paul R. Schoberg  
Reedley, California*

### And EF Hutton Says...

"EF Hutton Says No to PCs" is one of those headlines that the press never seems to tire of using—no matter how much in error it is [*PC World View*, PCW, Vol. 1, No. 5]. It is absolutely true that EF Hutton and Company is installing 350 Data General MV/4000 minicomputers. Valued at over \$40 million, this to our knowledge is the largest single order for computing equipment ever let out that is targeted at providing personal computing and office automation tools on an enterprise-wide basis. It is completely erroneous to depict that move as a "no" to personal computers. What it is is a resounding "yes!" to personal computing.

I'm continually amazed at how that fundamental issue is obscured by some misplaced zeal for the PC as a device, as opposed to the true goal of the PC user—effective personal computing. The stand-alone PC would not provide effective personal computing to our 5000 account executives (AE), since the problems that need to be resolved require that the device that the AE works with on a daily basis, his quotation terminal, be part of the solution.

So rather than throw out a device that the AE is very familiar with, is very reliable, and is a good terminal



# Even your favorite software can have annoying personal habits. Get ProKey.

If you're like most of us you probably own an IBM PC and a closetful of popular software. Maybe Wordstar, Visicalc, dBase II and a few others. And with each program comes its own peculiar protocol, commands and demands.

Suddenly you've become a personal slave to your personal computer.

Free yourself with ProKey.™

ProKey is unlike any other software because it operates just about any other software. So you can spend your time creatively while ProKey takes care of the tedious operational details. Silently, instantly, without errors.

ProKey can print spreadsheet tables, update databases, reformat reports and plot graphics and still leave you time to train for the triathlon or run out for a danish.

In fact, ProKey can memorize and execute anything you can type.

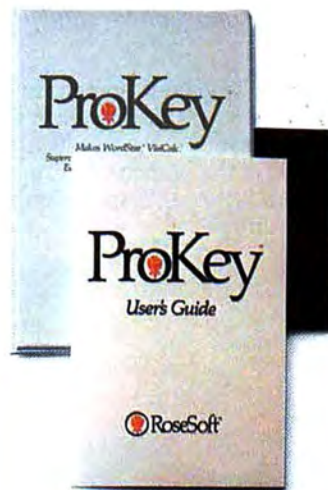
And no matter how extensive your software collection becomes ProKey controls them all, with one easy to remember protocol.

With all the time you save you'll be able to customize off-the-shelf software to your own personal or business requirements.

Ultimately you'll use ProKey as a "super-command center" operating your own software programs together to create a totally unique, incredibly creative system.

ProKey is available at most Computerland stores and wherever fine software is sold.

Once you use ProKey you'll never curse your cursor again.



RoseSoft, Inc.  
4710 University Way, N.E.  
Suite 601,  
Seattle, WA 98105  
(206) 524-2350

To run ProKey, you'll need an IBM Personal Computer or workalike DOS (any version, including 2.0), and 64K of RAM (WordStar requires 96K).

WordStar, VisiCalc and dBase II are trademarks, respectively, of Micro Pro, VisiCorp and Ashton-Tate.

Circle 162 on reader service card



Hank: Here's the report you've been waiting for. Hope you put your system on automatic and didn't wait up.



To all reps: Price changes on following items effective immediately: No. 10-111A, 10-114A, 10-AL.



Take that, bud. (And retaliate fast. I know phone rates are low now, but game's cutting into sack time.)



# Your computer's telephone. Hayes

Wouldn't it be great if, somehow, you could connect your computer to your accountant's, down the street? To the IBM\*\* PC at the branch office, upstate? Or to your favorite chess challenger, across country?

over ordinary phone lines, all across America.

But any modem will send and receive data.

Smartmodems also dial, answer and disconnect calls. Automatically. Without going through the telephone receiver, making them far superior to acoustic coupler modems.

**Choose your speed; choose your price.** The lower-priced Smartmodem 300 is ideal for local data swaps and communicates at 300 bps. For longer distance and larger volumes, Smartmodem 1200 communicates at 1200 bps or up to 300 bps, with a built-in selector that automatically detects transmission speeds.

Both work with rotary dials, Touch-Tone\* and key-set systems; connect to most timesharing systems; and feature an audio speaker.

Either Smartmodem is a perfect match for many different computers. And if you have an IBM PC, Hayes also provides the perfect communications software.

**Smartcom II™** We spent a lot of time developing our software, so you can spend less time using it. Smartcom II prompts you in the simple steps required to create, send, receive, display, list, name and re-name files. It even receives data completely unattended—especially helpful when you're sending work from home to office, or vice versa.

And if you need it, there's always "help." One of several special functions assigned to IBM function keys, this feature explains prompts, messages, etc. to make communicating extra easy.

With Smartcom II, it is. The program remembers communication parameters for 26 different remote systems. Just punch a key, you're all set.

You can treat dial-up and log-on sequences the same way. In fact, Smartcom II comes with codes already set up for four popular information services. COMPUSERVE® DIALOG'S KNOWLEDGE INDEX™ DOW JONES NEWS/RETRIEVAL® SERVICE, and THE SOURCE™ AMERICA'S INFORMATION UTILITY.™ Procedures for obtaining an account with each of the services are included in the Smartcom II manual. But that's not all.

**Special offers for Smartcom II**

owners! Dow Jones News/Retrieval Service has a special introductory offer for Smartcom II owners. By calling a toll-free number, they receive a free password and one free hour of service anytime after 6:01 p.m., local time.

You'll also be entitled to a valuable



With a telecomputing system by Hayes, you can.

Quickly. Easily. And for the price of a phone call.

**Hayes Smartmodem. Think of it as your computer's telephone.** Hayes Smartmodem 300, and the faster Smartmodem 1200, work with any computer with an RS-232 I/O port. They allow you to communicate,





Welcome to TELEMAIL! Your last access was Tuesday, Jan. 4, 1983 11:07 a.m. CHECK these bulletin boards: TELEMAIL...TELESOFT...



## Letters

in and of itself, and in the process be forced to develop emulation software to run on a PC that would enable the PC to provide all the service that we already have in place, we have decided that the optimal systems implementation would be to place a minicomputer in between all these existing terminals and the network.

This particular minicomputer, the MV/4000, is an extremely powerful processor with a class of even more powerful processors above it that we can grow into. In addition, the MV/4000 supports Data General's *Comprehensive Electronic Office* (CEO) package, which provides all the personal computing and office automation hooks and facilities available anywhere. Furthermore, there is a great deal of UNIX and CP/M software available today that runs on the MV/4000.

Lastly, for the few individuals who may have a specific business application that would not be efficient for EF Hutton to make available on a firm-wide basis through the system described above, there are hooks available in the MV/4000 that allow an individual to attach the IBM PC in terminal-emulation mode. This facility has been part of our systems planning since we began developing the plan in 1981.

Bottom line? EF Hutton and Company is making an extremely clear statement about its commitment to personal computing. We will accomplish that objective in the most systematic and efficient way possible—whether that be PCs or 3081s.

Vincent T. Pica II  
First Vice-president  
MIS Operations, EF Hutton  
New York, New York

### Lookup Lookout

I enjoyed your article "Tracking Bulls and Bears" [PCW, Vol. 1, No. 4]. It certainly gave me a workout on the Lookup function.

I am sure that you have had hundreds of letters calling the errors in the Lookup table to your attention. I have two other programs for days between dates, and they showed me that I was not getting correct results. I never suspected that the error was in the tables. I was trying to find an error that I had made.

James H. Fraser  
San Diego, California

*Thank you very much for your letter. My face, of course, is red. But I was happy to learn that you were able to correct the errors and get the worksheet running smoothly.—Andrew T. Williams*

*For those who didn't find the errors in Table 3 (page 208), the numbers opposite each month in the Months Table should go from 1 for January to 12 for December, and the last year of the Leap Years table should be 1985, not 2062. The error produced slight variations in the days-between-dates calculations.*

*A convenience disk (error free!) containing the worksheet from "Tracking Bulls and Bears" is still available for \$10 from Andrew T. Williams, Keeping Track of Your Stocks, P.O. Box 9563, Berkeley, CA 94709. Please specify whether you would like it in SuperCalc (1 or 2), VisiCalc, Multiplan, or 1-2-3 form. The template is for those spreadsheets as they run on the IBM PC and compatible microcomputers.—Ed.*

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Like all our products, Smartcom II and both Hayes Smartmodems are backed by excellent



documentation and full support from us to your dealer.

So see him today. Break out of isolation. Get a telephone for your desktop computer.

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# THE CORONA PC'S<sup>TM</sup> ARE HERE.



The Corona PC's, desktop and portable, give you everything you've ever wanted in an IBM-compatible PC and more. For a great deal less.

#### **Compatible and more.**

The Corona PC is a 16-bit microcomputer based on the 8088 microprocessor, just like the IBM PC. And like the IBM PC, it runs any software that conforms to the IBM standard.

But unlike the IBM PC, the Corona PC comes with 128K of memory. Supports up to 512K on the main board. Includes a 320K floppy drive, a communication port, a printer port and an improved IBM PC keyboard.

Both the desktop and portable Corona PC's include high-resolution monitors and built-in graphics. Higher character definition makes both models easier to read, and our 640 x 325 pixel high-resolution graphics are over 60% better than the

IBM PC. It's a complete system, the standard for microcomputing in the IBM-compatible world.

#### **You can take it with you.**

And unlike IBM, we have a portable version.

Its high-resolution, high-contrast 9" display is easy to read. It has all the power and features of our desktop, but lets you take it to the office next door, across the country or just conveniently tuck it onto a corner of your desk.

#### **More expandability.**

You may never add a thing to your Corona PC because we've built in so much capability.

But just in case, we've built all the important components into the main system board, leaving the four expansion slots free. And provided an extra large power supply to support any capabilities you may want to add in the future.





### **RAM-disk for incredible speed.**

Our RAM-disk software lets you treat an area of your computer's memory as if it were a disk drive. So you can copy your programs and data into memory, then watch your work get done faster.

### **More software.**

The Corona PC includes the MS-DOS operating system and comes with GW-BASIC, the MultiMate<sup>1</sup> word processor and the PC Tutor<sup>2</sup> training course. So you can start being productive immediately.

And you can run Context MBA<sup>3</sup>, dBASE II<sup>4</sup>, LogiCalc<sup>5</sup> and LogiQuest<sup>5</sup>, the EasyFamily<sup>6</sup>, Wordstar<sup>7</sup> and the "Star" family, the SuperWare<sup>8</sup> series, T.I.M.<sup>9</sup>, the VisiSeries<sup>10</sup> and Perfect Series<sup>11</sup> of programs and most other popular software.

### **And it improves your bottom line.**

The Corona Portable PC™ is \$2,545, the desktop

version is \$2,595. Both about a thousand dollars less than the equivalent IBM PC.

For more information, contact Corona Data Systems, 31324 Via Colinas, Westlake Village, CA 91361. (213) 991-1144. Call (800) 621-6746 toll-free.

Or better yet, just grab your hat and head to the nearest Corona PC dealer for a very convincing demonstration.



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**Circle 48 on reader service card**



*With an AST Research Multifunction Board, you can realize the full potential of your IBM PC or PC-XT without wasting valuable slot space. By combining your memory and input/output requirements on a single card, you can take advantage of more of the capabilities IBM designed into the PC, while leaving space for future enhancements as they are introduced.*

## **AST Research Multifunction Boards can add the following features to your PC:**

- **User Memory from 64K to 512K** — When added to your existing system memory, brings your PC up to its maximum of 640K. This enables you to run larger spreadsheets, create larger in-memory databases, or you can use the additional memory along with the supplied AST SuperPak™ software for print spooling or for simulating floppy drives to increase your PC's throughput.
- **Serial Ports** — By connecting a modem to a serial (async) port, your PC can communicate with other computers over telephone lines. By connecting a serial printer, you can obtain high quality print output. Other serial devices such as a plotter or mouse may also be connected to a serial port. The PC allows for the installation of up to two serial ports.



**Number One Add-On Products for IBM PC**



**Number One Add-On Products for IBM PC**





Optional features may be added by the user at any time by installing an AST Research Upgrade Package.

All products come with extensive documentation as well as all necessary adapter cables.

	MEMORY	Serial Port 1	Serial Port 2	Clock	Printer Port	Game Port	Bus Extension
SixPakPlus	X	X		X	X	X	
MegaPlus II	X	X	X	X	X	X	X
I/O Plus II		X	X	X	X	X	
ComboPlus	X	X		X	X		
MP Expansion	X						

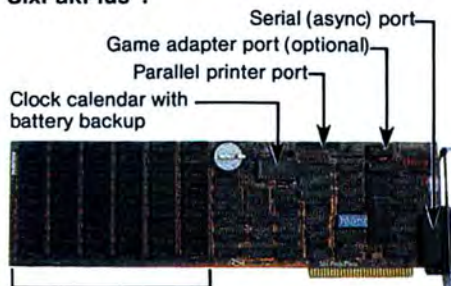
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## AST Research Micro-to-Mainframe Communications Products:

- **AST-SNA** — A family of five products that enable a PC to communicate with a mainframe via the IBM SNA protocol without the use of protocol converters.
- **AST-5251** — An interactive 5251 remote work station emulation package for use with the IBM System 34, 36, or 38.
- **AST-3780** — A hardware/software package which allows an IBM PC to communicate with a mainframe in 2780/3780 bisync protocol.
- **AST-BSC** — A hardware/software package that allows your IBM PC to provide all the features of a 3270 or 2770 terminal in bisync.
- **CC-232** — A programmable card that allows an IBM PC to communicate in async, bisync, SDLC or HDLC protocols.

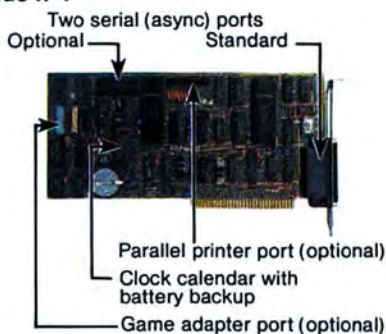


### SixPakPlus™:

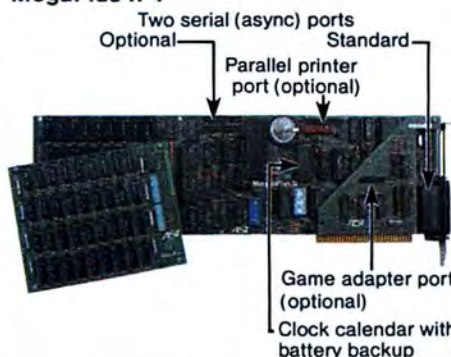


64K-384K of parity checked memory. Added to a PC or XT with a fully populated 256K system board, the SixPakPlus can bring the system memory to 640K, the maximum addressable user memory.

### I/O Plus II™:

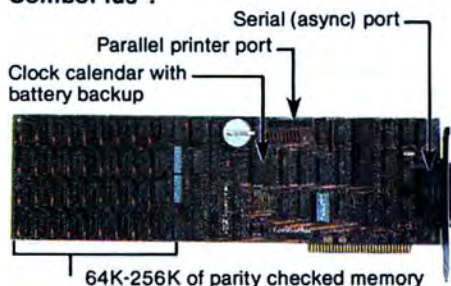


### MegaPlus II™:

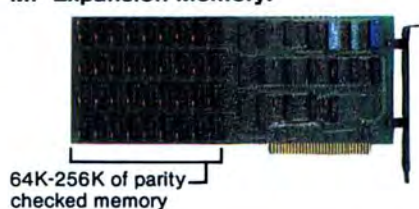


64K-512K of parity checked memory. The basic card expands to 256K, and with the MegaPak extension expands to an additional 128K or 256K of parity checked memory.

### ComboPlus™:



### MP Expansion Memory:



### AST-PCnet™:



- CSMA/CD 1 Mbps baseband Local Area Network
- Uses standard 75-ohm CATV coaxial cable capable of running up to 7,000 feet
- Interconnects multiple PC's (57,000 addressable limit)
- All PC-compatible disk drives and printers are shareable
- Networked access to mainframes via shared AST-3780
- Users can execute commands remotely on shared PC
- File lock-out
- DOS 1.1 and DOS 2.0 compatible

**AST  
RESEARCH INC.**

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• **Parallel Ports** — The parallel port is used for connecting a parallel printer to your PC. A parallel printer typically uses a dot-matrix output which is suitable for high-speed draft quality printouts. The PC allows for the installation of up to three parallel ports.

• **Clock-Calendar** — With the on board battery, the clock-calendar feature will maintain the correct date and time, even when the PC is turned off. This feature eliminates the need for typing in this information each time you power up your computer.

• **Game Adapter** — The game adapter port allows you to connect an IBM-type joystick to your PC so you can play the multitude of arcade-quality games which take full advantage of the PC's graphic capabilities. Or you

can use the joystick input for other applications by writing your own programs.

• **SuperPak™** — Every AST Research Multifunction Board comes with an AST SuperPak diskette containing programs for setting and accessing the clock, as well as SuperDrive™ and SuperSpool™, the most powerful RAM disk and print spooler available for PC-DOS. With SuperDrive you can use your PC's memory for simulating one to four floppy drives, from 20K to 360K each. SuperSpool allows you to set aside memory (from 4K to 512K) as a print buffer; SuperSpool sends output to the printer in the background while you execute your program in the foreground. With SuperDrive and SuperSpool, you can significantly improve your PC's operating speed.

• **Proven Compatibility** — All AST Research hardware and software products are 100% compatible with all versions of the PC and PC-XT as well as the Compaq and other PC look-alikes, and are 100% compatible with PC-DOS 1.1 and 2.0.

• **Warranty** — All AST Research products are backed with a one year limited warranty covering parts and labor with an optional paid second year warranty available.

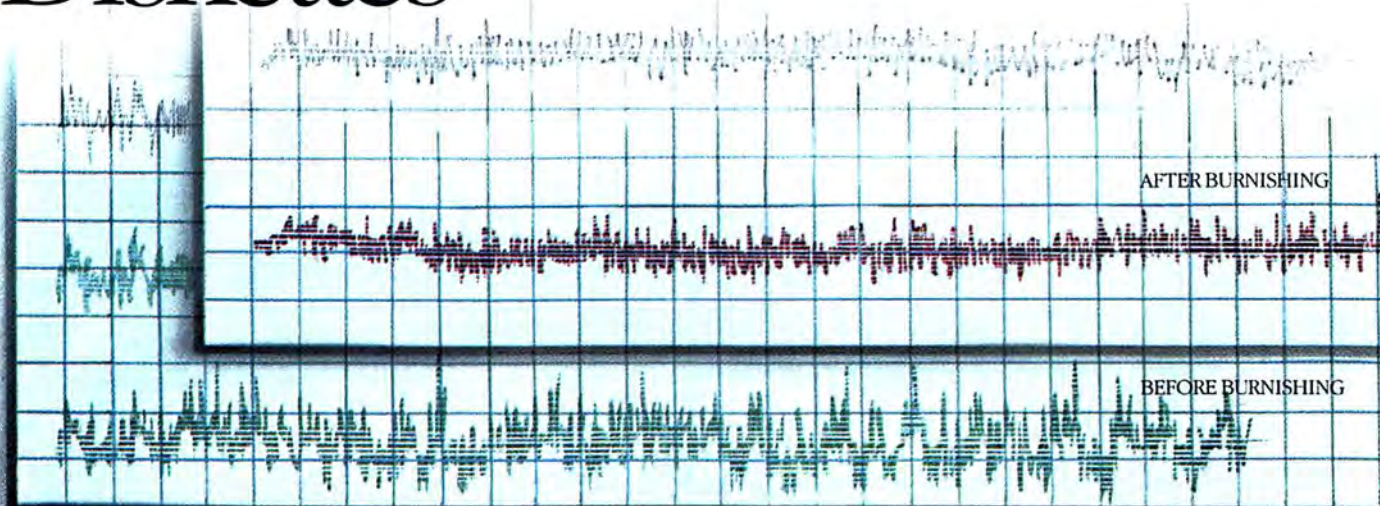
Of course, all AST Research Multifunction Boards come with the **AST "PLUS,"** our unsurpassed reputation for quality, reliability, after-the-sale support, and overall design excellence which give our products the best price/performance ratio in the industry!





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## Heads Above The Rest

### That's Why They're Quite a Bit Better

Dysan has taken conventional burnishing methods a bit further and developed a most advanced technique to assure optimum performance of your system.

Dysan's burnishing method and proprietary DY<sup>10</sup>™ lubricant makes the media surface so smooth that

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heads actually glide across the surface with optimum head-to-surface interface. That means precise recording, total system reliability, and protection of your floppy investment.

The true cost of a diskette is not just the purchase price, but the purchase price *plus* the time you spend to fully load the disc. That's a big investment and that's why Dysan goes a bit further to make diskettes which are the finest that money can buy.

#### Background:

Before burnishing, the surface of the media contains many microscopic peaks and valleys. Without proper burnishing, these tiny high points can interfere with read/write head interface which cause signal problems, surface abrasion, and debris accumulation. And that means poor system performance.

#### Other Benefits:

Dysan's "hands-off" auto-load certification system allows Dysan to test each and every diskette and eliminates any possibility of handling errors. Also, 100% surface testing both on *and* between the tracks guaran-

Circle 63 on reader service card



tees that every diskette is error-free. Plus, Dysan's proprietary DY<sup>10</sup> lubricant provides maximum head-to-surface compliance and prolongs diskette life. You can select from a complete line of premium 8" and 5¼" diskettes, single or double density, certified on one or both sides.

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# TWO

Second in a Series

Burnishing



# Pick up a SixPakPlus™ for your IBM® PC.

Introducing... SixPakPlus™, the refreshing new 384KB multi-function card! In response to the changing needs of the IBM PC and PC-XT marketplace, AST Research, Inc. is proud to announce the latest addition to our line of multifunction enhancement products, the SixPakPlus! This new product is the result of extensive marketing research into the needs of IBM PC users whether they have the original 64K system board, the newer 256K system board, or the PC-XT. The SixPakPlus has been engineered to meet these needs at a competitive price while main-

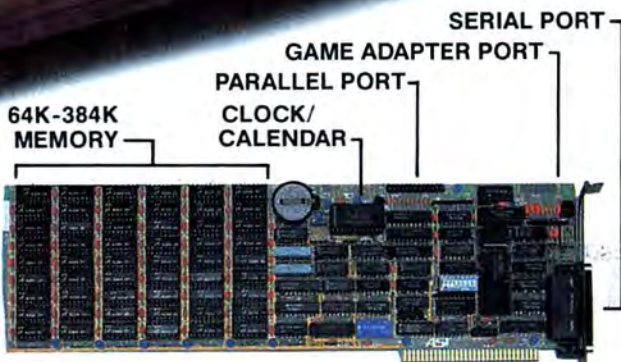
taining AST's high standards for quality and reliability.

The SixPak, as we like to call it, could have been named for the six banks of RAM on it. However, we like to think that it was named for the six functions of the card. The features of the SixPak include:

1. RAM memory starting at 64K, user-expandable in 64K increments to 384K. This makes the SixPak ideal for the PC or PC-XT with a 256K system board; 384K on a SixPak added to 256K on the system board yields 640K, the maximum addressable user memory in these systems.
2. One Serial (async) communications port, configurable as either COM1 or COM2, for use with serial printers, modems, a "mouse," and other serial devices. The serial port has on-board jumpers for easy management of the RS-232C lines, simplifying the wiring of cables in many installations.
3. One Parallel (printer) port, configurable as LPT1 or LPT2 (LPT2 or LPT3 when the IBM monochrome card is installed), for use with the IBM/Epson and other compatible printers. The port is compatible with IBM diagnostics.
4. A Clock-Calendar with battery backup, featuring an easily replaceable Lithium battery and a quartz-controlled timebase for a high degree of accuracy.
5. An optional IBM-compatible Game Adapter port, for use with an IBM-type joystick. In conjunction with application programming, this game port may be used for cursor control, in generating graphics or for playing games at the end of your work day!
6. Every SixPak comes with an AST SuperPak utility diskette which includes SuperDrive and SuperSpool, the most powerful disk emulator and print spooler software you can get. These programs will greatly enhance the throughput of your PC or PC-XT by emulating disk drive and printer access at RAM speeds rather than the normal slower speed of mechanical devices. SuperPak is the first of such software to be compatible with both DOS 1.1 and DOS 2.0.

Most important of all, the SixPak comes with the AST "Plus," AST's unsurpassed reputation for quality, reliability, after-the-sale support, and overall design excellence that gives our products the best price/performance ratio in the industry! Hence the name, SixPakPlus!

AST products are available from Computerland, Entre', ComputerMart, and selected dealers worldwide. Call factory if your dealer does not have the AST products you want.



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PC Tutor makes learning easier, faster, cheaper.

Requires 64KB, 1 double-sided diskette drive, an 80-character display and MS-DOS.

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# From Bravo to Bandwidth

*Edited by Andrew Fluegelman*

Charles Simonyi, Microsoft Corporation's manager of the Multi-Tools Group, is one of several alumni of the Xerox Palo Alto Research Center who are now influencing how we'll relate to the computer programs of the future. *PC World* Editor-in-Chief Andrew Fluegelman spoke with him about the origins of computer interface theory and the directions in which that theory may be headed. What follows is a portion of that thought-provoking conversation.

*PCW: Can you begin by describing the route that brought you to Microsoft?*

CS: I was working at Berkeley Computer Corporation when the Xerox Research Center was started, and I was in the core group recruited by Bob Taylor. Bob is

---

The Alto was the first real personal computer.

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often described as a "people collector," and many people at Berkeley Computer became part of his collection at the Xerox labs. It was fortuitous that I was there at the time.

*PCW: When was that?*

CS: In 1972.

*PCW: What work did you do there?*

CS: I took part in a number of projects, but probably the most important was the *Bravo* editor that was built for the Alto computer. *Bravo* was perhaps the first see-what-you-get-type editing system with a mouse and...

*PCW: It had a mouse even back then?*

CS: Absolutely. In my opinion, the Alto was the first real personal computer. It had a microprogrammable processor—not very special, but a reasonable processor. It had 128K bytes of memory, an 8½- by 11-inch bit-mapped screen, and a dedicated keyboard, which means that no decisions were made at the hardware level for what the keyboard could or could not do. And the mouse. It was all there in 1973.

*PCW: How did the Alto get its name?*

CS: It was named for Palo Alto, California, where the Center was located.

*PCW: And how were you involved with Bravo?*

CS: I was doing my thesis in software productivity, and as part of the thesis I was able to hire some people and build a program. That program happened to be the first little *Bravo*.

*PCW: What was Bravo like?*

CS: It was really quite nice, even by today's standards. I guess the Xerox Star and Apple's Lisa would have the only present-day examples of the kind of editing that *Bravo* could perform. Obviously, Lisa and the Star have much more, but just in terms of the text editing—how you select things and how you can make something bold and immediately display it as bold on the screen—*Bravo* was the first of its kind.

*PCW: What other things did Bravo have that hadn't existed before?*

CS: I think that the ability to show what you get on the screen with high precision and the simplicity of using the mouse were its most important features. Everything else was pretty much secondary.







## ● State of the Art

PCW: *What was the command selection like? Did it have menus?*

CS: The early version of *Bravo* did not have menus at all. A later version called *Bravo X* had a menu similar to the Star's. It had menus of words on the screen, and you pointed at the words to activate a program. *Bravo X* was quite a modern program for its time.

PCW: *What was Bravo used for?*

CS: It was built for a particular reason. In 1977 Xerox was interested in making early market probes with the Alto in the hopes of preparing for the Star or whatever was to come next. The early Alto models went to the seven top officers of the corporation, including the chairman of the board and the president. In addition, the chairman of the board was somewhat involved with Washington at the time, so we got to install some Altos in the Senate, the House of Representatives, and even in the White House. We had more than a dozen Altos in Washington, all running *Bravo X*.

PCW: *And what happened with them?*

CS: I don't know. I think they were running there for about 2 or 3 years. Somebody told me that they are still there.

PCW: *Why didn't Alto take off? Why don't we see Altos everywhere?*

CS: Alto was a research prototype. The technology in it wasn't quite up to date, and it wasn't a very cost-effective machine. I don't know the exact price, but you were talking about \$20,000 to \$30,000 per machine.

PCW: *Was that price based on how much was in it, the limitations of the technology at the time, or the fact that it was not produced in large quantities?*

CS: All three—remember, the purpose of the project was to develop the software. When somebody suggested that we build 50 Altos, the guy was roundly ridiculed. We ended up building 1500 in two models [Alto 1 and 2], but it was always, "Let's build 20 more; let's build 20 more." So 1500 machines were built without any economies of scale.

PCW: *Who worked on the project?*

CS: Ed McCreight, Chuck Thacker, and Butler Lampson were the primary designers of the hardware and software. They're still at Xerox, but Alto produced an immense number of notable graduates.

PCW: *Can you name a few?*

CS: Alan Kay, now the chief scientist at Atari, was a primary force in the whole Alto project. Reengineering of the Alto 2 was done by John Ellenby, who is now the chairman of Grid. Bob Metcalfe, the father of Ethernet who is currently the chairman of 3Com, was working there. Ben Wegbreit, who is vice-president of sales at Convergent Technologies, was there, as was Larry Tesler, one of the designers of Lisa.

PCW: *And the manager of Multi-Tools at Microsoft.*

CS: I was there too, yes.

PCW: *It's interesting to see ideas and features whose roots go back so far. In a way it's amazing that it's taken so long for them to appear in Microsoft's programs, at VisiCorp, and on Lisa. What caused the delay? Was the technology not ready or the market not ready?*

CS: It was more a matter of creating the right chemistry. Maybe the people who had a substantial stake in the ideas had to grow up. I don't mean in the sense of

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You're asking how to make a good menu, but it's more important to decide whether you should have a menu at all.

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years; actually, people were very mature at Xerox. But there was no one with the business experience and business vision to make things happen right away. Also, random connections had to be made—I had to meet Bill Gates, Larry Tesler had to meet Steve Jobs—there had to be a close coupling between the ideas and the business purpose.

PCW: *What was the average age of the people working on the Alto project?*

CS: The average age might have been 27 or 28, whereas at Microsoft now it's considerably younger.

PCW: *How old are you?*

CS: I'm 34, which makes me one of the oldest people at Microsoft. This is not a contest or anything, but in terms of age I'm one of the senior people in the technical community.

PCW: *What are some of the important principles you've carried forth from those Xerox days—in terms of, say, the style of the menus?*



CS: You're asking how to make a good menu, but it's more important to decide whether you should have a menu at all. Once you make that first decision, the second step is much easier.

I like the obvious analogy of a restaurant. Let's say I go to a French restaurant and I don't speak the language. It's a strange environment and I'm apprehensive. I'm afraid of making a fool of myself, so I'm kind of tense. Then a very imposing waiter comes over and starts addressing me in French. Suddenly, I've got clammy hands.

That's probably the same feeling the bookkeeper gets when he or she sits down at a computer. I never have those clammy hands at the computer, but I'm thinking of the French restaurant. What's the way out?

The way out is that I get the menu and point at something on the menu—I cannot go wrong. I may not get what I want—I might end up with snails—but at least I won't be embarrassed.

Because the menu gives all the choices, I at least see what the choices are, and I can at least point to one of them. But imagine if you had a French restaurant without a menu—that would be terrible.

It's the same thing with computer programs—you've got to have a menu. Menus are friendly because people know what their options are and they can select an option just by pointing. They do not have to look for something that they will not be able to find, and they don't have to type some command that might be wrong.

*PCW: You could take that analogy further; there are other possibilities. For instance, you could say, "These are our three specials. If you would like to see more, ask your waiter."*

CS: I don't want to go overboard on the analogy, but I know what you are driving at. When I got into the micro world, I realized that menu programs typically have many menus and that those menus are arranged in almost a mazelike fashion. It's a little bit like an adventure game—maybe adventure games came from those programs, or vice versa. At any rate, you typically have the print menu, the spelling menu, the edit menu, etc. Some of these programs have five, six, or seven menus, and to get from one menu to the other you press Control-C, for example. In fact, charts of those menus are published with different menus connected by channels, like charts of North America as viewed by a sixteenth-century explorer. One almost expects a little dragon to pop up somewhere and threaten you if you go the wrong way. That is crazy stuff. Those menus are supposed to be designed with some sort of efficiency in mind, but I really don't understand the theory behind them. If that was what your question was about, clearly, that's not the right way to do menus.

*PCW: What's your approach?*

CS: The Multi-Tool menus are all on one level. There's a menu from which you can choose a command. Unfortunately, you can't have all the commands on the main menu; you can use a subcommand, but you cannot traverse the branches of the tree. If you hit the "cancel" button, you go back to the main menu. You don't think of the submenus as menus in their own right, but more as a way of specifying a longer command.

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The keyboard is not an important optimization. Keyboard efficiency is important only for people who do extensive typing.

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For example, if you want to say "Window Split Horizontal," you type W-S-H, and as you select Window, and then Split, and then Horizontal, those words appear one after the other on the screen. Mathematically, your path is still a tree, but the user really doesn't think of it that way. The user just thinks of it as a command, Window Split Horizontal, which is invoked by W-S-H. It's certainly not a maze.

*PCW: With the mouse incorporated into Microsoft's programs now, there are three ways to invoke a command.*

CS: You're right. You can point at it with the space bar, you can type the initial letter, or you can point at it with the mouse.

*PCW: Can the options cause confusion?*

CS: It might be confusing for someone who just gets a system with the mouse, and for that person we would not emphasize the other two options.

*PCW: What's the relation of space bar pointing and initial letter typing to the mouse?*

CS: The real purpose of the other two is to prepare the public for the mouse. Pointing with the space bar is not a good way to point, but it is pointing. The purpose of the command-letter option is to suggest to people that when you type the first letter, you are, in fact, pointing. But nobody's going to type 13 spaces to get to the print option, for example. Space bar pointing wasn't necessarily intended as something useful—it was intended as an example.

However, if the menu's very small—if it consists of only the words *yes* and *no*—hitting the space bar will



## ● State of the Art

change *yes* to *no* and *no* to *yes*. Hitting the space bar is a simpler operation than typing either *y* or *n*, so in that case it's even convenient.

But the purpose of those options is really to prepare the user for what will come in the future. I wouldn't view them as three different ways to give commands. They're more like three stages of evolution still present in the product, just as we carry the genes of our earlier stages of evolution. I think that these products will carry them along for awhile. Ten years from now they probably won't be there.

*PCW: But aren't there times when it would be more efficient to type W-S-H when you know you want to split a window horizontally? What functions do you see people ultimately using the mouse for, as opposed to using the commands?*

CS: It's difficult to say. Actually, I think that you will be able to do a horizontal or vertical split just by pointing at a specific area of the screen with the mouse. It would not be a command anymore; it would be a split

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The ability to show what you get on the screen with high precision and the simplicity of using the mouse were *Bravo's* most important features.

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performed directly on the screen, almost as if you had a pair of scissors. You would move to a certain area on the screen, the cursor would become little scissors, then you would push a button and the window would split.

Sometimes having the ability to express something in terms of the keyboard is good. I don't know what the balance is going to be. If a command is very common, you will probably do it with the mouse. If the command is rare, I think that...well, you could still do it with the mouse. It's hard to know. At this point, I'm really not worried about what people are going to do. I want to enable people to do things, to be able to choose and not pay a penalty either way. Let's see what happens—let the chips fall where they may.

*PCW: What about the keyboard itself? Do you see that changing? Do you wish we had a different keyboard?*

CS: Looking at the keyboard is not an important optimization. Keyboard efficiency is important only for people who do extensive typing—for the transcriber, for example. But if you are a professional transcriber, the keyboard is not the best way anyway. Court reporters do not use keyboards; they use a ten-key instrument.

For a normal user, though, the keyboard is not that critical. When you are preparing your article, you are not typing that much. You are editing an incredible amount, but the new amount that you type is not more than 20 to 30 percent of your work. So I ask you, would it be worthwhile to put a lot of effort into learning a brand new skill to improve that 20 to 30 percent by maybe 5 percent or 10 percent? I doubt it. So I don't think that keyboards are an issue—we are stuck with the keyboard we have.

*PCW: In some ways the invention of the computer has lessened the need to be efficient. No one has to re-type manuscripts anymore.*

CS: You're absolutely right, but again, the keyboard is probably not much of a bottleneck even in that process. If the keyboard is used to point at each character that you edit, then of course it quickly becomes the bottleneck. But if the keyboard is used only to enter new text, which is the rule, then I don't believe that it's the bottleneck.

Suppose you had the best transcriber in the world listening to every word that you utter. Would you be that much better off? I don't think so. You would still spend a lot of time preparing an article. I'm sure that for between \$50,000 and \$100,000 a year you'd be able to have an excellent transcription of everything you said. But nobody needs that, because it wouldn't help that much.

Pointing, on the other hand, is very important. You don't use the keyboard for pointing, so you need a good pointing device.

*PCW: And you think the mouse is it?*

CS: The mouse is, for the time being, absolutely the way to go. Again, I will say that the pointing is what's important. Implementation of pointing is an engineering problem and engineers work at it. The mouse is the best engineering solution I have seen, and it's quite satisfactory. I don't know how you could do much better.

*PCW: What's your opinion of touch panels?*

CS: Touch panels have a lot of problems. In some situations they are excellent, but if you have to edit and every time you want to point at something you have to



raise your hand, after 50 or 60 times you will feel some muscles that you never knew you had.

The other thing is that when you point at something you obscure what you're pointing at. I challenge you to point to a letter in a document in such a way that I can tell you at which letter you are pointing. Just think of any letter and try to point it out for me. I wouldn't be able to guess whether you were pointing at the *i* or the *n* next to the *i*. The error rate of such a method would be

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I guess the Xerox Star and Apple's Lisa would have the only present-day examples of the kind of editing that *Bravo* could perform.

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very great. Obviously, if you just want to say I'm talking about a particular paragraph, then using your finger to point would be alright.

PCW: *But the mouse is just for pointing. When you're communicating on line with someone on the network, you've got to do more than point. In those situations efficiency is important. Maybe that ten-key steno system you mentioned is the most efficient way to get 256 ASCII characters into a machine. Maybe that's the keyboard we'll end up with.*

CS: I don't know. Those are skills that have to be learned. Most people won't be willing to make the investment. I don't believe there's value in it. If you're communicating in real time, there should be voice. Why bother with the keyboard?

PCW: *Do you think we'll just forget about the keyboard entirely?*

CS: I'm not sure. When I mentioned voice I was talking about real-time voice, human-to-human. I think that's really important. Computer-to-human voice synthesis is very nice. Certainly in any kind of consumer product, voice response is a very good feature. But speech does not have high bandwidth, and it has a high error rate. When you are talking about convenience, you're absolutely right. But if you're stressing bandwidth, I'm not sure that speech is the way to go.

PCW: *That's a term that you use frequently at Microsoft.*

CS: Bandwidth?

PCW: *Yes, in this context what does it mean?*

CS: By bandwidth we simply mean the bits of information per second that are transmitted. If I have some message that I want to convey to you, it can be expressed in terms of a number of bits. Bandwidth is a measure of the time in which I can transmit, say, 1000 bits. The higher the bandwidth, the quicker it is to transmit information.

The effective bandwidth is a function of many things. One of them is error rate. If I talk very fast, it may not increase the bandwidth, simply because you may not understand what I am saying. If you say "Eh?" and I have to repeat myself, we lose the advantages of higher bandwidth.

PCW: *What's the most efficient way for us to communicate, in terms of bandwidth?*

CS: To take your question seriously, the human organ that has the highest bandwidth is the eye. Its bandwidth is greater than any of the other organs by a large order of magnitude. So if you want to transmit something at an extremely high bandwidth, it should be done visually.

PCW: *What about output?*

CS: How do you express something at the greatest bandwidth? I don't know. There's nothing comparable on the output side. The human eye has a bandwidth that is much higher than the highest quality TV. Speech obviously has much less. Any FM station gives you higher bandwidth than speech, and that's just a small fraction of TV, so I don't know what would be the best way to output.

You see, it's actually a good balance. When I input something, I input something from the world, but when I output something, I always output something from myself. And the world is so much bigger than I am that it stands to reason that there is much more to input than output. I can read the *Encyclopaedia Britannica*, but can I say that much? No I can't. I don't have many thoughts. Even saying this much is causing me great effort, and someone can read this in 5 seconds, 1 second, a split second. So it's not worth it, is it?

The problem is not being able to express one's thoughts fast enough. The problem is having thoughts worth expressing. So, if we had a mouse that would be ten times faster than what we have now, I don't think the world would be improved by much. Maybe it's all for the best. ●



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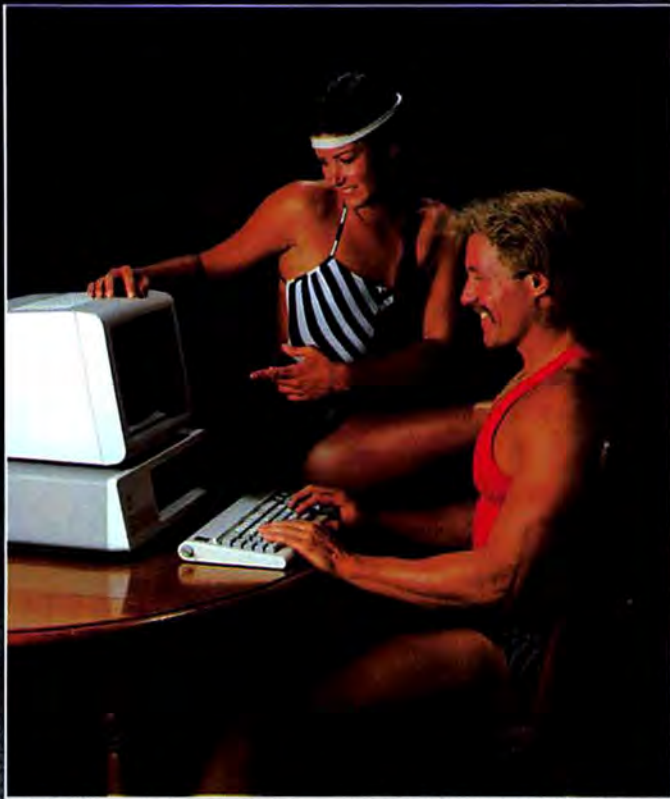
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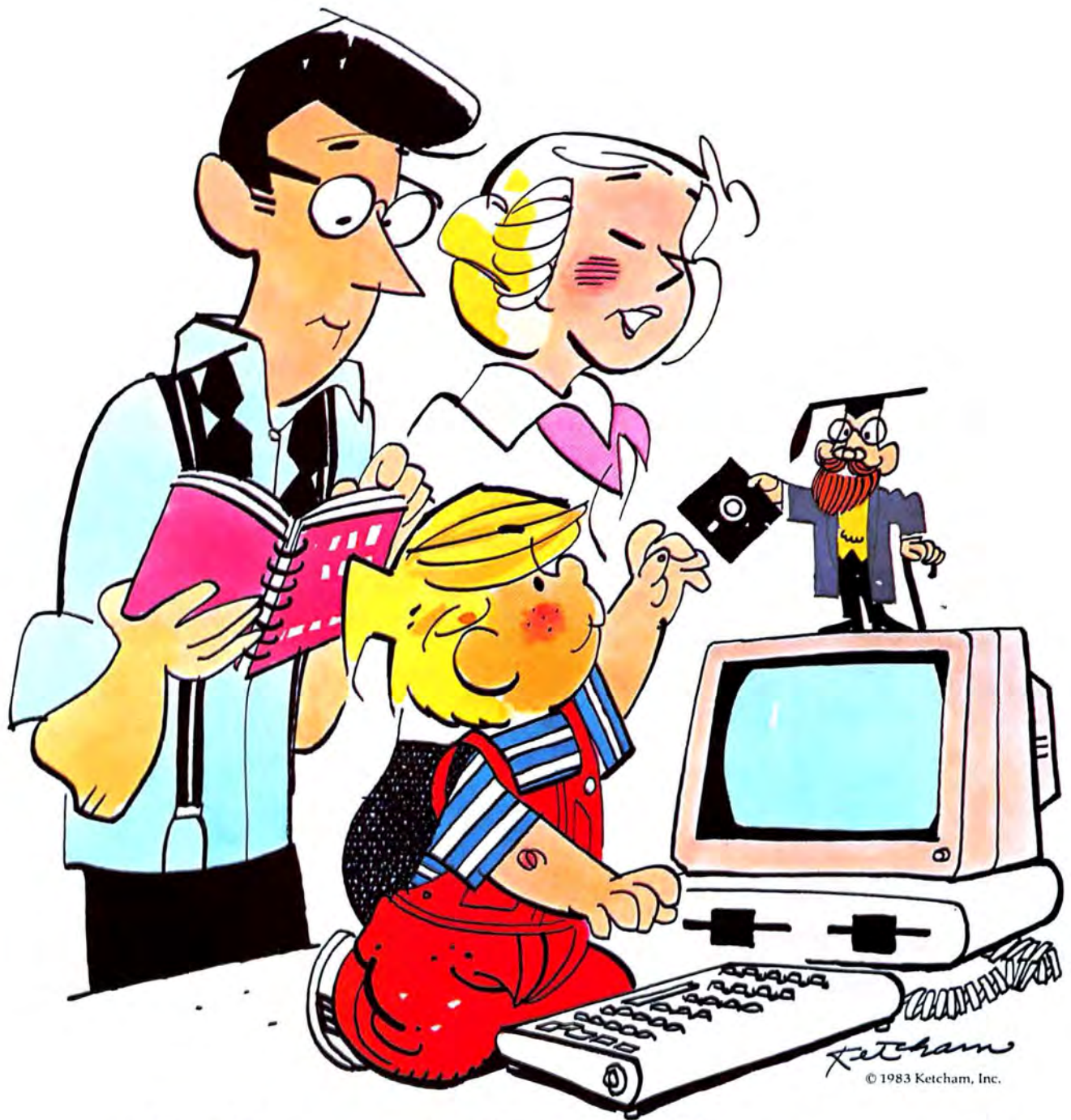
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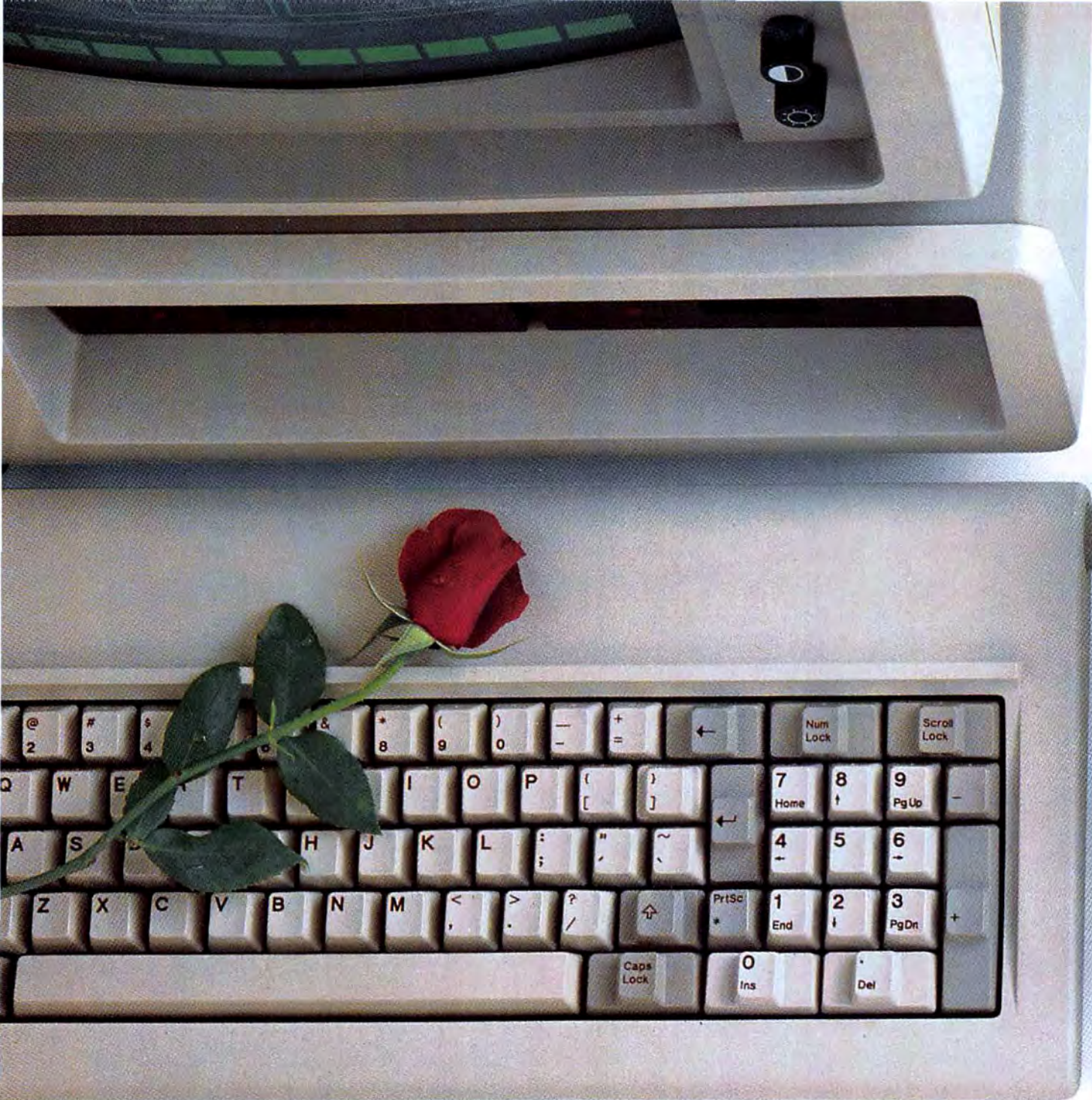
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# What Makes Modems Run?

*Demystifying modems—devices that allow computers to converse over standard telephone lines*

Larry Jordan

In the world of data communications, terminals and computers often need to "talk" to each other using human-voice-frequency signals. When a terminal or computer is located a great distance from another terminal or computer and a communications link must be established between the devices, using standard telephone lines and equipment is often cheaper and more convenient than installing dedicated communications equipment.

To use standard lines a device called a modem must be installed between the terminal or computer and the telephone system. The modem is the final link between a digital-based device (terminal or computer) and the analog-based telephone system. Without such a device, data communications would not be the booming business it is today and the IBM Personal Computer owner would be deprived of one of that computer's most useful applications.

## How Modems Work

In the simplest terms, on the transmitting end a modem converts binary electrical signals from a terminal or computer into voice-frequency signals that can be sent over the public telephone system. On the receiving end a modem also converts voice-frequency signals transmitted

through the telephone system into binary electrical signals that are forwarded to a terminal or computer. In specialized cases a modem may also be used to receive signals that are then transmitted to a serial printer. As shown in Figure 1, modems mod-

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It takes approximately  
one minute to transfer  
2000 bytes of text at  
300 bps.

---

ulate digital signals (square wave signals carrying information based on a series of digits that are either 1, for "on," or 0, for "off") into analog signals (oscillating signals that carry information based on the variations in amplitude—strength—or frequency of the signal wave) and demodulate analog signals into digital signals. Hence the name *modem*: modulator-demodulator.

Modems are used to produce signals compatible with telephone equipment. The equipment used in the telephone system requires that digital signals from the computer be converted to analog signals for transmission. Telephone system amplifiers and filters will alter digital square-

wave signals into unrecognizable garbage by the time they reach another computer across town.

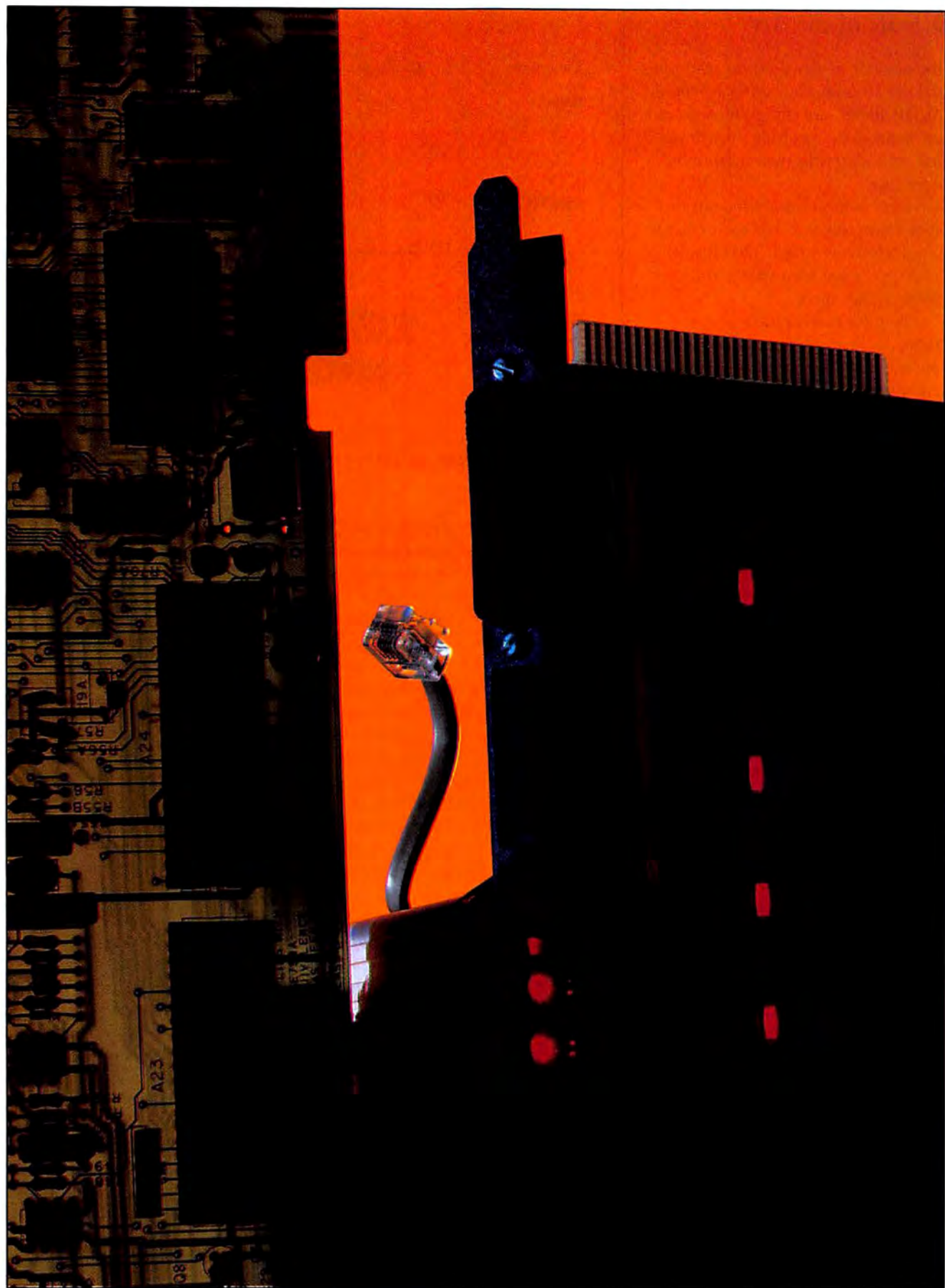
Another limitation imposed by the quality of public telephone equipment is the rate at which data can be transferred. IBM PC users will generally find that modems that fall within their budgets operate at 1200 bits per second (bps) or less. Data transfer rates as high as 4800 bps can be achieved using the same telephone equipment, but modems providing that capability are significantly more complex and expensive than those operating at lower rates.

Modems can be categorized according to speed, protocols, features, and intelligence (e.g., automation of answering and dialing functions or capacity for storage of dialing directory). They can also be differentiated by housing design: they may be designed to stand alone or to fit inside the system unit in an expansion slot. Figure 2 shows three typical modem classification methods.

## Modem Speeds and Protocols

The speed of a modem is determined by the maximum rate at which it can transmit or receive data. That rate is measured in either bits per second or baud. Bits per second is the number of binary digits (0's and 1's) transferred per second, whereas baud is







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the number of signal events transmitted per second. They differ whenever digital signals are superimposed onto analog signals, resulting in each signal event carrying two or more binary bits.

The classification of modems by speed is as follows: 600 bps or less is considered low speed; 1200 bps to 9600 bps is medium speed; and over 9600 is high speed.

The most common communications device used in personal computer configurations is the Bell 103 compatible low-speed modem. Bell 103 is a communications standard (or protocol) for modulation and demodulation of data signals. Communication at 1200 bps generally uses either Bell 212A or Racal-Vadic protocol. Almost every modem manufacturer produces a Bell 103 modem, and the costs of these units range from \$80

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A modem number link feature allows the user to establish a chain of numbers to be dialed in sequence.

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to \$300. The less expensive models do not support auto-dial and auto-answer and cannot be used to store telephone numbers. Expensive models can be used to auto-dial telephone numbers stored in disk files or in the modem's own memory. Some of the Bell 103 modems can also be set up with host software for unattended auto-answer operation; the Hayes Smartmodem is a good example of this type.

The distinguishing characteristic of the Bell 103 modem is the way it handles transmitted and received data. As shown in Figure 3, these modems use specific audio frequency ranges to differentiate between transmitted and

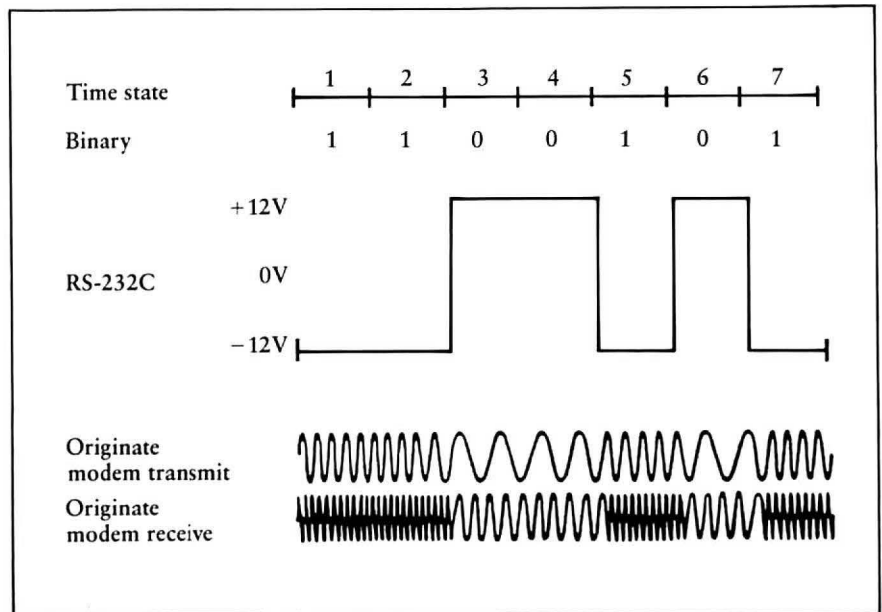


Figure 1: Binary signal frequency modulation

received data. Figure 3 also shows that the binary logic values of transmitted and received data are assigned specific frequencies.

The originate and answer modes for Bell 103 modems are controlled through frequency shifting. The modem that initiates a communications link is set to the originate mode and the remote modem that responds and completes the communications link is set to the answer mode. As shown in Figure 3, the answer-mode receive frequencies are the same as the originate-mode transmit frequencies. By the same token, the originate-mode receive frequencies are the same as the answer-mode transmit frequencies. The configuration of transmit and receive frequencies means that one modem must be in the answer mode and the other in the originate mode for the communications link to be properly established and the data transferred.

Frequency modulation carries information in variations of the time periods between "peaks" in a signal wave. The wave describes the strength of a signal. The more often the signal is at its highest strength, or

peak, the higher the frequency. When digital (on or off) information is translated to frequency-modulated signals, one frequency value indicates an "off" condition (or 0 bit) while a different frequency is used for an "on" condition (or 1 bit).

Bell 103 compatible modems may be configured as originate only, answer only, or originate/answer. If you never plan to have your modem answer an incoming call from another computer or terminal, you do not need answer-mode capability. But most modems available today provide both modes.

Low-speed modems are excellent for applications that require a great deal of conversation-mode communications or small file transfers. The maximum continuous transfer rate at 300 bps is 30 characters per second (cps), which translates into approximately 300 words per minute—faster than any typist. Another advantage of 300 bps communications is that many people can comfortably read text at that speed. If you want to read the information but have no need to store it for later use, you can list the file on the IBM PC monitor.

The lower charges generally offered by time-sharing information



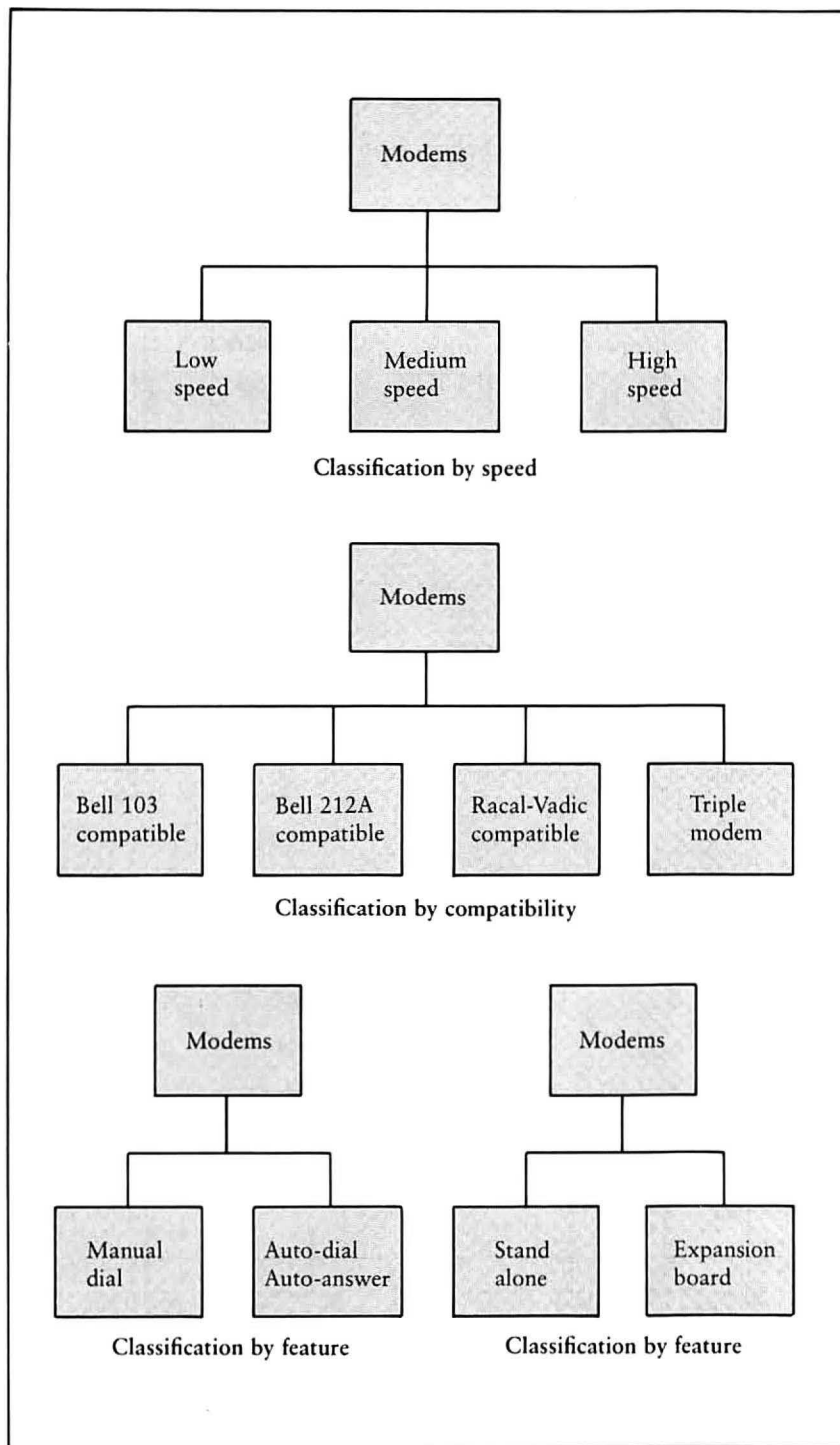


Figure 2: Modem classification

services for low-speed connection time can also result in cost savings for conversation-mode interaction. The CompuServe information utility, for example, charges \$5 per hour for 300 bps connection or \$17.50 per

hour for 1200 bps connection during evenings and weekends. Based on these rates, a person would have to transfer 798K of files (more than two full DOS 2.00 formatted floppy disks) for every 20 minutes of conversation-mode interaction to reach the break-even cost of changing from

300 bps to 1200 bps connection, not considering the additional cost of the 1200 bps modem.

For applications that involve frequent large file transfers or the clustering of input from several terminals, low-speed modems are not a good choice. It takes approximately one minute to transfer 2000 bytes of text at 300 bps, which translates to 30 minutes of connect time to transfer a 60K file. Transferring several 60K files results in the computer being dedicated to communications for a significant period of time; operator support is also required during the entire session if the communications software used does not provide batch mode or multiple file transfer options. For applications of this type, most businesses and some individuals choose medium-speed modems.

Most of the medium-speed modems available to a PC owner operate at 1200 bps, but their compatibility with other systems varies with the make and the model. Some new 1200 bps modems operate in only half-duplex, limiting the information systems they can be used to access. For example, The Source, another information utility, cannot be accessed by anything but a full-duplex system. Other modems offer compatibility with either Bell 212A or Racal-Vadic systems. The more expensive medium-speed modems are compatible with both Bell 212A and Racal-Vadic, and some so-called triple modems support Bell 103, Bell 212A, and Racal-Vadic protocols. The extra features you require in a modem will of course increase the cost of the device.

Medium-speed modems differ in several ways from low-speed modems. Instead of shifting frequencies, as is done under the Bell 103 protocol, these modems use a technique called phase shifting, which is illustrated in Figure 4. Phase modulation, or phase-shift keying, maintains a constant frequency throughout transmission but changes the starting



## State of the Art

point. The signal transmission always starts at a neutral midpoint, but a shift changes the direction of a signal, moving toward either a positive peak or a negative "trough." When digital information is translated to phase-shift keying, a 1 or "on" bit is indicated by no deviation or phase change (a 0-degree shift) while a 0 or "off" bit is designated as a 180-degree shift.

The Bell 212A and Racal-Vadic protocols both use phase shifting to increase data throughput, but the signal frequency used as a basis for the phase shifting is different for the two. Therefore, the protocols are not compatible, and the same modem protocol has to be used at both ends of a 1200 bps communications link, adding another level of complexity to going from 300 bps to 1200 bps. Fortunately, most information services offer both Bell 212A and Racal-Vadic compatibility, so PC users can achieve 1200 bps communication without purchasing a top-of-the-line, medium-speed modem.

Modems that operate at speeds above 1200 bps use more sophisticated electrical signal manipulation to achieve those rates while staying within the frequency limits imposed by public telephone equipment. Figure 4 illustrates a technique called phase amplitude modulation, a combination of phase shifting and amplitude modulation. It is used in the design of 9600 bps modems for mainframe communications. Such magic does not come cheap: some 9600 bps modems cost more than an IBM PC.

### Modem Features

Besides classification by speed and protocol, modems are often classified by features or level of intelligence. As costs for memory and microprocessors decrease, the power and flexibility of modems increase, making last year's model almost obsolete. This has been the trend over the past several years, and it can be expected to continue.

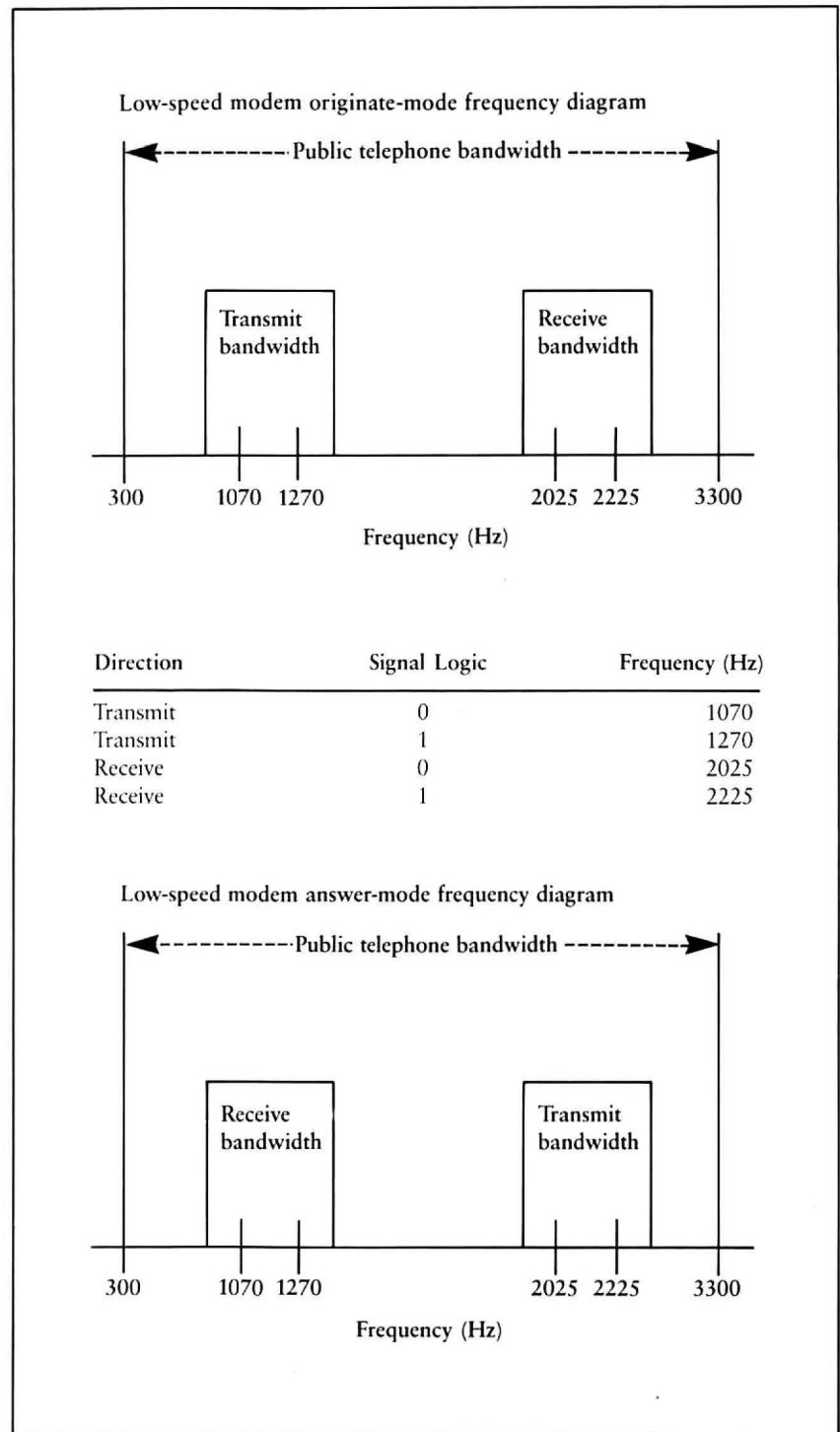


Figure 3: Low-speed modem frequencies

A list of features available in modems is shown in Table 1. Most PC users find that a modem offering only a few of these features meets their needs, but some business applications require a full-featured modem that

supports a majority of the listed options. Note that the term *full-featured* differs from one modem manufacturer to another. If you need several capabilities in a single modem, you should investigate the actual features of available models before choosing



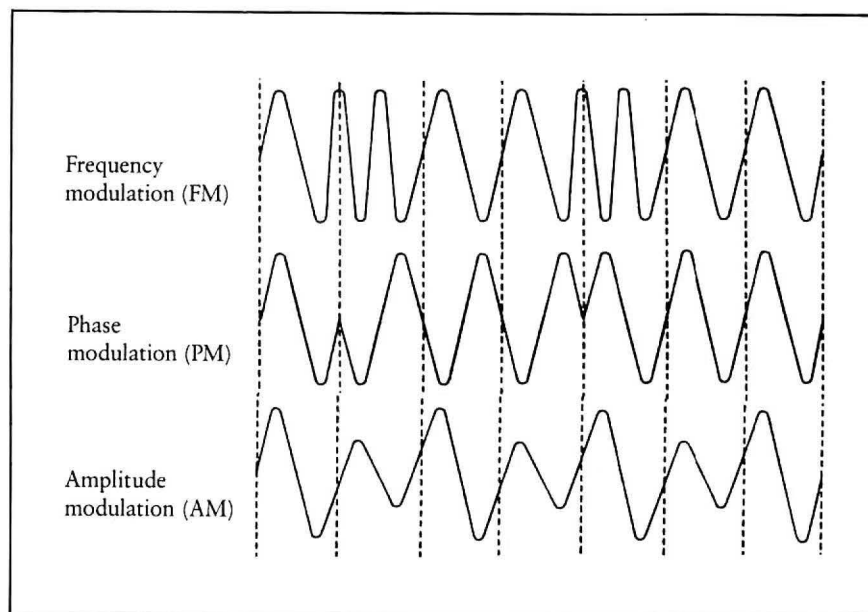


Figure 4: Digital modulation methods

Help command	Command modes
Command recognition	Command abort
Quit command	Manual dial
Dialing directory	Dial tones
Name selection dialing	Last number redial
Repeat dialing	Number linking
Directory modification	Auto-answer
Busy mode	Protocol detect and switch
Set answerback string	Set backspace character
Set attention character	Set disconnect character
Modem register contents	Modem switches
Built-in self-test	

Table 1: Modem features

one. Each of the features listed in Table 1 is discussed in the following paragraphs to help you perform that investigation.

### Help Command

Many new modems provide command help files. To get that help the user simply enters an H or the word

Help while interactively conversing with the modem from the PC keyboard. The help files are usually brief explanations of frequently used functions and commands, but they suffice to remind you of commands you may have forgotten.

### Command Modes

Because of the dominance of the Hayes Smartmodem in the personal computer community, many intelligent modems provide a Hayes Smartmodem compatible command mode. This mode allows the user to use software specifically designed for the Smartmodem. Besides the Hayes mode, some modems also have a unique command mode designed by the modem manufacturer. The manufacturer's own mode often duplicates the Hayes mode and provides additional capabilities beyond those found in a Hayes Smartmodem. Switching between the two modes is usually performed by issuing a short command sequence to the modem. The Hayes mode is characterized by an OK response to commands (when the verbal response mode is in effect) and the manufacturer-specific mode is characterized by some other character prompt such as '\$' or '>'. The Hayes mode requires a carriage return at the end of a command to initiate its execution, whereas vendor-specific commands may begin execution after a single letter or number is entered at the keyboard.

### Command Recognition

Some modems require a specific speed (bps) and parity configuration to recognize commands; others will accept commands regardless of the communications parameters. You may need to experiment to determine the parameters that work if they are not specified in the modem manual. Modems that accept several configurations often must be either reset through software commands or placed in a dormant mode before a new set of parameters can be used. Others provide an external reset button or an off/on switch that will reset most or all of the parameters. Stand-alone modems can be easily switched off and then back on, but expansion board modems require that the computer be turned off for a power-off reset of the modem. However, the user can reset most expansion board modems through software controls.



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### Command Abort

After a dialing command has been issued to an intelligent modem, you can usually stop the call before it is completed by sending the modem an abort command. Most modems interpret the carriage return or a pair of carriage returns as an abort command. This abort signal interrupts the execution of any modem command before a call is completed and the modem goes on-line with a remote system.

### Quit Command

Intelligent modems may allow a user to turn the internal monitor programs off with a quit command. This type of modem may also go into dormant mode automatically after a fixed number of minutes of keyboard inactivity. The modem then remains in a quiet or dormant mode until it receives several carriage returns. This dormant state may be required for data transfer rate (bps) or parity changes. After changing communications parameters and pressing the carriage return, the modem senses the new communications parameters and is activated with a matched set of parameters. The modem will usually report its operating speed when the monitor program is reactivated.

This design may also allow the user to specify a longer period of inactivity (or "no activity") or to specify that the monitor never go into the dormant mode. This is a desirable feature if the modem is used frequently with the same host system or with several host systems that have the same communications parameters.

### Manual Dial

Modems that provide their own dialing directory also allow the user to dial a telephone number manually from the PC keyboard. The command typically starts with either an ATD or a D followed by the telephone number and a carriage return.



The modem may also allow a batch-mode call using special telephone number dialing prefix and suffix character strings. For example, a telephone number may have to be preceded by a '<K' and followed by a '>' before the modem will dial the number. The manual dial and batch-mode dial commands can be used in communications software packages to dial phone numbers from directories stored on disk.

### Dialing Directory

A modem dialing directory allows a user to store frequently used telephone numbers. A number can be dialed from the directory by keyboard selection of a menu number that corresponds to the telephone number. Dialing directories usually allow the user to store 20 to 60 characters with each number to describe the host system accessed by the number. Some directories are stored in nonvolatile bubble memory; alternatively, a battery backup is provided that allows the user to disconnect the modem from its power supply for several days without losing the stored numbers.

### Name Selection Redialing

Modems that provide dialing directories may allow the user to select a host system to dial simply by typing the host's name. After the user enters a name from the PC keyboard, the modem searches the dialing directory and dials the associated telephone number if the name is found. This feature may also allow input of only part of the name to activate the automatic dialing of the appropriate number.

### Dial Tones

Modem dialing commands usually include a selection of pulse or touch-tone dialing. The dialing signals transmitted to the telephone system are the type specified by the dialing prefix command. Some modems al-

low the dial type to change during the dialing sequence to match the telephone equipment in use. This feature may also include a secondary dial-tone wait command. Dial-tone wait commands cause the dialing sequence to pause until a secondary dial tone is detected; they are better than a simple time delay during the dialing sequence.

A very intelligent modem not only waits for a secondary dial tone during a dialing sequence, but also senses and switches between touch-tone and pulse dialing to match the

telephone system being used. Usually this type of modem provides a blind dialing mode also. Blind dialing allows the modem to dial when a dial tone is supposed to be present but none is detected. Some PBX telephone systems use nonstandard tones that certain modems will interpret as a dead line. Blind dialing is the only way to get around the problem.

### Last Number Redial

Some modems enable the user to redial the last number called by entering one number or letter at the

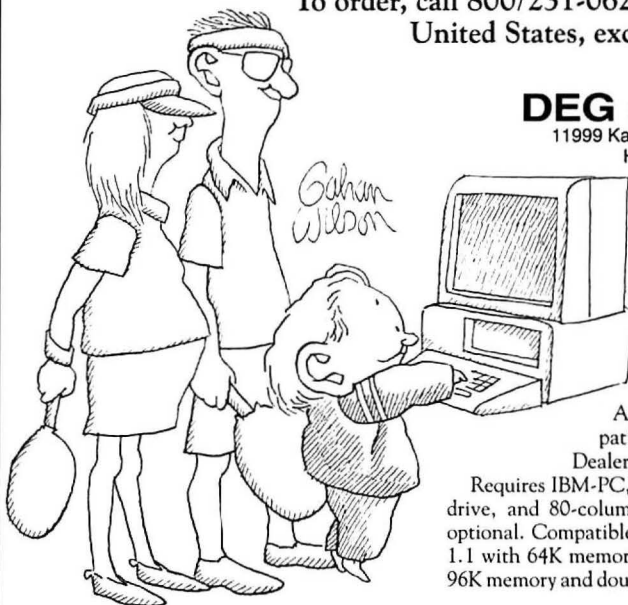
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computer keyboard. This capability can be used by a communications software package to redial a number several times without having to store the number in the computer's memory.

### **Repeat Dialing**

Some modems can redial a telephone number a predetermined number of times. When you enter a numeral after a redial command, the modem dials repeatedly until the connection is made or until it has made the specified number of attempts.

### **Number Linking**

Number linking enables the user to specify at least one other telephone number that should be dialed if the first number is busy or does not answer. This is an excellent feature for use with mainframe systems that have more than one access line or with bulletin board systems that are frequently busy. A modem number link feature also allows the user to establish a chain of numbers to be dialed in sequence, and the last number in the sequence may often be linked back to the first number in the sequence so that a polling of telephone numbers is possible. Number linking can be used to redial one number an unlimited number of times by specifying the original number dialed as the linked number. This can sometimes be used to get around the FCC requirement that an auto-dialer not repeat a dial more than 15 times. (In Canada the limit is 10.)

A number-linking feature, like an auto-dial feature, should provide an optional alarm to indicate a completed telephone connection. For linking numbers that are frequently busy or link-redialing a single number that is frequently busy, an alarm is often convenient for users who have other tasks to perform while the link operation is in progress. This feature should also permit the alarm to be disabled when it is not needed or desired.

### **Directory Modification**

Modem dialing directories should be designed for easy modification of names and telephone numbers. A single command should be able to clear either selected entries or all directory entries. The clear-all-entries command should require confirmation that you really want all entries cleared before executing the command. Another modem command should allow the user to list all or selected entries in the directory.

### **Auto-Answer**

Many intelligent modems offer control of the number of telephone rings that should occur before a call is answered in an automatic answer mode. For example, the command `ATS0=5` causes a Hayes Smartmodem to answer a call on the fifth ring. These same modems normally allow a user to force them to answer the telephone whether or not a call is coming in. Connecting two computers directly via two modems without going through the telephone system requires a forced answer. By placing a short length of telephone cable between two Smartmodems, you can connect two computers for file transfers by executing a force-to-answer (ATA) command on one modem and a force-to-dial (ATD) command on the other modem. You can also use the force-to-answer feature when a single line is used for voice and data communications and the data communications call is dialed manually on a normal telephone.

### **Busy Mode**

The busy command provided by modems allows a user to take the phone "off the hook" for a while. This command is useful for bulletin board operators who want to use the system temporarily for other applications but want the system to appear busy to callers. The busy command can also be used on a voice line to keep calls from coming in for a period of



time. Through software control the telephone could be made to appear busy for certain time periods each day.

#### Protocol Detect and Switch

The auto-answer mode of some modems automatically detects the protocol of an incoming call and switches its own protocol to match that of the caller. Typical protocols are Bell 103, Bell 113, and Bell 212A, but some of the more expensive modems also include the Racal-Vadic protocol. The protocol switch between Bell 103/113 (300 bps) and Bell

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A very intelligent modem senses and switches between touch-tone and pulse dialing to match the telephone system being used.

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212A or Racal-Vadic (1200 bps) also requires a data speed switch. If a modem does not provide detect and switch capabilities, these operations can usually be accomplished through software control.

#### Set Answerback String

Modems can be programmed to transmit a particular sequence of characters immediately after originating or answering a call. Typical built-in answerback registers (reserved areas of internal memory) hold between 16 and 32 characters and are used to identify the modem, terminal, or computer work station to a remote computer. This is particularly useful when the modem is dedicated for use with a single host or information service system. The answerback string feature saves the user from keying in a password or a logon code every time a call is placed to the system.



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Circle 7 on reader service card

## State of the Art

### Set Backspace Character

Some host computers require the selection of a special character to be interpreted as a backspace. The ASCII character equivalent of a Control-H (ASCII value 8) is normally the default backspace delete character, but some systems use the ASCII DEL character (ASCII value 127) as a backspace delete also. The "set backspace" command programs the modem to accept a character other than a Control-H as a backspace.

### Set Attention Character

Modems usually have on-line and off-line operating modes. The modem is in an interactive-command mode while off-line and in a "transparent" transmit and receive mode while on-line. In the off-line mode, the modem will respond to commands, but after a call is made and the telephone is answered on the remote end, the modem automatically switches to the on-line mode. In the on-line mode, the modem will not recognize modem commands.

To get the modem to go off-line so that it will respond to keyboard commands, several "attention" characters must be sent to the modem. The modem usually comes with a default attention character (for example, the '+' is the default attention character for the Hayes Smartmodem), but that character can be redefined. This feature is useful for bulletin board software developers because it allows them to have the attention character redefined before each caller enters the system. Without a redefinition of the attention character, system saboteurs could cause the bulletin board to "lock up" by issuing the modem attention command during a communication session.

### Set Disconnect Character

Some modems allow a user to specify a special character string that will cause the modem to sever the connection and drop the carrier signal (go "on hook") when a call is completed. The carrier signal is the un-



altered signal that is constantly transmitted and received whenever a modem connection is established between two computer devices. When information is transmitted, it alters the carrier. This signal encoding is sometimes described as having the information superimposed, or "riding," on the carrier signal.

The character string usually consists of two or more characters that must be sent to the modem sequentially from the local terminal. Characters received from the remote terminal or computer will not produce the same results. This is a useful capability when the modem is used to call a host system that leaves the carrier connected long after a log-off command has been received. The carrier signal must be dropped and the local modem returned to an "on hook" status before the local system can make another call.

### Modem Register Contents

Communications software packages must sometimes query the contents of a modem's internal memory registers in order to detect and modify the contents of the registers or to detect those changes in register contents that act as signals to initiate software functions. A modem should provide commands that allow a software package to both query and modify the contents of its registers. This is particularly useful in bulletin board software design because such parameters as the speed (bps), parity, and number of data bits must be detected when the modem answers an incoming call.

### Modem Switches

Some communications software packages require that special signals either be present or absent between the computer and a modem for the program to function properly. For example, *PC-Talk III* requires that switch 1 (Data Terminal Ready) on the stand-alone Hayes Smartmodem be in the down position for communications parameters to be changed while on-line with a host system. If

switch 1 is up, the carrier and the connection with the remote computer are lost during the parameter change. Modems must allow these signals to be set either through software control or through manual switch control. The ideal design would allow either manual or software changes in these signal switches.

### Built-in Self-tests

The built-in self-test features in a modem are pattern generator and error-checking circuitry. These features allow the modem to be tested as a stand-alone device or in conjunction with a similarly equipped remote modem. The tests verify the modem's ability to send and receive data accurately. The three types of test modes are the analog loop-back self-test, the digital loop-back self-test, and the remote digital loop self-test.

The analog loop-back self-test verifies the operation of a local modem as a stand-alone unit. Data is sent from the self-test circuit through the modem's transmitter. The transmitter

output is routed back into the modem's receiver, which then routes the data back to the self-test circuit. The self-test circuit compares transmitted patterns to received patterns and signals whether there are any errors.

The digital loop-back self-test verifies the operation of a remote modem. With the help of the remote modem operator (to change switch positions on the remote modem), data is sent from the local modem and looped through the receiver and the transmitter of the remote modem. When the data is received back at the local modem, it is compared with the original transmitted data. If errors are detected, the modem notifies the local user. The remote digital loop self-test is identical to the digital loop-back self-test except that it can be performed without remote operator assistance.

### Stand-alone or Board-mounted

During the last few months many modem vendors have introduced modems designed to be installed in a PC

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5	0	0	500
6	0	0	0
7	0	0	0



## ● State of the Art

expansion slot. This design has been available for the Apple computer for several years but is new for IBM PC and compatible computers.

Although they perform essentially the same functions, the stand-alone and expansion board designs each have specific advantages and disadvantages. The type you choose will probably depend on your specific communications application and the advantages provided by one modem type.

Table 2 lists the respective advantages and drawbacks of the stand-

alone and board-mounted modems. From this list you can see that a board-mounted modem is a logical choice for the owner of an IBM PC-compatible portable who wants to minimize the number of gadgets to be carried along with the computer. People who own an IBM PC XT or a PC with an expansion chassis might also select a board-mounted modem since those computers have additional expansion slots available and larger heat removal capacity than the IBM PC. People who want a complete communications hardware package that does not require external cables,

boxes, and power supplies might also want a board-mounted modem.

Board-mounted modems must have some method to communicate dialing information (e.g., the number being dialed, whether dialing has been completed, whether a connection has been made to a remote system) to the IBM PC user. Some board modems use either the IBM PC speaker or one located on the modem board to help the user understand what is taking place after a call is initiated. The user can hear the telephone dialing sounds and the results of the call, or a busy signal if the call is not completed. Other modems use screen messages to indicate the status of a call. Both methods work, but the sounds of a telephone dialing and a voice-frequency response after the call is completed are somehow more natural and congenial.

A stand-alone modem is a good choice for people who use several computers and terminals, all of which require a modem for communication with other devices. This type is easily moved from one device to another. A stand-alone modem is also a good choice for communications software developers and bulletin board operators.

Stand alone or board mounted, a modem can open up the world of computer communications. Despite the extensive range of features described here, most modems are designed to run transparently; that is, the end user probably won't spend very much time or effort controlling or operating the modem. ●

*Editor's note: This article describes the features and functions of modems and explains their operation. "The Modem Market," also in this issue, examines some of the most popular modems for the PC according to their implementation of those features and functions.*

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*Larry Jordan is a freelance writer who manages power plant start-up engineers for the NUS Corporation.*

### Stand-alone modems

#### Pros

- Can be used with any computer or terminal.
- Has indicator lights that show action and status.
- Heat load is external to computer system unit.
- Can be removed from serial port so port can be used for other applications.
- Communications port 1 can be used for direct connection between computers for 9600 bps data transfer rate.
- Has power on/off switch for last resort modem reset.
- Has DIP switches that can be easily set for special use.
- Already has several years of proven performance.

#### Cons

- Requires space adjacent to computer.
- Has to be transported when computer is taken on trip.
- Requires a power supply connection.
- Requires an RS-232C cable.
- Requires a serial communications adapter connection.

### Expansion board modem

#### Pros

- Requires no space outside computer system unit.
- Requires no serial port connection.
- Requires no RS-232C cable.
- Requires no external power supply.
- Eliminates DIP switches that vendors can require reset.
- DIP switch settings can be software controlled.
- Does not have to be transported separate from computer.

#### Cons

- Eliminates communications port 1 direct connection option for high-speed data transfer between computers.
- Requires one expansion slot inside unit.
- Cannot be used with incompatible computer.
- Provides no indicator lights to show action and status.
- Provides no hardware default value reset switch.
- Adds significant heat load inside system unit.
- Requires installation inside system or expansion unit.

Table 2: Stand-alone vs. expansion board modems





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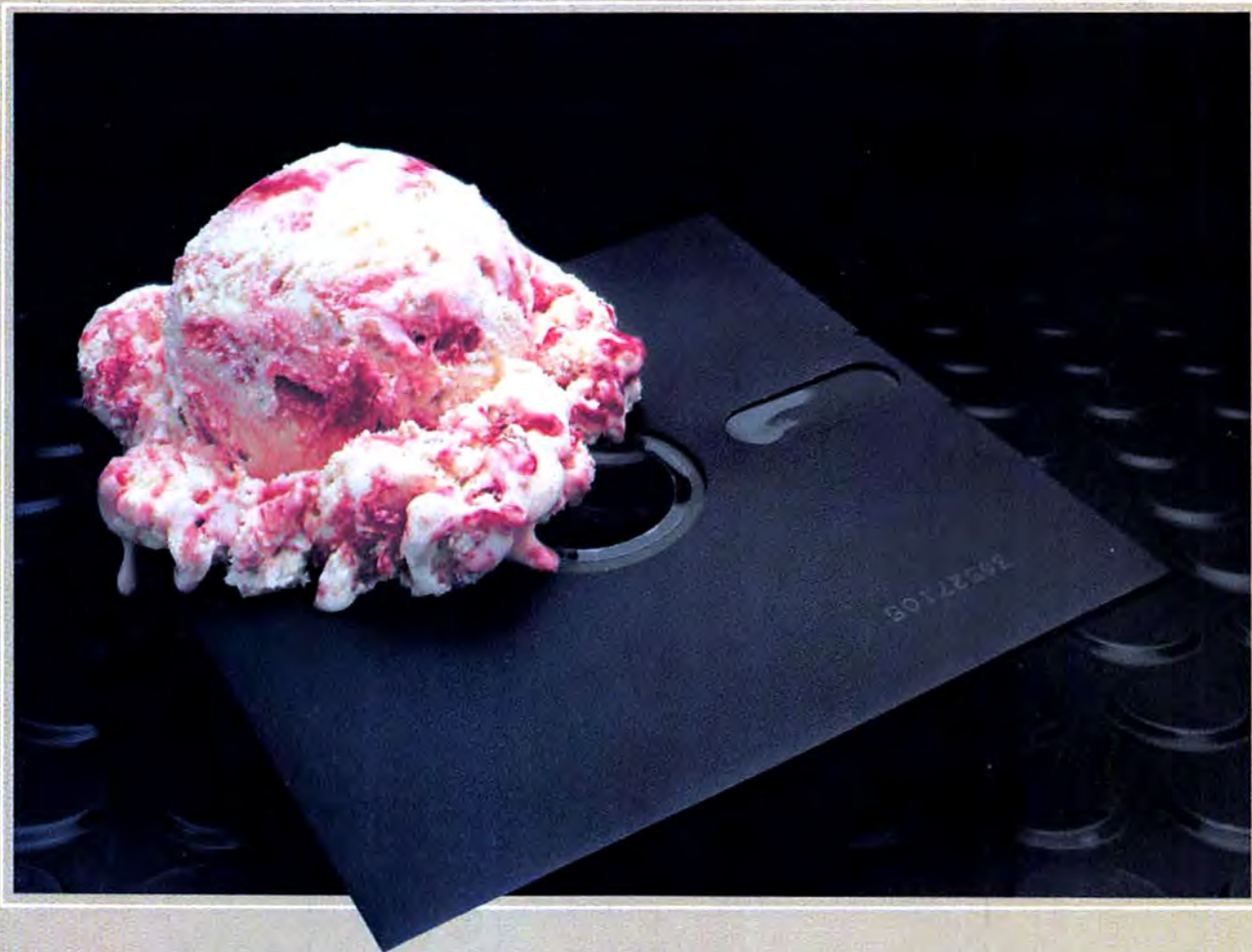
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# PC WORLD View

News and notes for the computing community

Miriam Medom

PC World View reports new developments in computer technology, items of interest to all computer enthusiasts, and the most significant and enticing speculation about industry trends and personalities. We've reserved the "Grapevine" section of this column for industry reports that are still at the speculative stage.

## Oklahoma Outrage

Two readers have sent reports of a distinctly dangerous development for computer users in Oklahoma. Douglas Miller of Tulsa sent along a news article on the new phone rates for data communications, and Connie Smith of Norman sent the following report.

*Ma Bell has taken a big byte out of microcomputing in Oklahoma. This development has left many computer users looking wistfully at an unused modem and angrily at last month's phone bill.*

A ruling by the Oklahoma Corporation Commission has allowed Southwestern Bell to begin charging a hefty fee of \$45.90 per month to transmit data over company lines via computer and modem. Telephone company officials have been out in force to explain the ruling to irate computer users, although they have not yet stated directly that users of home computers who transmit data over phone lines are actually costing the company more. Their justification for the rate increase is a strict interpretation of a 1965 law, the Information Terminal Service Tariff, intended for corporate and business users of mainframe computers.



*If allowed to stand, and if adopted elsewhere, this ruling could have a severe impact on the microcomputer industry. With some computer systems—complete with printer—now selling for \$600, many observers predict that millions of people will use their computers for banking, shopping, and a variety of networking activities. But not if they have to pay \$550.80 per year for the phone line to go with the system.*

Computer groups in Oklahoma are currently fighting to change the commission's ruling, Smith reports. If they don't succeed, the use of information utilities such as The Source and CompuServe and the prospects for all manner of computer transactions will dry up like the Oklahoma plains in a drought.

## Grapevine

### WordStar Wars?

The industry rumor mill is buzzing with reports, which strike us as highly plausible, that MicroPro is hatching an entirely new word processing program. Although little information about the program's features has leaked from the California-based firm, the headquarters for this top-secret project is said to be near George Lucas's film studios in Marin County. Maybe some neighborhood inspiration will rub off and we'll be able to cut and paste text with a light sword when the new program is finished.

Another point of speculation is whether this new program will compete directly with the firm's now-dominant WordStar. Some observers predict that the new program will become MicroPro's high-end product, priced at \$400 or \$500, and that WordStar's price will be lowered to \$100 or \$150.

This speculation about lower prices for major software products is probably accurate, according to various market researchers. In fact, MicroPro has made one step in that direction already: the firm sells WordStar to schools for a mere \$40.

### Buffergate

At least two businesses have experienced a strange phenomenon with printing buffers. These devices, which are small stand-alone units linked by cables to a computer and one or more printers, permit use of



the computer for other tasks while printing is done simultaneously. The file(s) to be printed are sent to the buffer's memory and the printer works from that source, thereby freeing the computer. These devices can be purchased with varying amounts of memory, generally ranging from 8K to 64K.

Several companies offer these printing buffers, although at least two firms' devices appear to be identical except for their labels. And oddly enough, some of the buffers sold under both firms' labels have contained only half the memory advertised and paid for. This memory shortage was discovered by one corporate manager when he tried to send a file longer than 40K to the buffer for printing and received a "buffer full" signal from the device.

This prompted him to pry the cover off the device; he discovered that the buffer's board was socketed for 64K of memory—32 chips of 16K each—but only half the sockets contained chips. Since he had paid for a 64K buffer and received only 32K of memory, he returned the device and purchased a comparable buffer offered by another firm. Upon inspecting this device, he was rudely surprised to find that it too was labeled 64K but contained only 32K of chips. Inspection of two other buffers from the second firm yielded the same results.

So far the dealers and manufacturers have provided new buffers or have added chips to the deficient ones, but there may be a lot of buffer users who haven't printed anything big enough to discover whether they've been shorted on memory. For future buffer buyers, this caveat should apply: be sure to check the chips before parting with the green.



### *Tandon and Big Who?*

Disk drive maker Tandon Corporation of Chatsworth, California, has signed a contract valued at \$310 million to supply floppy disk drives to "a major microcomputer manufacturer." Although neither company will confirm the fact, industry sources assume that IBM is the recipient of those millions of dollars worth of drives, since Tandon was a principal supplier of drives for the PC from the beginning. Tandon has already begun shipping drives under this new contract and is slated to keep supplying drives to IBM (or whomever) through 1984.

## **Big Blue's News**

### *PCs Go Go Go in Japan*

IBM has made a big splash in Japan with its model 5550 computer, a 16-bit machine similar to the PC. The Japanese translation of the computer's model number is *Gogogo maru*—and *maru* has the colloquial meaning of "okay" as well as representing zero.

To introduce its new business-oriented computer to the Japanese populace, IBM hired a well-known actor, Atsumi Kiyoshi, a sort of Asian Peter Falk. Kiyoshi can be seen on billboards and posters all over Tokyo; he is reclining on a white satin sofa, staring out sexily from under an IBM-blue fedora.

So far sales of the *Gogogo maru* are going well. One researcher predicts that IBM will capture 20 to 30 percent of the Japanese market for 16-bit computers, and an IBM Japan spokesperson notes that the firm expects to sell "tens of thousands" of 5550s by the end of the year.

### *Magnanimous Gestures*

IBM has been giving money and machines away at a fast clip this year. In addition to its elementary and secondary school programs in several states, the corporation has donated equipment and development funds to several major universities. Along with Digital Equipment Corporation (DEC), IBM will fund research at MIT, and in addition will make solo donations to Brown University and Carnegie Tech. The Brown donation is valued at a hefty \$15 million. Brown will use the money to estab-



lish an Institute for Research in Information and Scholarship, which in turn will administer the university's \$50 million "scholar's work station" experiment. This program may put Brown in the vanguard of computer research in the United States, alongside such stalwarts as MIT, Carnegie, and Stanford.

A group of 20 universities are the big winners in the donation sweepstakes, however. IBM has initiated a program to give \$40 million worth of hardware and software for computer-aided design and computer-aided manufacturing (CAD/CAM). All the recipient schools are strong in engineering, and IBM's donations are designed to stimulate research and planning in all aspects of manufacturing. As a further assist to the academic emphasis on manufacturing, IBM will award another \$10 million in cash grants to five universities (not yet named) to establish curricula in manufacturing for graduate students.

### *Software Selling Hardware*

The standard advice to first-time computer buyers is this: choose your software, then pick hardware to go with it. In an innovative formalization of that advice, IBM has begun paying fees to software and service companies to help sell its computers. This new ancillary sales force will receive 2½ percent of the price of top-line hardware covered by the plan, such as the System-38, and 10 percent of the lower priced computers, including the PC. In addition to acting as sales representatives, the software



and service firms will be expected to provide post-installation customer assistance. IBM's own sales force is presumably too busy selling computers to offer this service.

In a move to further permeate the market with PCs, IBM has named another 300 authorized PC dealers, bringing the total number of dealers to 1100. Concurrently, IBM has expanded production capacity for the PC and the XT and plans to continue to add dealers to its retail network. A spokesperson at PC headquarters in Boca Raton, Florida, noted that the dry spell in availability of the computers has passed and that the company produced more PCs (including XTs) in the first five months of 1983 than in all of 1982.

### *Teach Me Today*

In another outside move, IBM has chosen two independent firms to offer training on the PC in IBM Product Centers. The two companies are ComputerKnowledge of Dallas and Personal Computer Training of San Francisco. The Texas-based firm will initially provide training at Product Centers in Dallas, Houston, and New York City, and the San Francisco company will offer training in West Coast Product Centers.

### *Swinging High Tech*

It may be too late for this year's Masters, but golfers can start getting ready for next year with the help of the Golftech II computer. This specialized microcomputer is linked to a videotape recorder and camera, which record and analyze a golfer's swing. Immediately after the golfer drives a ball from a tee into a net, Golftech II's display reports the club-head's speed and path, the squareness of the club's impact with the ball, and a projection of the ball's angle of flight and the distance it would carry.

With the videotape replay as a guide, the golfer can see the flaws in his or her swing, and an instructor can interpret the visual and numerical data to help the golfer improve the swing. Golf pro Hank Pollex was so impressed with Golftech II that he bought the system and opened an indoor driving range called Visual Golf in Palo Alto, California. One of the best features of Visual Golf, says Pollex, is that his clients don't cancel their lessons when it rains.





## PCs Go to Sea

The Coast Guard has installed three PCs on the 378-foot cutter *Rush*, based in Alameda, California. The ship's crew uses the PCs for word processing, financial planning, and inventory control. Lt. Daniel Elliott of the Coast Guard's newly established Technology Resources Office notes that the PC is an inexpensive alternative to systems from Wang and Convergent Technologies used elsewhere in the service, and the PC has received official support from the Coast Guard. Previously some units purchased Apple and TRS-80 computers, but the Coast Guard does not provide support or training for these machines.

## Software Shuffles

Several computer makers have announced that the family of programs from Perfect Software of Berkeley, California, will be bundled with their machines. These arrangements apparently have worked well for 8-bit computers, but Perfect Software has been less than perfectly implemented

on 16-bit machines such as the IBM PC and compatible computers. The company's word processing program, *Perfect Writer*, was promised and advertised for the PC for nearly a year before it was actually released.

Two makers of PC-compatible computers grew tired of waiting for *Perfect Writer* and have substituted *Volkswriter* as their word processor. Columbia Data Products of Columbia, Maryland, will offer the program for its Multipersonal Computer, and Computer Devices of Burlington, Massachusetts, will supply *Volkswriter* with the Dot Computer.

Software makers also seem to be ripe for acquisition these days. Dictronics and Aspen Software, publishers of the *Random House Thesaurus*, *Proofreader*, and *Grammatik*, have been purchased by Wang. Information Unlimited Software of Sausalito, California, publisher of *EasyWriter II*, *EasySpeller II*, *EasyPlanner*, and other programs, has been acquired by mainframe software developer Computer Associates International of Jericho, New York. It looks as if the big-computer boys are

discovering what analysts have been predicting for months: the trend is toward micros, and the majority of the money is in software.

## On-line Job Hunt

Connexions is a new dial-up data base service for job seekers in high-tech industries. The company, based in Cambridge, Massachusetts (800/562-3282), collects listings of professional-level openings in computer-related fields and posts them on its electronic bulletin board. Subscribers pay \$15 for each 2 hours of connect time, during which they may browse the listings—sorted by job category, location, and salary—and even submit an electronic resume to prospective employers.

The whole process is anonymous until you identify yourself to an employer, so you can shop for new opportunities without jeopardizing your current job. Exact salaries are not included in the job listings, but you choose search criteria before reading the listings that set a salary range in increments of \$5000. So far the listings on the Connexions data base are computer- and engineering-intensive, and the "Other" category is empty. Let's hope this service prospers and expands so that PC users can really capitalize on their computers. ●

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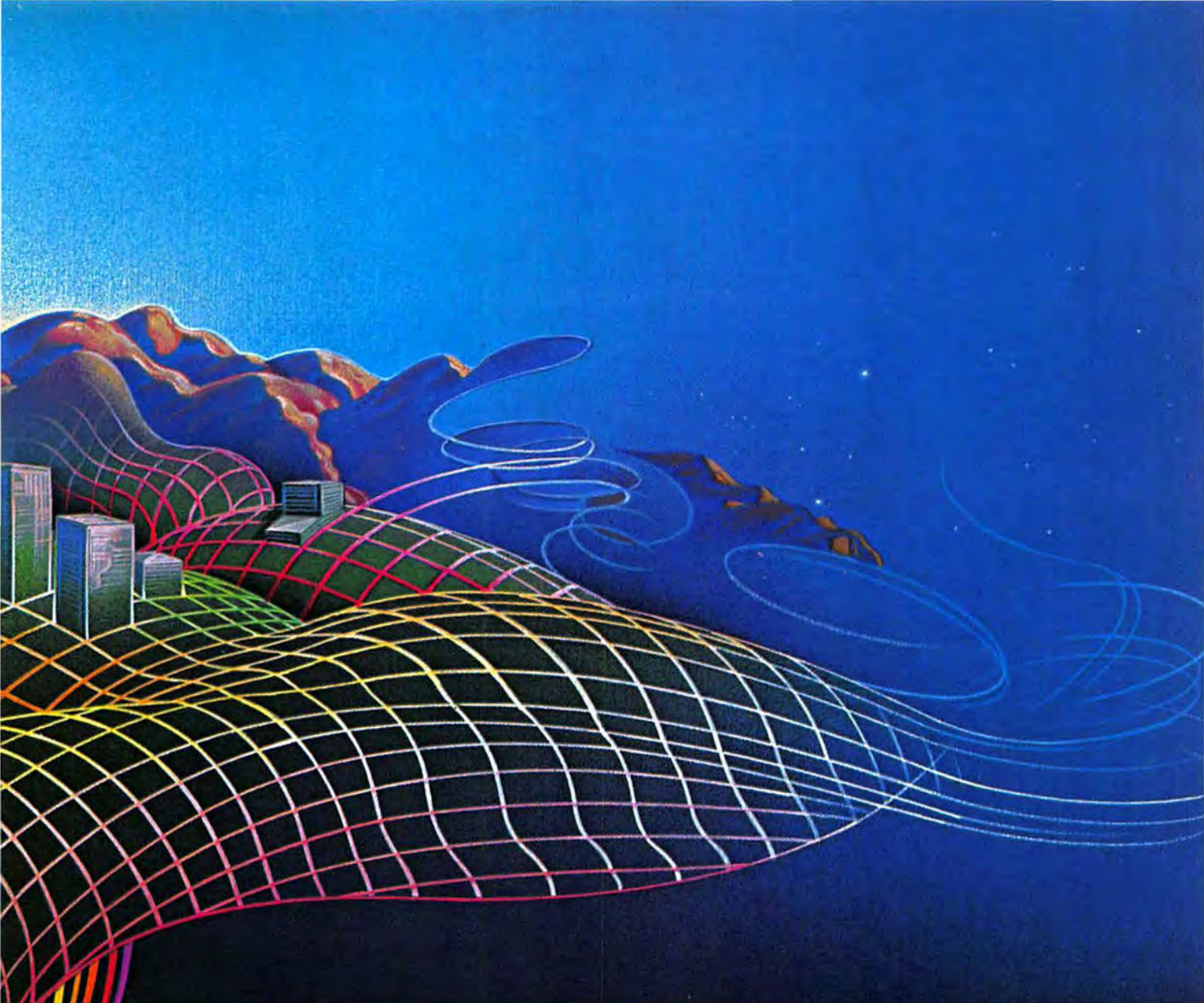
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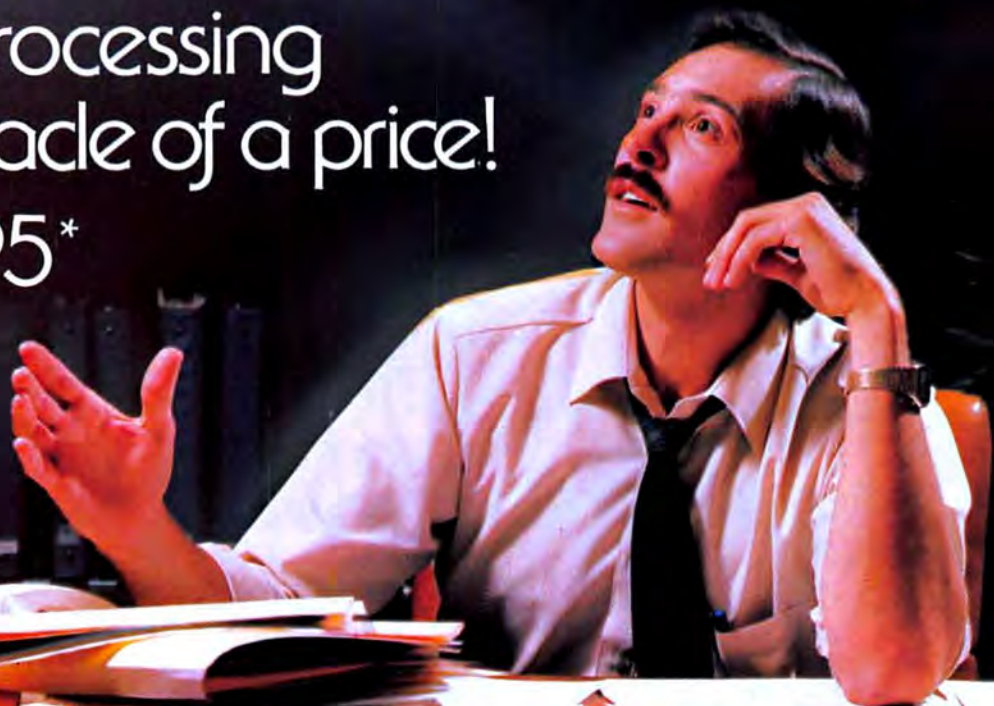
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# The Modem Market

Larry Jordan

*Because computer communications is becoming more important to a larger group of PC owners, the market is exploding with modems—those little black boxes that allow a computer to send and receive data over normal voice telephone lines. To help you make a more informed purchase decision, this article examines some of the most popular modems currently being used with the IBM PC.*

Modems convert the digital signal containing data from a computer to an analog signal that can be transmitted over the voice-grade telephone lines, and convert the analog signal they receive from the phone line to the digital signal that the computer can understand. Modems don't really differ in performance—speed or strength—rather, their quality and usefulness can be judged by the range of features offered and the way those features are implemented. Those features are described and explained in "What Makes Modems Run?" in this issue.

Due to the proven popularity of the Hayes Smartmodem 300 and the emerging popularity of the new 1200 bps version, the Smartmodem 1200 is used in this article as the benchmark for evaluating the other modems commonly used on the IBM PC and IBM PC compatibles. Even the expansion-board-mounted Smartmodem 1200B is measured against its stand-alone Smartmodem 1200 brother.

## The Old Workhorse

Although I had previously used a variety of direct-connect and acoustically coupled modems for communications with mainframe computers in business applications, the modem I chose to buy several months after I took delivery of my IBM PC was a Hayes Smartmodem 300. At the time only a couple of 300 bps intelligent modems were available, and the Hayes came highly recom-

mended. It also looked good. It had several LED lights on the front and came in a professional-looking aluminum box. The real reason I bought the modem, however, was the intelligent features it provided.

The Smartmodem 300 has performed exactly as advertised, and I would still be using it today if not for the release of a new Hayes product. My Smartmodem 300 has recently taken a back seat to a Smartmodem 1200, mainly because all my bulletin board SYSOP (system operator) friends had switched to 1200 bps operation, and I was not about to be outdone. I now have a good, used 300 bps Smartmodem for sale, but the market for it is drying up quickly as everyone catches the 1200 bps fever. "Smartmodem 450" in this issue discusses 450 bps operation on the 300 bps modem. It may help build a secondary market for used 300 bps Smartmodems.

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My Smartmodem 300 has recently taken a back seat to a Smartmodem 1200.

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## The New Workhorse

I operate a Remote Bulletin Board System (RBBS-PC) when I am not using the PC for other applications, and the Smartmodem 1200 allows 1200 bps callers to download software at four times the speed allowed by my retired 300 bps Smartmodem. It also allows users to call in at 300 bps and then switch to 450 bps for a 50 percent increase in download speed. Other than the 1200 bps speed option and the strange noise it produces when







## ● Review

making a 1200 bps connection, the Smartmodem 1200 is the same, fine modem as the Smartmodem 300. As you can see from Tables 1 and 2, however, some new modems are going to give Hayes a run for the money, particularly in the expansion board modem market.

Smartmodem 1200, Hayes Microcomputer Products, Inc., 5923 Peachtree Industrial Blvd., Norcross, GA 30092, 404/449-8791. List price: \$699.

The modem evaluations that follow are in alphabetical order. All board-mounted modems for the IBM PC that were commercially available when these evaluations were done (in June and early July 1983) are presented here. Modems that have been announced since that time will be reviewed in future issues of *PC World*.

### Bytcom (Toyocom) 212AD

The name Toyocom made me think of Toyota as I pulled the modem out of its box, but I was relieved to find no gear shift devices on the modem. Instead I found a wide, low-profile plastic box with several switches and LED indicator lights on the front. (The 212AD is now manufactured and marketed under the Bytcom label and is referred to in this article as the Bytcom 212AD.)

After installing an RS-232C cable between the stand-alone modem and the computer's serial adapter and plugging in the modem's 2-pound external power supply, I was pleased to find the response of what appeared to be a pretty good modem.

The Bytcom monitor program is in the dormant mode when the modem is first turned on. Sending two carriage returns to the modem wakes it up and displays the baud rate and parity of the connection with the PC. This is a nice feature for communications software that reverts back to a set of default communications parameters after each call. The screen displays the parameters in effect before a call is made, a feature that can eliminate parameter switching after a call is completed.

The only drawback to this feature is the default "no activity" time. The modem goes to sleep after 2 minutes in the interactive mode, with no keyboard activity, and this 2-minute default value cannot be changed. Sending the modem two carriage returns every time you want to use it can be annoying.

Despite the inconvenience involved in waking the modem from the dormant state, I found that it had a number of user-friendly features. When you send the modem an H (for Help), it responds with a concise explanation of each of its commands. When you press L it also lists the contents of its nonvolatile dialing directory. You can easily modify the contents of the dialing direc-

tory. Numbers are automatically dialed when you press a single-digit number or an N followed by the name of the host system to be dialed. A telephone number can also be redialed once or several times using the modem redial command. A telephone number in the directory can be linked to any one of the other ten numbers stored in the modem. If no connection is achieved after a number is dialed, the modem dials the next linked number. Linking a number to itself causes the modem to redial a busy number an indefinite number of times, a feature that I found indispensable for getting into several bulletin board systems in the Washington, D.C. area.

I had several problems with the Bytcom 212AD. First, the modem commands are not consistent. Some commands work when only uppercase letters are used and others when only lowercase letters are used. This inconsistency is confusing. Second, the modem has no power on/off switch. The only way to reset the modem or turn it off is to unplug the power transformer. Third, the modem uses a 2-character disconnect code. It is all too easy for that code to be embedded in a document or a program being sent to a host system. The code should be at least 3 characters long to reduce the probability of an unwanted disconnect from the host to an acceptable level. Fourth, the modem installation/operation manual is poorly written. It contains many typing errors and does not adequately describe the operation of the modem.

Finally, I could not get the modem to work with host and bulletin board systems that use Hayes Smartmodems to answer the telephone automatically. It

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Sending a modem two carriage  
returns every time you want to  
use it can be annoying.

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would work fine when I called remote Rixon modems, but the Bytcom would tell me 'No Answer' or 'Dead Line' when I called a Smartmodem system. Dialing the number manually confirmed that the Smartmodem actually answered the call. The manufacturer reports that a firmware modification in the current production units has corrected the Smartmodem incompatibility.

I recommend the Bytcom modem for people who intend to use it with a dumb terminal. It has several powerful features, but the smart terminal communications programs available for the IBM PC equal or surpass most of the Bytcom's capabilities. Many of the advanced features of smart terminal programs cannot be used with the Bytcom, however, because they require Hayes Smartmodem compatibility.



Modem Feature	Bitcom 212AD	Hayes Smartmodem 1200	Hayes Smartmodem 1200B	Microcom PCS	Rioxon PC212A	U.S. Robotics Passport	Ven-Tel PC Modem Plus
<b>Modem type:</b> Stand-alone	●	●	—	●	—	●	—
Expansion board	—	—	●	—	●	—	●
<b>Transmission Protocols:</b> Bell 103	●	●	●	●	●	●	●
Bell 113	●	●	●	—	●	●	●
Bell 212A	●	●	●	●	●	●	●
Racal-Vadic	—	—	—	—	—	—	—
<b>BPS rate capability:</b> 300	●	●	●	●	●	●	●
1200	●	●	●	●	●	●	●
<b>Duplex modes:</b> Half	—	●	●	●	●	●	●
Full	●	●	●	●	●	●	●
<b>Line monitor speaker:</b> Uses PC speaker	—	—	—	—	—	—	●
Provides its own	—	●	●	●	—	●	—
None	●	—	—	—	●	—	—
<b>Telephone compatibility:</b> Four pin modular	●	●	●	●	●	●	●
Six pin modular	●	—	—	—	—	—	—
<b>Power supply source:</b> External regulator	●	●	—	●	—	●	—
Uses PC bus power	—	—	●	—	●	—	●
<b>Switch position control:</b> Manual switch only	●	—	—	—	—	●	—
Software switch only	—	—	—	—	●	—	—
Both	—	●	●	●	—	—	●
<b>Built-in test modes:</b> Self-test	●	—	—	—	—	—	—
Analog loop-back	●	—	—	—	●	—	—
Remote digital	●	—	—	●	●	—	—
<b>Communications modes:</b> Asynchronous	●	●	●	●	●	●	●
Synchronous	●	—	—	—	—	—	—
<b>Modem operating states:</b> Off-line command	●	●	●	●	●	●	●
On-line communication	●	●	●	●	●	●	●
Quit (dormant)	●	—	—	—	●	—	—

Table 1: Modem hardware features



Modem Feature	Bytcom 212AD	Hayes Smartmodem 1200	Hayes Smartmodem 1200B	Microcom PCS	Rixon PC212A	U.S. Robotics Passport	Ven-Tel PC Modem Plus
Command help file: Available on-line	—	—	—	—	—	—	—
Available off-line	●	—	—	—	●	—	—
Command compatibility: Vendor-unique mode	●	—	—	●	—	—	—
Hayes-compatible mode	—	●	●	—	—	●	●
Both	—	—	—	—	●	—	—
Parameter change recognition: From dormant state	●	—	—	—	—	—	—
From command state	—	●	●	●	—	●	●
Both	—	—	—	—	●	—	—
Dial types available: Pulse (rotary)	●	●	●	●	●	●	●
Touch tone	●	●	●	●	●	●	●
Detect and switch	—	—	—	—	●	—	—
Call/answer modes: Manual originate	●	●	●	●	●	●	●
Manual answer	●	●	●	●	●	●	●
Auto-answer	●	●	●	●	●	●	●
Dialing modes: Keyboard input	●	●	●	●	●	●	●
Software disk directory	●	●	●	●	●	—	●
Modem stored directory	●	—	—	—	●	—	—
Automatic dial design: Dial from menu	●	—	—	●	●	—	—
Dial by host name	●	—	—	—	—	—	—
Redial busy number	●	—	—	—	●	—	—
Redial x times	●	—	—	—	●	—	—
Repeat dial last number	●	●	●	●	●	●	—
Link alternative number	●	—	—	—	●	—	—
Tone recognition: First dial tone	●	—	—	—	●	—	—
Secondary dial tone	●	—	—	—	●	—	—
Busy signal	●	—	—	—	●	—	—
Dead line	●	—	—	—	●	—	—

Table 2: Modem software features



Bytcom 212AD, Bytcom, Inc., 2169 Francisco Blvd., Ste. H, San Rafael, CA 94901, 800/227-3254, 415/485-0700 in California. List price: \$595.

### Hayes Smartmodem 1200B

The Hayes Smartmodem 1200B is essentially a Smartmodem 1200 mounted on an expansion board. It is manufactured with the same high standards as the stand-alone Smartmodems. Hayes also does an excellent job of packaging the modem; the one I evaluated was delivered in a 3- by 2- by 1-foot box filled with foam pellets, surrounding the standard, Hayes shrink-wrapped modem box, which was delivered just as it was shipped from the factory.

Hayes includes its *Smartcom II* smart terminal communications package with the Smartmodem 1200B. "The Communicators," *PC World's* review of communications packages (Vol. 1, No. 5) rated *Smartcom II* as one of the best available for the IBM PC. Since that review, Hayes has corrected the "colored snow" problem that plagued color monitor applications of the original version of *Smartcom II*.

The 1200B comes with an outstanding installation and operations manual. Following the manual's instructions and photographs, I was able to unpack, inventory, and install the modem in 20 minutes. The installation would have gone faster, but I had to remove my Quadram multifunction board and disable its communications port. The Hayes modem comes configured as COM1: and can be reconfigured to COM2: if that is more convenient.

The only adjustment I had to make after closing my PC and powering up was turning the modem speaker volume down. The modem came from the factory with the board-mounted speaker set at full volume. My first call with the modem brought several curious visitors to the computer room. After reducing the volume with the externally mounted adjustment knob, I was ready to start communicating.

The modem worked in both originate and answer modes with the *PC-Talk III*, *Crosstalk*, *Telios*, and *Smartcom II* communications packages and in auto-answer mode with my *RBBS-PC* bulletin board software without a single modem-mounted switch position change. This is a major accomplishment in light of the numerous switch position changes that you have to make with a stand-alone Smartmodem to go from any communications package to *Crosstalk* or the *RBBS-PC* package.

All Smartmodem dialing functions and control commands worked the same with the 1200B and the stand-alone Smartmodem, including the EPROM version request ATI command. This command causes the

Smartmodem to tell you the EPROM version number. The version I tested was 123, which was fortunate since earlier EPROM versions 121 and 122 contain bugs and will not properly answer the telephone in the auto-answer mode.

One of three problems I had with the 1200B was the lack of an audio or visual indication of carrier loss. With the stand-alone Smartmodems, you can glance at the front panel, LED carrier-detect indicator if you suspect a loss of carrier during a communication session, but the 1200B has no LED lights. An indicator of carrier loss would save a lot of futile pounding on the <Enter> key to get a disconnected remote system to respond. Fortunately, some communications packages, including *Telios*, have a carrier-loss message that flashes to warn you of such events; most, however, do not.

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I was able to unpack, inventory,  
and install the Hayes Smart-  
modem 1200B in 20 minutes.

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The second problem I had with the Smartmodem 1200B was an occasional modem "lock up." Either the modem would stop responding or the speaker would not work properly. This sometimes happened immediately after I turned on the PC, but on one occasion it happened after two days of continuous operation. The bulletin board I was operating suddenly quit working, and the problem was diagnosed as a locked up modem. The only way to recover from these problems was to turn the PC off and then turn it back on; the modem itself does not have an external on/off or reset switch.

The only other problem I had with the Smartmodem 1200B was in changing communications parameters while on-line with a host system. Several bulletin board and host systems that I regularly call require that you change parity and data bits when you use their protocol file transfer features. Every time I tried to change parameters, however, the 1200B would drop the telephone connection. Using the Hayes stand-alone modem, you can place internal switch 1 in the down position and thereby cause the modem to ignore the Data Terminal Ready (DTR) status of the PC. This procedure allows you to drop the DTR signal momentarily to the modem (which happens during communications parameter changes) without causing the modem to disconnect from a host system. The 1200B has no equivalent switch and always monitors the DTR signal. To use the special error-checking protocols of the host systems, I had to go back to my stand-alone Smartmodem.



## ● Review

Smartmodem 1200B, Hayes Microcomputer Products, Inc., 5923 Peachtree Industrial Blvd., Norcross, GA 30092, 404/449-8791. List price: \$599.

### Microcom PCS

The Microcom Professional Communications System (PCS) is more than a modem; it is a Z-80 central processor driven microcomputer electronic mail system. The stand-alone unit is about four times bigger than a Hayes Smartmodem and contains 32K of RAM. It has a robust array of modem features, including a ten-number telephone dialing directory with battery backup. As Tables 1 and 2 show, the PCS has most of the modem features provided by a Smartmodem 1200, plus some not provided by the Smartmodem.

The PCS dialing directory is similar to the Rixon PC212A and the Bytcom 212AD directories. Telephone numbers can be stored and dialed with a simple dialing command. Unfortunately, the PCS does not allow link-

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Microcom PCS has a robust array of modem features, including a ten-number telephone dialing directory with battery backup.

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ing of directory entries or repeat dialing when a dialed number is busy. The modem does allow dialing time delays (special characters that cause 3-second dialing sequence pauses), but will only perform blind-pulse or touch-tone dialing; it does not wait for a dial tone before starting a dialing sequence and does not automatically switch dialing types to match the telephone system.

The PCS automatically senses and matches speed (bps) with the terminal or computer, but binary file transfer is cumbersome. The modem's factory default attention code is Control-A. Unfortunately, that character is often contained in binary files, and the modem returns prematurely to the off-line command mode whenever it encounters a Control-A during a binary file transfer. This is particularly true with the Xmodem file transfer protocol because Xmodem uses the Control-A (an ASCII start-of-header character) to signal the start of a file transfer. Thus, the transfer aborts before the first block is transferred. The modem does allow redefinition of the attention character or a change of modes that can alleviate the binary file transfer problems, but the manual provides minimal information to help the user make the changes.

The PCS has a unique modem feature called the Reliable Link Protocol. This is an error-checking file transfer protocol that uses the cyclic redundancy check (CRC-16) technique for transmission error detection. This type of error detection is more accurate than the checksum method used in the Xmodem protocol. The PCS Reliable protocol retransmits blocks of data when errors are detected, a procedure that results in better than 99.9 percent error-free file transfers. Due to the unique handshaking characters employed by the PCS, the protocol can be used between only two PCS modems or between a PCS modem and another communications station that supports the Reliable Link Protocol.

Until recently, the protocol has been proprietary and available with only PCS modems, but the protocol may soon appear in several communications packages. Microcom recently decided to make its protocol available to the public with the hope that it will become a national standard for binary and data file transfers. A spokesperson for Microcom also stated that a BASIC language implementation of the protocol may be released as an example for software developers.

In addition to its modem features, PCS can act as a printer interface device. On the rear of the modem are two serial ports: one for connection to a computer or terminal and a second for connection to a serial printer. PCS also allows you to select a printer buffer size in the range of 1 to 31K. This is an excellent feature for simultaneous communications and printing of received data. The simultaneous printing can be toggled on and off using PCS commands.

Although PCS has the equivalent computing power of a Radio Shack TRS-80 Model 100, for most IBM PC applications this is far more than necessary. A simple software-driven modem such as the Rixon or the Smartmodem 1200 is easier to use and is well suited for most communications applications. The PCS is better suited for dumb terminal communications or stand-alone electronic mail applications. The electronic mail capabilities of the PCS will be reviewed in a future article on host and bulletin board systems.

Professional Communications System, Microcom, Inc., 1400A Providence Hwy., Norwood, MA 02062, 617/762-9310. List price: \$995.

### Rixon PC212A

The Rixon modem came well packaged, but a novice would find it a little more difficult to install than the Hayes 1200B. The user manual has installation instructions, but the diagrams are not as clear as the Hayes photographs. The manual actually looked "rushed-to-market," complete with a cover sheet explaining last-minute changes in modem EPROM commands. Unfortu-



## Modem Indicator Lights

Most stand-alone modems have indicator lights on the front panel to show action and status. These lights are labeled with cryptic symbols that do not mean much to the communications novice. The symbols are also not the same on all modems, which leads to further confusion when a person uses more than one modem. The following definitions and the explanation of symbols in the table below will clarify some of the modem label confusion.

*Auto-Answer* indicates the auto-answer status of the modem. When this indicator is on, the modem will automatically answer an incoming call.

*Carrier Detect* indicates whether the modem has detected a carrier signal from a remote modem. This indicator has to be on for data transmission to take place.

*Data Terminal Ready* indicates whether the terminal (the IBM PC) is ready to receive and send data. This indicator must be on for the modem to maintain the connection with a remote modem.

	Smartmodem 1200	Bytcom 212AD	PCS 1200
Auto-Answer	AA		
Carrier Detect	CD		CD
Data Terminal Ready	TR		DTR
High Speed	HS		HS
Modem Check		MC	
Modem Ready	MR	MR	
Off Hook	OH	MB	OH
Receive Data	RD	RD	
Send Data	SD	SD	
Test Mode		TM	

*High Speed* indicates the modem operating speed. When the indicator is on, the modem is operating at 1200 bps. When the indicator is off, the modem is operating at 300 bps or at another programmed speed less than 1200 bps.

*Modem Check* has an assigned special meaning for modem testing. The modem manual specifies the exact meaning of this indicator.

*Modem Ready* indicates the modem operation status. When this indicator is on, the modem is ready to receive and send data.

*Off Hook* indicates the status of the data line connected to the modem. When the modem is using the telephone line, the indicator is on. This indicator is also on when a modem is making the telephone line appear to be busy.

*Receive Data* indicates the receipt of data from a remote modem. When this indicator is on, data is coming in from the remote modem.

*Send Data* indicates the transmission of data to a remote modem. When this indicator is on, the modem is sending data to the remote modem.

*Test Mode* indicates that the modem is in a test mode.

The indicator lights on a stand-alone modem are good diagnostic tools. By watching the data send and receive, the auto-answer, and the speed (bps) indicator lights, a software developer can avoid many hours of debugging time. The indicator lights also tell the system operator (SYSOP) of a bulletin board whether the auto-answer software is functioning properly and whether someone is on the system—which often happens just as the SYSOP sits down at the terminal to do some useful work. The carrier-detect and off-hook lights also tell the SYSOP when the caller has disconnected.

nately, I failed to realize the importance of the cover sheet until I had spent almost an hour trying to get the modem to switch from the Rixon mode to the Hayes-compatible mode. All the Rixon commands worked fine, but the modem refused to respond with an 'OK' when instructed to act like a Hayes Smartmodem. After I had fully explored the impressive array of Rixon commands, I finally discovered the small print that noted the revised Hayes actuation command.

The Rixon command mode provides a full set of modem dialing and control commands, including a complete modem response message set that displays the

results of telephone calls. The modem has a dialing directory that can be programmed to contain up to ten telephone numbers and host computer names or descriptions. You can dial a host system by entering a single digit from the PC keyboard. Software auto-dialing directories can also be used to augment the modem's internal dialing directory.

By using the Rixon batch-mode dialing format, I was able to use my full *PC-Talk III* dialing directory, but dialing required one additional keystroke for the batch



mode dialing suffix command beyond that normally required. I had to program the batch-mode suffix symbol into an upload key sequence and send it to the modem after the number. The *Telios* and *Crosstalk* communications packages come with a separately defined dialing suffix that makes the modem easy to use in the Rixon command mode.

The Rixon command mode also provides powerful dialing commands. Each stored telephone number can contain a sequence that dials numbers and then waits for secondary dial tones. The modem automatically detects touch tone or pulse tone and switches to match the detected tone during the dialing sequence. Directory numbers can also be linked to other directory numbers so that secondary numbers are dialed if no connection is made with the first call. And finally, numbers can be automatically redialed up to ten times. If a connection is made during a redialing sequence, the modem sends the computer a bell tone (Control-G).

After successfully getting into the Hayes mode, I found that the Rixon PC212A gave me all the Hayes-compatible commands I needed to run most of my communications and bulletin board software, but I did find some incompatibility with the Hayes command string format. The Hayes commands work fine on the Rixon modem, but you cannot leave delimiting blank spaces in command strings as you can with a Hayes Smartmodem. Besides making a long command string more difficult to read, the blank space prohibition can be confusing to first-time PC212A users.

The Rixon manual made no reference to outlawing blank spaces, and when I called to inquire about the problem, Rixon seemed genuinely surprised that I would want spaces in a command string. Rixon's Washington, D.C., representative said that the company would revise the modem's EPROMs to allow spaces in command strings. Perhaps the EPROM modification will correct the modem's incompatibility with the Hayes *Smartcom II* communications package as well. The package informs you that the Smartmodem is not responding soon after the program is loaded into memory, and beyond that point it will not interact with the Rixon modem.

Another problem I had with the Rixon PC212A was the absence of sounds when telephone numbers are dialed in the Hayes mode. The Rixon mode uses screen messages to let you know the results of telephone calls but does not provide those same messages in the Hayes mode. The modem has no speaker of its own and does not use the IBM PC speaker to duplicate the function of the Hayes speaker. After initiating a dialing command sequence, you have no indication of the performance of the commands. At one point during the Hayes mode testing, I had to dial my own home voice telephone number to be sure the modem was actually dialing; that was how I discovered the blank-space command-string limitation.

The Hayes mode should either be equipped with a Rixon message function equivalent or the modem wired for sound. I prefer a speaker, but some people find the sounds annoying and prefer messages.

The only other problem I had with the PC212A occurred when I tried to change communications parameters while on-line with a host system. The PC212A, like the Smartmodem 1200B, always monitors the PC's DTR signal and drops the telephone connection when the DTR signal is interrupted. Changing communications parameters momentarily interrupts the DTR and thus causes the connection to be lost. The manual describes a complex modem-command override to correct the problem, but I could not get the command to work.

PC212A, Rixon, Inc., 2120 Industrial Pkwy., Silver Spring, MD 20904, 301/6220-2121. List price: \$499, with optional serial port \$539.

### U.S. Robotics Passport

The Passport is a compact, stand-alone Hayes Smartmodem 1200 compatible modem made by U.S. Robotics, Inc. This modem is housed in a plastic case about three-fourths the size of a Hayes Smartmodem and comes complete with a Velcro strip for mounting it on the side of the PC System Unit. I chose to place the modem on top of the System Unit, but the side mount can save space in a crowded computer area.

At first glance the Passport appears to be an excellent modem, but its installation and operation in some cases belied that initial impression. The modem has an RS-232C cable permanently attached that eliminates the hassles of modem cable installation as long as you order the right version. The Passport I received for review had a male connector at the end of the modem cable, but the IBM PC serial ports require female connectors. When I called U.S. Robotics about the problem, I was told that the modem can be ordered with either a male or a female connector; they chose to send me one with a male connector because most computers require a male connector. So much for most computers—it cost me \$30 to purchase an adapter that would allow my IBM PC to communicate with the Passport.

One Passport feature I liked was the location of its signal override switches. The override switches of most modems, including the Hayes Smartmodem, are located inside a cover plate, and the plate is often difficult to remove. The Passport switches are located in a recessed cavity on the back of the modem; the cavity has no cover plate and does not need one. All four override switches can be easily adjusted using a small screwdriver.

After making all the proper switch adjustments and cable attachments, I found several problems with the Passport's operating characteristics. The modem uses



Hayes-compatible commands and worked fine while dialing telephone numbers at both 300 and 1200 bps, but problems occurred after I made connections with remote host systems. Every time a call came in on the line I was using for communications, the modem dropped my host connection and answered the telephone. The modem has no auto-answer override switch; the only way to disable the auto-answer is with a modem string command. Apparently the override command does not work. Regardless of the command strings sent to the modem, it dropped my host connection with every incoming call. Commanding the modem to answer only after receiving several rings would keep the connection from dropping, but each time the modem saw a ring signal on the line, it sent garbled characters to my screen. The manufacturer reports that an improved version of the product, including a correction of this auto-answer problem, is being developed.

Another problem I had with the Passport was insufficient Smartmodem command compatibility to support auto-answer software operation. It would not work with three host and bulletin board systems advertised as Hayes Smartmodem compatible because the modem does not provide as many manual switch overrides as the Smartmodem.

The last problem I had with the modem was speaker control. The modem's internal speaker was helpful for telephone dialing, but it has no volume control. The default condition leaves the speaker on, and software command strings must be sent to keep the speaker quiet. The absence of a speaker volume control is a nuisance, but I would rather have a modem with a speaker and no volume control than no speaker at all.

Passport, U.S. Robotics, Inc., 1123 W. Washington, Chicago, IL 60607, 312/733-0497. List price: \$449.

#### Ven-Tel PC Modem Plus

The PC Modem Plus expansion board should not be confused with the PCMODEM communications software package. The two are produced by different companies and are not offered as a combination package. In fact, PC Modem Plus includes the *Crosstalk* communications software (version 1.4) as a bonus.

The manual explaining installation and operations for PC Modem Plus is not in the same league with the Hayes and Rixon manuals, but the modem functioned properly when I installed it in my PC. The board is well made and comes in two versions. You can purchase it as a 300 bps Bell 103 compatible modem and upgrade it to a 300/1200 bps modem later by purchasing a plug-in module from the modem manufacturer, or you can purchase it initially as a 300/1200 bps modem. The upgrade option is good for people who are handy with chip installation and are on a tight budget when they initially purchase a modem.

The PC Modem Plus uses the Hayes Smartmodem commands, but I found that it was not compatible with all Hayes-compatible smart terminal communications packages. The *Crosstalk* program performed as expected with the board, but I could not get *PC-Talk III*, *Telios*, or *Smartcom II* to operate with the modem. I also had trouble getting the modem to answer the telephone while the computer was operating remote host and bulletin board software. The modem has ten switches that can be set, but the documentation did not provide enough clues for me to configure them for proper operation of *RBBS-PC*, *Hostcomm*, or *Remote Access*.

A unique PC Modem Plus feature is its sound effects. The modem does not have a speaker of its own. Instead, it uses the IBM PC speaker to produce the same sound effects as the Hayes Smartmodem. The Hayes speaker volume is adjustable through hardware (external volume adjustment knobs), whereas the PC Modem Plus allows software adjustment (modem command strings) of the PC speaker volume. I prefer the Hayes design because it allows you to set the volume permanently, but the volume adjustment commands are a good second choice.

I was able to test this modem at only 300 bps because the 1200 bps upgrade module was not yet available. According to Ven-Tel, the module will be available by the time this issue of *PC World* is published.

PC Modem Plus, Ven-Tel Inc., 2342 Walsh Ave., Santa Clara, CA 95051, 408/727-5721. List price: 300 bps version \$389.

#### Back to the Workhorse

After completing the modem evaluations, I was happy to return to full-time use of my stand-alone Hayes Smartmodem 1200. I like the LED lights on the front and the internal speaker, but most of all I know I can depend on the Smartmodem. I can also run any communications software as long as I am willing to remove the front cover and set the switch settings to match the communications package.

If I needed a modem for a COMPAQ or another IBM PC compatible portable, I would have difficulty choosing between a Hayes 1200B and a Rixon PC212A, but I would probably choose the Rixon unless Hayes could demonstrate better reliability than I experienced with the 1200B I tested. ●

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*Larry Jordan is a freelance writer who manages power plant start-up engineers for NUS Corporation. He coauthored the book Communications and Networking for the IBM PC, published by The Brady Company.*





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MG

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the ones from  
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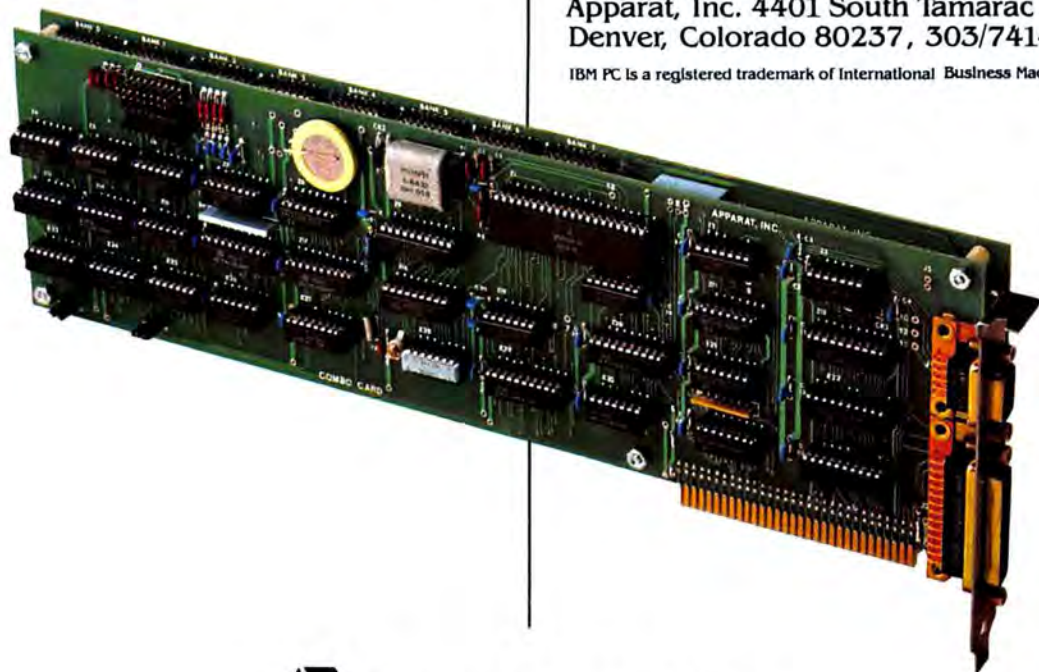
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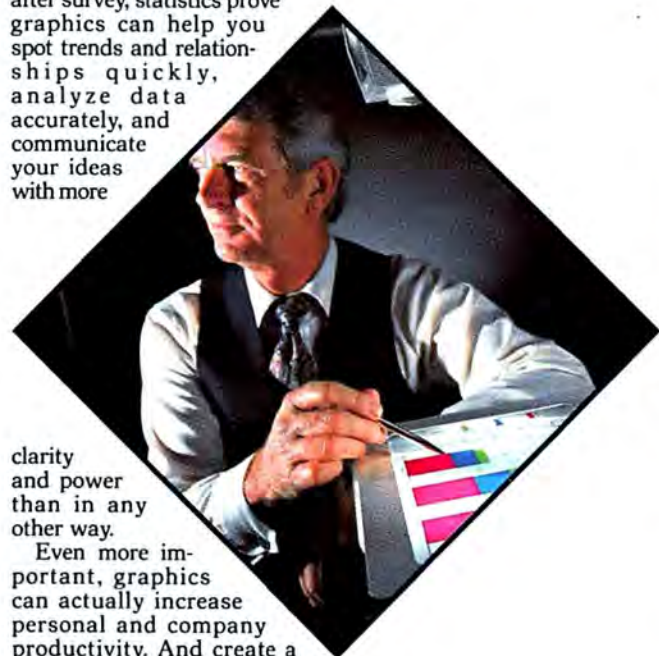
# How HP business graphics



**Enhance your reputation for being more professional, persuasive, credible and effective than your competition with the new HP 7475A Business Professional's Plotter.**

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The vital importance of graphics to today's business professional cannot be overstated. In survey after survey, statistics prove graphics can help you spot trends and relationships quickly, analyze data accurately, and communicate your ideas with more



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Graphics industry experts maintain that good graphics contain four colors per chart. But Hewlett-Packard goes the experts two better by providing a six-pen carousel, so you can store and use pens of different widths—thick pens for bold headings and thin pens for details. And with six pens, you won't have to waste valuable time changing them. That's important when "the boss wants to see your presentation in twenty minutes!"

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While most professional business applications will be satisfied with standard 8½ x 11" paper or transparencies, the HP 7475A adds the



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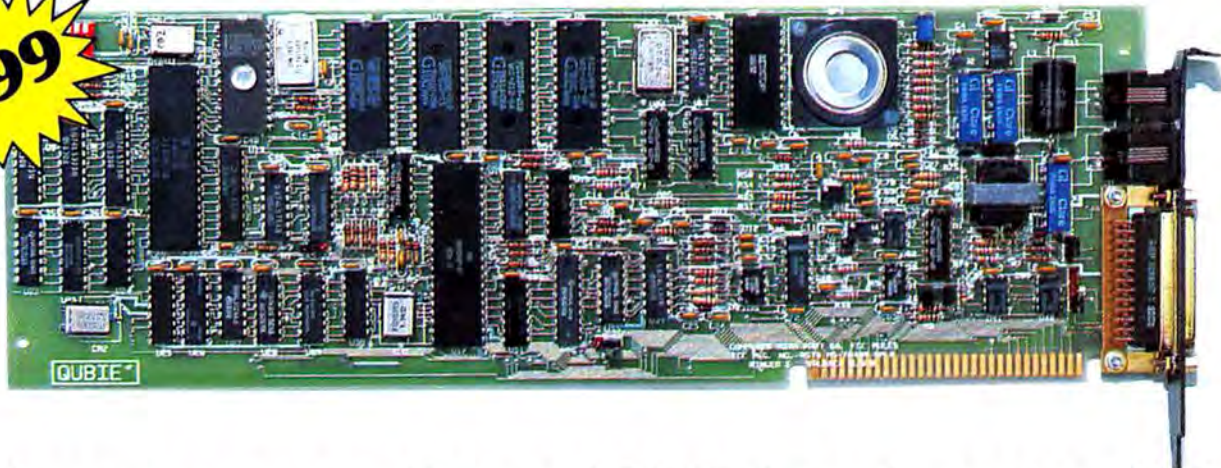
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## Why pay more for a 1200 baud, auto-dial, 212A Modem for your IBM PC?

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We took a different approach. With the Qubie PC modem card you can say goodbye to the fellow who delivers your ice because refrigeration has been invented. Through the use of four microprocessors (see picture) the tones are chopped up **digitally** and measured millions of times per second, eliminating the need for analog circuitry. Two microprocessors do the modulating, two the demodulating. The chips are programmed to emulate the 103 (30 characters per second) or 112 (210 characters per second) standards and determine the correct speed automatically. It's a proven technology that provides outstanding performance. Best of all, it's inexpensive and reliable.

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The Qubie PC modem is 100% compatible with the Hayes software commands so you can use any of the popular communications packages like CrossTalk, Transend, PC-Talk III, etc. Of course we include our QubieComm software package. We think it is as comprehensive a program as you will need. It stores phone numbers, log-on information, handles setting the modems characteristics, saves to disk files, transmits from disk files, and even allows you to transmit a disk file with error checking using the XMODEM protocol. You can even set up your modem for auto answer mode so your computer can be accessed remotely.

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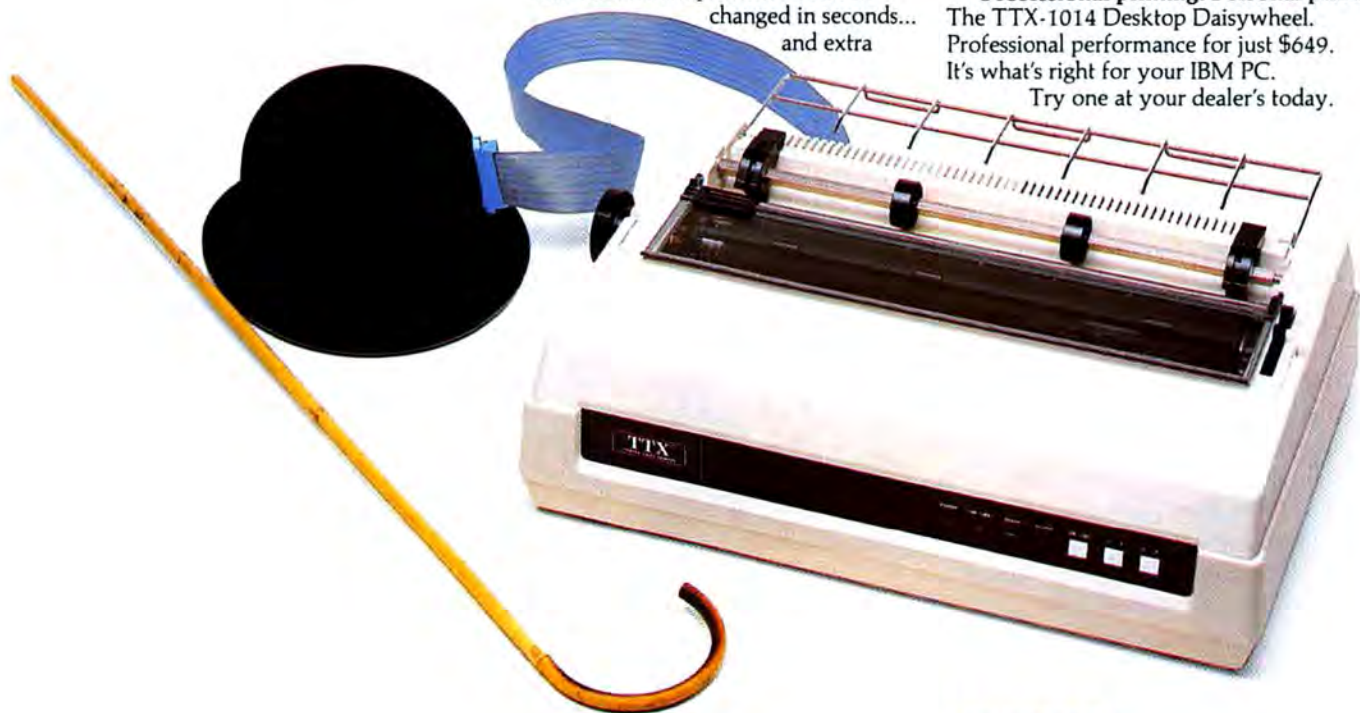
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# War of the Words

*Microsoft Word, VisiWord, and WordStar are compared on the basis of agility and ease of use.*

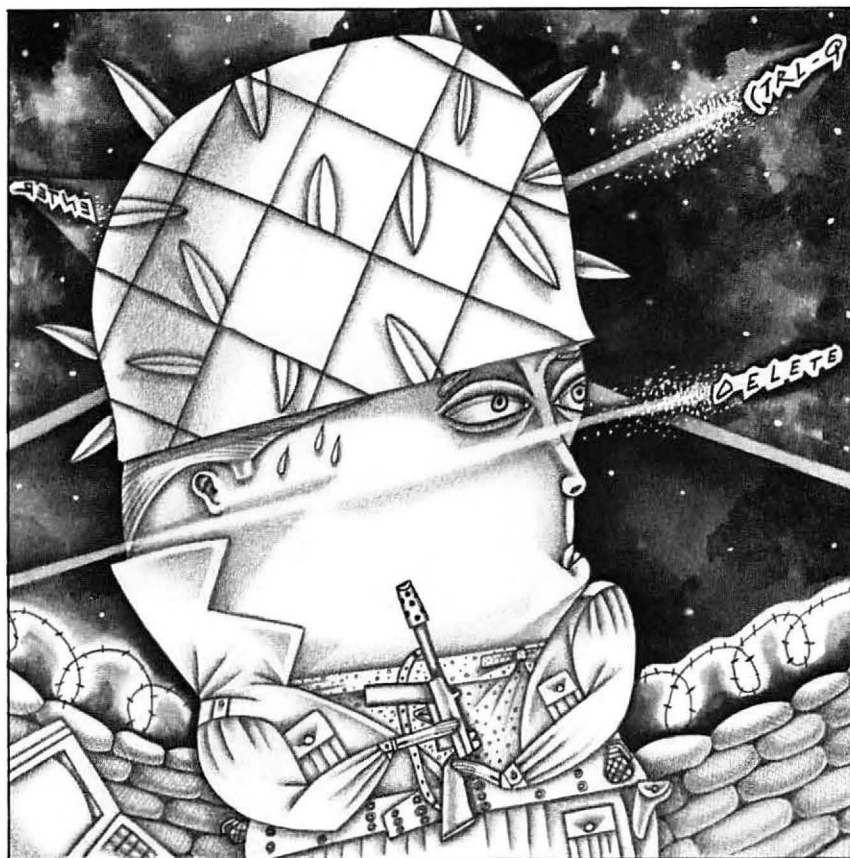
Burton L. Alperson

*WordStar* has been the best selling word processor for the IBM PC since the introduction of that computer. Many consider it the standard of comparison for microcomputer word processors. The program, originally designed for 8-bit machines, was simply converted for 16-bit operation. The conversion added little to the original program. *WordStar* operates on a PC in much the same way it operates on other microcomputers.

Word processors designed specifically for the PC are beginning to appear. VisiCorp's entry, *VisiWord*, is already on the market. Microsoft's program, *Microsoft Word*, should be available by the time this article appears in print.

These programs include several innovative features. Both provide automatic, on-screen formatting. Justified text, for example, remains justified during text insertions, deletions, and cut-and-paste operations; there is no need to reform paragraphs manually after these operations.

Both programs provide routines that help you recover from potentially disastrous mistakes. For example, if you accidentally delete a word or a line, *VisiWord* allows you to restore it with an operation called Undo. *Microsoft Word* has an even more powerful utility, called Undo. The amount of text that can be re-



stored with the Undo command is limited only by disk size. Thus, if you accidentally delete several pages, you can restore them with two keystrokes (<Esc> U).

The feature that seems to be generating the most interest is the ability to support a mouse, a palm-sized device that can be used to position a

cursor, select text for an action, and select and invoke commands. The current release of *VisiWord* does not yet support a mouse, but a version of the program scheduled for October release integrates word processing into the mouse-driven *Visi/ON* environment. The first release of *Microsoft Word* is capable of functioning with or without a mouse.



## Mousing Around

Because no standard terminology exists for operations with a mouse, this article will define and use a set of terms adapted from a preliminary draft of the manual for Microsoft's mouse. Thus, CLICK-L means push and release the left mouse button; CLICK-R means push and release the right button; CLICK-LR means push and release both buttons; and CLICK means push and release either button. Similar conventions can be applied to PUSH (hold the identified button while taking some action) and RELEASE (release the identified button after taking some action). The direction ' $=>something$ ' means point to *something* on the screen with the mouse.

Details of *VisiWord*'s mouse operations have not been released. In *Microsoft Word* the mouse operates as follows: if you point  $n$  lines down on the left border of the screen then CLICK-L, the screen scrolls  $n$  lines toward the beginning of the document. If you point to the same place and CLICK-R, the screen scrolls  $n$  lines toward the end of the document. If you point to the upper-left border and CLICK-LR, you jump to the beginning of the document. Pointing to the lower-left border followed by CLICK-LR jumps you to the end of the document.

Text can also be selected for action (insert, delete, locate, etc.) with the mouse. ' $=>character$ ' (point to a character) followed by CLICK-L selects the character. ' $=>character$ ' followed by CLICK-R selects the word in which the character is embedded. ' $=>character$ ' followed by CLICK-LR selects the sentence in which the character is embedded. ' $=>near Left Border$ ' followed by CLICK-L selects a line. ' $=>near Left Border$ ' followed by CLICK-R selects a paragraph. ' $=>near Left Border$ ' followed by CLICK-LR selects the entire document.

' $=>Right Border$ ' and then CLICK opens a horizontal window wherever the command is executed. Likewise, ' $=>Top Border$ ' and then CLICK opens a vertical window. (Up

to eight windows may be open at once.) Pointing to the bottom-right corner of a window followed by PUSH, then moving up or left followed by RELEASE shrinks the size of the window. Pointing to the bottom-right corner of a window followed by PUSH, then moving down or right followed by RELEASE expands the size of the window.

Commands may also be selected or invoked with the Microsoft Mouse. Pointing to a command in the menu followed by CLICK-L generally engages the command. Pointing to a command in the menu followed by CLICK-R generally engages and carries out a command. The former action is useful for commands that require an argument or response to a prompt (e.g., Find and Replace), while the latter can be used for commands to be invoked immediately (e.g., Delete, Insert).

These operations are more difficult to describe than they are to use. They are well chosen and easily remembered, and after a brief period of practice they feel natural.

## A Functional Comparison

Because *VisiWord* and *Microsoft Word* are considerably less expensive than *WordStar*, but comparable or superior to it in power and innovation, a functional comparison of all three programs is of some interest. The functional test used for this article was based on a single document that required extensive editing (see Figure 1). The kinds of operations involved were typical of those one might ask of any good word processor. The document was edited with *WordStar*, *VisiWord*, *Word-KEY* (*Microsoft Word* without the mouse), and *Word-MOUSE*, (*Microsoft Word* with the mouse). The major issue to be resolved was how much effort each word processor requires to edit the sample document into its final form (see Figure 2).

This kind of editing is a more stringent test of a word processor than the simple typing of a first draft.

Most screen-oriented programs are similar to one another in performing simple typing tasks. Other than using carriage returns only at the end of paragraphs and understanding the difference between a <CapsLock> key and a <ShiftLock> key, you can treat the computer as an expensive typewriter with a display. It is only in editing that important differences among word processors emerge.

## The Criterion Problem

An issue that had to be resolved before proceeding was the selection of a criterion. In judging the effort in-

---

A reasonable criterion of effort is the number of separate actions required to accomplish a standard task.

---

involved in using the various programs, what is a fair standard for comparison?

Two contenders for this standard could be ruled out immediately. The first was the way operations are invoked. Software company marketing departments are fond of claiming advantages for control code operations, function key operations, or escapes to a menu. Differences among these alternatives are actually trivial. Even the current favorite, the use of menus, requires understanding of the program operations identified in the menu. After learning the basics of a program, you can get used to almost anything, and with continued use, whatever program you are using seems to have the most appropriate way to invoke operations. Except for poorly designed programs, the way operations are invoked is not a reasonable standard for comparison.



double-space + justify right

This is the first line of the document. When finished, this will be the next to the last line of the document. When finished this will be the second and last line of the first paragraph.

This is the first line of the second paragraph. When finished, this line will have all spelling errors corrected. This line will be copied, and it will appear twice. This whole paragraph will appear as the third paragraph of the final document.

This is the first line of the third paragraph. When finished, all duplications duplications will be fixed fixed. This sentence is superfluous, and it will be removed in the final document.

This paragraph will become the second paragraph of the final document. It contains several sentences to simulate the movement of a large paragraph from one location to another. In other words, this paragraph is used for the illustration of cut-and-paste operations. To put the matter somewhat differently, we will simulate cutting a large paragraph from one section of document and pasting it to another. This operation is valuable for text that seems to go on and on and on and on.

This line will be centered.

This line will be boldfaced and underlined.

BF + Underlined

The appropriate words will be subscripted and superscripted in this sentence.

The word, consistent is consistently misspelled. The final document should reflect that the consistent misspelling of consistent is consistently corrected. Anything less would be inconsistent.

This paragraph should be indented and justified in the final document. It will simulate the insertion of an extended quotation in a document.

This line will be eliminated in the final document.

indent + justify

This sentence will be eliminated as though by accident. It will appear in the final document, but the editing process will simulate an accidental erasure that has to be restored.

Notice that this document is single-spaced and flush left (i.e., unjustified). The final document will be double-spaced and justified.

This is the final paragraph. It will contain a sentence from the first paragraph when finished.

Figure 1: Sample document before editing



This is the first line of the document. When finished, this will be the second and last line of the first paragraph.

This paragraph will become the second paragraph of the final document. It contains several sentences to simulate the movement of a large paragraph from one location to another. In other words, this paragraph is used for the illustration of cut-and-paste operations. To put the matter somewhat differently, we will simulate cutting a large paragraph from one section of document and pasting it to another. This operation is valuable for text that seems to go on and on and on and on.

This is the first line of the second paragraph. When finished, this line will have all spelling errors corrected. This line will be copied, and it will appear twice. This line will be copied, and it will appear twice. This whole paragraph will appear as the third paragraph of the final document.

This is the first line of the third paragraph. When finished, all duplications will be fixed.

This line will be centered.

This line will be boldfaced and underlined.

The appropriate words will be <sup>superscripted</sup> and <sub>subscripted</sub> in this sentence.

The word, consistent is consistently misspelled. The final document should reflect that the consistent misspelling of consistent is consistently corrected. Anything less would be inconsistent.

*(continues)*

Figure 2: Sample document after editing



This paragraph should be indented and justified in the final document. It will simulate the insertion of an extended quotation in a document.

This sentence will be eliminated as though by accident. It will appear in the final document, but the editing process will simulate an accidental erasure that has to be restored.

Notice that this document is single-spaced and flush left (i.e., unjustified). The final document will be double-spaced and justified.

This is the final paragraph. When finished this will be the next to the last line of the document. It will contain a sentence from the first paragraph when finished.

Table 2 (continued)

Another contender was the total amount of time necessary to edit a standard document. However, this variable is so heavily confounded with the operator's familiarity with the program and reaction time that it too had to be ruled out.

A reasonable criterion of effort was the number of separate actions required to accomplish a standard task. If a program requires 47 keystrokes to accomplish a task that another program can accomplish in 13 keystrokes, clearly the former program requires more effort for the task than the latter. The more computer experience you have, the more you come to appreciate reductions in the number of actions required to accomplish a task.

It is possible to distort this measure and thus be unfair to a program. In word processing programs many alternative strategies can accomplish a given result. Choosing clumsy strategies can make a program look

worse than it is. The full sequence of actions for this test is shown in the figures. Every attempt was made to employ efficient strategies. However, if you see a more parsimonious way to accomplish the task, you will want to adjust the test results accordingly. On the other hand, in a well-designed program the best alternative should also be the most obvious one. You should not have to slow down your work while you figure out the most elegant strategy.

Another way to bias the effort criterion is by changing the order in which you edit a document. Some programs operate best with one sequence of events, while other programs require a different sequence. In this test the order was intentionally optimized for *WordStar*. Since that program represents the oldest technology among the programs involved, it seemed reasonable to give it the edge in this respect.

### Moving a Sentence

The first editing task was the movement of a sentence from the beginning of the document to the end. The steps involved for the word processors are shown in Figure 3. After some cursor movement commands in *WordStar* (1-4), the beginning of a block was marked (5). Additional cursor movements (6-7) were required before marking the end of the block (8). The cursor was then moved to the intended location for the sentence (9-17) and a block move was invoked (18-19). The remaining commands reformatted all involved text and moved the cursor appropriately. *WordStar* required 24 actions to accomplish the task.

*VisiWord's* performance was seriously hindered by the absence of a word-by-word cursor movement command. The program lacks a way to make the cursor jump from one word to the next. Fifteen actions were needed just to bring the cursor from the beginning of the document



Operation: Move sentence from first to last paragraph

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Q	1 End	1 CursorDown	1 =>Sentence
2 D	2 CursorLeft	2 F9 (Sentence)	2 CLICK-LR
3 Ctrl-A	3 CursorLeft	3 Del	3 =>LL Border
4 Ctrl-A	4 CursorLeft	4 Ctrl-PgDn	4 CLICK-LR
5 F7 (Begin block)	5 CursorLeft	5 CursorUp	5 =>Location
6 CursorDown	6 CursorLeft	6 CursorUp	6 Ctrl-CLICK-R
7 Ctrl-F	7 CursorLeft	7 F8 (Word rt.)	
8 F8 (End block)	8 CursorLeft	8 F8 (Word rt.)	
9 F9 (Beginning of file)	9 CursorLeft	9 F8 (Word rt.)	
10 CursorUp	10 CursorLeft	10 F8 (Word rt.)	
11 CursorUp	11 CursorLeft	11 F8 (Word rt.)	
12 Ctrl-A	12 CursorLeft	12 F8 (Word rt.)	
13 Ctrl-A	13 CursorLeft	13 F8 (Word rt.)	
14 Ctrl-A	14 CursorLeft	14 Ins	
15 Ctrl-A	15 CursorLeft		
16 Ctrl-A	16 Esc		
17 Ctrl-A	17 M (Move)		
18 Ctrl-A	18 T (Text)		
19 V	19 End		
20 Ctrl-Q	20 CursorDown		
21 S	21 CursorLeft		
22 Ctrl-B	22 CursorLeft		
23 F10 (End of file)	23 Enter		
24 Ctrl-B	24 End		
	25 End		
	26 End		
	27 CursorUp		
	28 End		
	29 CursorUp		
	30 CursorLeft		
	31 CursorLeft		
	32 CursorLeft		
	33 CursorLeft		
	34 CursorLeft		
	35 Enter		

Figure 3: Cut and paste—moving a sentence

to the beginning of the second sentence. The text move operation was then identified by <Esc> (enter the menu), M (Move), and T (Text) in steps 16-18. More cursor movement was required to define the text block (19-22), and the end of the block was then defined (23). The remaining commands identified the destination (35) after more cursor movement (24-34).

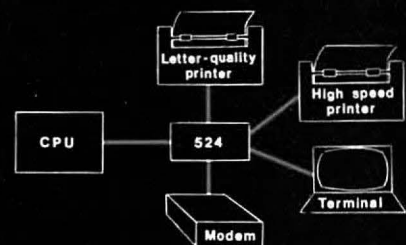
Word-KEY accomplished this task in 14 operations. After positioning the cursor in the second sentence (1), the sentence was selected (2) for the

next operation (3). The <Del> operation deleted the text and automatically reformed the paragraph. The deleted text was not lost; it was transferred to a storage area called the "Scrap." Text in the Scrap may be re-stored with an Undo command or moved anywhere in the document. After moving the cursor to the destination (4-13), the text in the Scrap was inserted (14) and the paragraph was automatically reformed.

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## ● Review

*Word-MOUSE* required only 6 actions. After positioning the mouse cursor (1) in the sentence, the sentence was selected (2). The document was scrolled to the bottom by pointing to the lower-left screen border and giving the scroll command (3-4). The destination was indicated and the transfer was performed (5-6).

### Correcting Spelling Errors

Correcting the series of spelling errors in the second paragraph required 32 actions with *WordStar* (see Figure 4). The fastest way to make the first correction was with a Find and Replace operation (1-2). After defining the change (3-12) and responding to the associated prompts (13-14), the cursor was moved to the second error (15-16), and this error was corrected (17-20). The remaining errors were corrected in a similar fashion (note that *WordStar* departs from normal DOS practice by deleting characters with <Ctrl>-G rather than <Del>).

A Find and Replace operation was also the fastest way to correct the first error with *VisiWord*. After entering the menu (1) and invoking Find (2), the target word and its replacement were defined (3-14). Step 8, P (Previous), told *VisiWord* to search backward through the document, and step 9, R (Replace), invoked the replace operation. The remaining corrections were done in a way similar to *WordStar*'s, using the <Del> key instead of <Ctrl>-G. Again, *VisiWord* was seriously hampered by the absence of a word-by-word cursor movement command, and 42 actions were required to complete the task. An alternative strategy of using Find and Replace for all corrections was attempted to see if this would improve performance. This strategy degraded performance even further to about 50 actions.

*Word-KEY* required 37 actions to complete the corrections. After engaging the Find and Replace operation (1-14), I made the remaining



corrections in much the same way as in the other programs (15-37). The <F8> key, which appeared several times, is the *Word-KEY* operation for moving or selecting the word to the right.

*Word-MOUSE* allowed a different strategy for correcting the errors. I needed only to point to the location for the first correction (1) and select the character (2). The remaining changes were obvious and few in number—18 steps total.

The introduction of the mouse is clearly a step forward in word processing.

#### Copying a Sentence

Copying a sentence to another location was not a difficult task for any of these programs (see Figure 5). Except for indicating Copy rather than Replace, the strategy was identical to that shown in Figure 3. There were some differences in the number of actions, due primarily to differences in the amount of cursor movement. The effort involved was 14 actions for *WordStar*, 19 for *VisiWord*, 7 for *Word-KEY*, and 4 for *Word-MOUSE*.

#### Correcting Duplications

Deleting duplicated words in *WordStar* required character-by-character cursor movement (1) and word-by-word cursor movement (2-3) (see Figure 6). The command for deleting the word to the right (4, 8) was also required. *WordStar* did its work in 8 actions.

The inability of *VisiWord* to move word by word and to delete a word with a single command hindered its performance again. *VisiWord* required 32 actions.

*Word-KEY* required 11 actions. The <F7> key that appears in steps 8-10 is the *Word-KEY* command to move or select the word to the left.

#### Operation: Fix spelling errors

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Q	1 Esc	1 Ctrl-PgUp	1 =>s
2 A	2 F	2 Esc	2 CLICK-L
3 t	3 t	3 R	3 i
4 h	4 h	4 Y	4 s
5 s	5 s	5 t	5 Del
6 i	6 i	6 h	6 Del
7 Enter	7 Enter	7 s	7 =>g
8 t	8 P	8 i	8 CLICK-L
9 h	9 R	9 Tab	9 Del
10 i	10 t	10 t	10 CursorRight
11 s	11 h	11 h	11 e
12 Enter	12 i	12 i	12 =>b
13 Enter	13 s	13 s	13 CLICK-L
14 Y	14 Enter	14 Enter	14 v
15 CursorRight	15 Esc	15 CursorRight	15 Del
16 CursorRight	16 CursorRight	16 CursorRight	16 =>l
17 n	17 CursorRight	17 Del	17 CLICK-L
18 e	18 CursorRight	18 Del	18 l
19 Ctrl-G	19 CursorRight	19 n	
20 Ctrl-G	20 n	20 e	
21 Ctrl-F	21 e	21 F8 (Word rt.)	
22 Ctrl-F	22 Del	22 F8 (Word rt.)	
23 CursorRight	23 Del	23 CursorLeft	
24 CursorRight	24 CursorRight	24 CursorRight	
25 v	25 CursorRight	25 CursorRight	
26 Ctrl-G	26 CursorRight	26 CursorRight	
27 Ctrl-F	27 CursorRight	27 v	
28 Ctrl-F	28 CursorRight	28 Del	
29 CursorRight	29 CursorRight	29 F8 (Word rt.)	
30 CursorRight	30 CursorRight	30 F8 (Word rt.)	
31 CursorRight	31 CursorRight	31 F8 (Word rt.)	
32 l	32 v	32 CursorLeft	
	33 Del	33 CursorRight	
	34 CursorRight	34 CursorRight	
	35 CursorRight	35 CursorRight	
	36 CursorRight	36 CursorRight	
	37 CursorRight	37 l	
	38 CursorRight		
	39 CursorRight		
	40 CursorRight		
	41 CursorRight		
	42 CursorRight		
	43 l		

Figure 4: Correcting spelling errors

Like *WordStar*, *Word-MOUSE* required 8 actions for this operation. After pointing to the word to be deleted (1, 5) and selecting it (2, 6), I pointed to the Delete command in the menu (3, 7) and completed the action (4, 8).

Deleting a sentence is a straightforward operation for most word processors (see Figure 7). *WordStar* required only 6 actions. After some cursor movement (1-3), a series of line deletion commands (4-6) was all that was necessary.

With 23 actions *VisiWord* was a victim of one of its virtues. Because



## ● Review

the program engages word wrap automatically, the sentence to be deleted ended up on two lines. Since *VisiWord* lacks a word-by-word cursor movement command, the cursor had to be moved character by character (1-17), and then the sentence had to be deleted word by word with 'Delete to the end of line' commands (18-22).

This was one situation in which *VisiWord* was treated unfairly by the optimization of the sequence of edits to favor *WordStar*. If the words had been deleted (Figure 6) after the sentence deletion (Figure 7), *VisiWord* would have looked much better. On the other hand, how far should one have to plan in advance in a well-designed program?

*Word-KEY* and *Word-MOUSE* required only 4 actions to complete that operation. After moving to the appropriate location (1), I selected the sentence (2) and deleted it (3-4).

### Moving a Paragraph

For *WordStar* and *VisiWord* moving a paragraph was little different from moving a sentence (see Figure 8). The only important difference between Figure 3 (moving a sentence) and Figure 8 (moving a paragraph) is the amount of cursor movement. In the test *WordStar* required 26 actions while *VisiWord* required 30. (Steps 19-26 for *WordStar* and steps 21-30 for *VisiWord* are cursor movement commands to get into position for the next task.)

For *Word-KEY* the <F10> command in step 2 represents the only difference between a sentence move and a paragraph move. That command selects a paragraph for action. Steps 1 and 2 accomplish the same selection for *Word-MOUSE*. Those programs required 17 and 6 steps respectively for a paragraph move.

### Centering Text

Centering text (Figure 9) was a simple operation for all the programs. *WordStar* required 2 actions and the other programs required only 1 action.

#### Operation: Copy sentence

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Q	1 CursorDown	1 CursorDown	1 =>Sentence
2 D	2 Home	2 F9 (Sentence)	2 CLICK-LR
3 F7 (Begin block)	3 Esc	3 Esc	3 =>Location
4 CursorDown	4 C	4 C	4 Shift-CLICK-R
5 Ctrl-A	5 T	5 Enter	
6 Ctrl-A	6 End	6 F8 (Word rt.)	
7 F8 (End block)	7 CursorLeft	7 Ins	
8 Ctrl-K	8 CursorLeft		
9 C	9 CursorLeft		
10 CursorUp	10 CursorLeft		
11 CursorUp	11 CursorLeft		
12 Ctrl-Q	12 CursorLeft		
13 S	13 CursorLeft		
14 Ctrl-B	14 CursorLeft		
	15 CursorLeft		
	16 CursorLeft		
	17 CursorLeft		
	18 Enter		
	19 Enter		

Figure 5: Copying a sentence

#### Operation: Delete duplicated words

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 CursorDown	1 CursorDown	1 CursorDown	1 =>duplicated
2 Ctrl-F	2 CursorDown	2 CursorDown	2 CLICK-R
3 Ctrl-F	3 CursorDown	3 CursorDown	3 =>Delete
4 Ctrl-T	4 CursorDown	4 CursorDown	4 CLICK-R
5 CursorRight	5 Backspace	5 F8 (Word rt.)	5 =>fixed
6 CursorRight	6 Backspace	6 F8 (Word rt.)	6 CLICK-R
7 CursorRight	7 Backspace	7 Del	7 =>Delete
8 Ctrl-T	8 Del	8 F7 (Word lt.)	8 CLICK-R
	9 Del	9 F7 (Word lt.)	
	10 Del	10 F7 (Word lt.)	
	11 CursorLeft	11 Del	
	12 CursorLeft		
	13 CursorLeft		
	14 CursorLeft		
	15 CursorLeft		
	16 CursorLeft		
	17 CursorLeft		
	18 CursorLeft		
	19 CursorLeft		
	20 Backspace		
	21 Backspace		
	22 Backspace		
	23 Backspace		
	24 Backspace		
	25 Backspace		
	26 Backspace		
	27 Backspace		
	28 Backspace		
	29 Backspace		
	30 Backspace		
	31 Backspace		
	32 Backspace		

Figure 6: Deleting words



# Operation: Delete sentence

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Q	1 CursorRight	1 CursorDown	1 =>Sentence
2 D	2 CursorRight	2 F9 (Sentence)	2 CLICK-LR
3 Enter	3 CursorRight	3 Esc	3 =>Delete
4 Ctrl-Y	4 CursorRight	4 Del	4 CLICK-R
5 Ctrl-Y	5 CursorRight		
6 Ctrl-Y	6 CursorRight		
	7 CursorRight		
	8 CursorRight		
	9 CursorRight		
	10 CursorRight		
	11 CursorRight		
	12 CursorRight		
	13 CursorRight		
	14 CursorRight		
	15 CursorRight		
	16 CursorRight		
	17 CursorRight		
	18 F6 (Delete to EOL)		
	19 F6 (Delete to EOL)		
	20 F6 (Delete to EOL)		
	21 F6 (Delete to EOL)		
	22 F6 (Delete to EOL)		
	23 Enter		

Figure 7: Deleting a sentence

## Enhancing Text

Indicating print enhancements such as boldfacing, underlining, subscripting, and superscripting should be a simple matter for any reasonably sophisticated word processor (see Figures 10 and 11). For *WordStar*, *Word-KEY*, and *Word-MOUSE*, this was the case. *WordStar* (7 actions) required only some cursor movement (1, 4-5) and a boldface and underline toggle with <F5> and <F6> (2-3, 6-7). The operation of *Word-MOUSE* and *Word-KEY* (4 actions each) was even easier. I simply indicated the text (1), selected it (2), and typed <Alt>-B for boldface and <Alt>-U for underline (3-4).

Subscripting and superscripting were not much more difficult to perform than other print enhancements. *WordStar* required 13 actions,

with subscripting being indicated by <Ctrl>-P followed by <Ctrl>-V, and superscripting indicated by <Ctrl>-P followed by <Ctrl>-T. *Word-KEY* and *Word-MOUSE* required 7 and 6 steps respectively, with subscripting indicated by <Alt>-<Minus> and superscripting indicated by <Alt>-<Plus>.

*VisiWord* presented a different picture. Figure 10 is abbreviated because *VisiWord*'s sequence of steps for this task was so disproportionately long. After some initial cursor movement to get into position (1-2), the menu was engaged (3) for L-Layout (4), C-Character (5), and E-Emphasis (6). It was then necessary to use the "again" key, <F2>, 42 times to indicate each character to be boldfaced. Underlining was similarly tedious. For each character to be underlined you had to use the underline key, <F8>. In total, *VisiWord* required 96 actions to underline and boldface the single line of text.



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Operation: Move paragraph

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 F7 (Begin block)	1 Esc	1 CursorDown	1 =>near L. Border
2 CursorDown	2 M	2 F10 (Paragraph)	2 CLICK-R
3 CursorDown	3 T	3 Del	3 =>Location
4 CursorDown	4 CursorDown	4 Ctrl-PgUp	4 Ctrl-CLICK-R
5 CursorDown	5 CursorDown	5 CursorDown	5 =>Sentence
6 CursorDown	6 CursorDown	6 CursorDown	6 CLICK-LR
7 CursorDown	7 CursorDown	7 CursorDown	
8 CursorDown	8 CursorDown	8 Ins	
9 CursorDown	9 CursorDown	9 CursorDown	
10 F8 (End block)	10 CursorDown	10 CursorDown	
11 Ctrl-Q	11 CursorDown	11 CursorDown	
12 R	12 CursorDown	12 CursorDown	
13 CursorDown	13 Enter	12 CursorDown	
14 CursorDown	14 Home	13 CursorDown	
15 Ctrl-K	15 Home	14 CursorDown	
16 V	16 CursorDown	15 CursorDown	
17 Ctrl-Q	17 CursorDown	16 CursorDown	
18 P	18 CursorDown	17 CursorDown	
19 CursorDown	19 CursorDown		
20 CursorDown	20 Enter		
21 CursorDown	21 CursorDown		
22 CursorDown	22 CursorDown		
23 CursorDown	23 CursorDown		
24 CursorDown	24 CursorDown		
25 CursorDown	25 CursorDown		
26 CursorDown	25 CursorDown		
	26 CursorDown		
	27 CursorDown		
	28 CursorDown		
	29 CursorDown		
	30 CursorDown		

Figure 8: Cut and paste—moving a paragraph

Operation: Center line

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Q	1 F10 (Center line)	1 Alt-C	1 Alt-C
2 C			

Figure 9: Centering text

Subscripting and superscripting presented similar problems for *VisiWord*. The command logic is the same as for boldfacing, except that you specify B (Below) for subscripting and A (Above) for superscripting. *VisiWord* required 49 actions to complete the task.

### Find and Replace

The programs were roughly comparable on global Find and Replace operations (see Figure 12). *WordStar* required 19 actions. The Find and Replace syntax was the same as for fixing spelling errors (Figure 4). The only change was in the responses to

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Indicating print enhancements such as boldfacing should be a simple matter for any reasonably sophisticated word processor.

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the Options prompt in steps 17 and 18. These instructions caused *WordStar* to replace all instances (G) without waiting for verification of each change (N).

*VisiWord*, which required 18 actions, also had a different response in step 10. This response (A) caused the program to replace all instances of the target string.

*Word-KEY*'s syntax differed in steps 3 and 20-24. <F10> selected the paragraph containing the words to be changed. The remaining changes caused the program to replace without waiting for verification of each replacement in response to menu prompts. *Word-KEY* required 24 actions.



The sequence required for *Word-MOUSE* was as follows: select the paragraph (1-2), point to and select the Replace command in the menu (3-4), define the target and its replacement (5-17), and tell the program not to wait for verification of each replacement and to complete the command (18-19). *Word-MOUSE* required 19 actions.

#### Deleting a Line

Except for differences in cursor movement to get to the desired location, the effort necessary for deleting a single line was comparable among the programs (see Figure 13). *WordStar* required 11 actions, 10 of which were cursor movement commands. *VisiWord* required 5 actions, 4 of which were cursor movement commands. *Word-KEY* required 6 commands, 4 of which were cursor

movement commands. *Word-MOUSE* required 6 commands, 2 of which were cursor movement commands.

#### Oops!—Undo That

Automatically restoring text that has been accidentally deleted is a feature not handled by *WordStar* (see Figure 14). Consequently, with *WordStar* 60 actions were required to restore the text character by character. The amount of effort, of course, depends on the amount of text affected. This particular sentence contained 55 characters and spaces; the remaining 5 actions were *WordStar* commands.

*VisiWord* required only 3 actions to restore the deleted text. <F9> is the Undelete command in this program. It should be noted that the affected text could be restored only because it was in a single line. If the text had been longer than that, restoring it would have been just as difficult with *VisiWord* as with *WordStar*.

*Word-KEY* and *Word-MOUSE* required 4 and 6 actions respectively. With *Word-KEY* the operation was invoked by typing U in the menu, while with *Word-MOUSE* it was invoked by pointing to Undo with the mouse followed by CLICK-R. *Word-KEY* and *Word-MOUSE* are capable of restoring deleted text, regardless of length.

#### Indented Paragraphs

Setting up and justifying an indented paragraph is useful for outlines and extended quotations (see Figure 15). All the programs have effective routines to accomplish that task. *WordStar* required 9 actions, but 6 were cursor movement commands. <Ctrl>-O, G, and <Ctrl>-B were the operating commands required. Of the three programs, *WordStar* is the only one that will not preserve



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the format of the indented paragraph if the document is reformatted. In such a case, the paragraph has to be skipped in the reformatting process, or it will be necessary to return to the paragraph and indent it again.

With *VisiWord* the paragraph was indented in 4 steps, 3 of which were cursor movement commands. *Word-KEY* required 2 steps including 1 cursor movement, and *Word-MOUSE* took 3 steps including 2 cursor movements.

### Double-space and Justify

The final editing task was reformatting the entire document to double-space and justify the text (see Figure 16). Reformatting the document with *WordStar* took 44 actions. After going to the beginning of the document (1), setting up justification (2-3), setting up double-spacing (5-6), and turning off hyphen help (7-8), reformatting proper could begin. The

Operation: Boldface and underline			
WordStar	VisiWord	Word-KEY	Word-MOUSE
Actions	Actions	Actions	Actions
1 CursorDown	1 CursorDown	1 CursorDown	1 =>Sentence
2 F6 (Boldface)	2 Home	2 F9 (Sentence)	2 CLICK-LR
3 F5 (Underline)	3 Esc	3 Alt-B	3 Alt-B
4 Ctrl-Q	4 L (Layout)	4 Alt-U	4 Alt-U
5 D	5 C (Character)		
6 F6 (End boldface)	6 E (Emphasis)		
7 F5 (End underline)	7 F2 (Again)		
	repeat step 7		
	for steps 8-48		
	49 Esc		
	50 Esc		
	51 Home		
	52 F8 (Underline) repeat step 52 for steps 53-94		

Figure 10: Print formatting—boldface and underline

commands <Ctrl>-B and <Ctrl>-N were used to reform a paragraph and double-space between paragraphs.

With *WordStar* an alternate strategy for this task is available. A command modifier (<Ctrl>-Q, Q) can be used to tell *WordStar* to repeat a

command until the end of the document or until <Space> is typed from the keyboard. You can save 23 keystrokes by issuing the following sequence of commands: <F10>, <Ctrl>-O, J, <Ctrl>-O, S, 2, <Enter>, <Ctrl>-O, H, <Ctrl>-Q,

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Q, <Ctrl>-B, <Space>, <Ctrl>-O, G, <Ctrl>-B, <Ctrl>-N, <Ctrl>-Q, Q, <Ctrl>-B, <Space>. However, using this strategy means that you have to stare at the screen until the indented paragraph comes up. You then have to catch and stop the reformatting process by pressing <Space> and reformat the indented paragraph separately before returning to the <Ctrl>-Q, Q, <Ctrl>-B sequence. If this seems like an acceptable alternative to you, subtract 23 from the *WordStar* effort score.

The other programs are comparable to one another in effort. *VisiWord* required 12 actions. After going to the beginning of the document (1-3) and entering the menu (4), I engaged Layout (5), Format (6), Double-space (7), Justification (8-9), Enter Another Menu (10), Quit Layout (11), and Return to Editing (12).

With *Word-KEY*, I performed the following: Select the Whole Document (1), Enter the Menu (2), Engage Format (3), Paragraph (4), Justify (5), Double-space (6-10), and Complete the Command (11). Except for pointing to the commands rather than typing them, *Word-MOUSE* followed a similar procedure. *Word-KEY* and *Word-MOUSE* took 11 and 12 actions respectively to complete this task.

### Evaluations

This functional comparison of the three programs is by no means comprehensive—such a test is premature at this writing. The surprisingly poor performance of *VisiWord* should be improved when the product is re-released with mouse support. In addition, the manufacturer promised that *VisiWord* version 1.1, which was unavailable at press time, would bring significant speed improvements as a result of optimized program code. The version of *Microsoft Word* available for this review was a beta-test version that was not ready for release. Many innovative features of both programs, such as forms capacity, glossaries, and galleries have not been discussed. Table 1 compares the most important features of the pro-

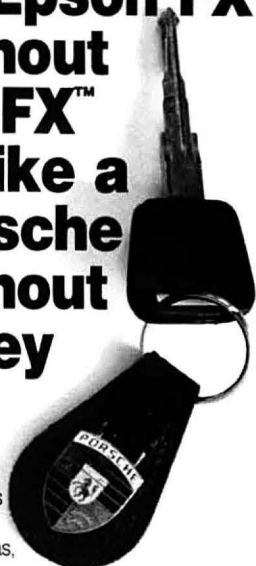
### Operation: Subscript and superscript

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 CursorDown	1 CursorDown	1 CursorDown	1 =>subscript
2 Ctrl-A	2 CursorLeft	2 F7 (Word lt.)	2 CLICK-R
3 Ctrl-P	3 CursorLeft	3 F7 (Word lt.)	3 Alt--
4 V	4 CursorLeft	4 Alt--	4 =>superscript
5 Ctrl-F	5 CursorLeft	5 F8 (Word rt.)	5 CLICK-R
6 Ctrl-P	6 CursorLeft	6 F8 (Word rt.)	6 Alt- +
7 V	7 CursorLeft	7 Alt- +	
8 Ctrl-F	8 CursorLeft		
9 Ctrl-P	9 CursorLeft		
10 T	10 CursorLeft		
11 Ctrl-F	11 CursorLeft		
12 Ctrl-P	12 CursorLeft		
13 T	13 CursorLeft		
	14 Esc		
	15 C		
	16 B		
	17 F2 (Again)		
	18 F2 (Again)		
	19 F2 (Again)		
	20 F2 (Again)		
	21 F2 (Again)		
	22 F2 (Again)		
	23 F2 (Again)		
	24 F2 (Again)		
	25 F2 (Again)		
	26 F2 (Again)		
	27 F2 (Again)		
	28 F2 (Again)		
	29 CursorRight		
	30 CursorRight		
	31 CursorRight		
	32 CursorRight		
	33 CursorRight		
	34 Esc		
	35 L		
	36 C		
	37 A		
	38 F2 (Again)		
	39 F2 (Again)		
	40 F2 (Again)		
	41 F2 (Again)		
	42 F2 (Again)		
	43 F2 (Again)		
	44 F2 (Again)		
	45 F2 (Again)		
	46 F2 (Again)		
	47 F2 (Again)		
	48 F2 (Again)		
	49 F2 (Again)		

Figure 11: Print formatting—subscript and superscript



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## Review

### Operation: Multiple Find and Replace

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Q	1 Esc	1 CursorDown	1 = >near L
2 A	2 F	2 CursorDown	Border
3 k	3 k	3 F10 (Para-graph)	2 CLICK-LR
4 o	4 o	4 Esc	3 = >Replace
5 n	5 n	5 R	4 CLICK
6 s	6 s	6 k	5 k
7 i	7 i	7 o	6 o
8 s	8 s	8 n	7 n
9 Enter	9 Enter	9 s	8 s
10 c	10 A	10 i	9 i
11 o	11 c	11 s	10 s
12 n	12 o	12 Tab	11 Tab
13 s	13 n	13 c	12 c
14 i	14 s	14 o	13 o
15 s	15 i	15 n	14 n
16 Enter	16 s	16 s	15 s
17 N	17 Enter	17 i	16 i
18 G	18 Esc	18 s	17 s
19 Enter		19 Tab	18 = >No
		20 Space	19 CLICK-F
		21 Tab	
		22 Tab	
		23 Space	
		24 Enter	

Figure 12: Multiple Find and Replace

### Operation: Delete line

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 CursorUp	1 CursorDown	1 CursorDown	1 = >LL Border
2 CursorUp	2 CursorDown	2 CursorDown	2 CLICK-R
3 CursorUp	3 CursorDown	3 CursorDown	3 = >Line
4 CursorUp	4 CursorDown	4 CursorDown	4 CLICK-LR
5 CursorUp	5 F5 (Delete line)	5 F9 (Sentence)	5 = >Delete
6 CursorUp		6 Del	6 CLICK-R
7 CursorUp			
8 CursorUp			
9 CursorUp			
10 CursorUp			
11 Ctrl-Y			

Figure 13: Deleting a line



# Operation: Accidentally delete and restore text

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 Ctrl-Y	1 End	1 Shift-F9	1 =>Sentence
2 Tab	2 F5 (Delete line)	(Select line)	2 CLICK-LR
3 T	3 F9 (Undelete)	2 Del	3 =>Delete
4 h		3 Esc	4 CLICK-R
5 i		4 U (Undo)	5 =>Undo
6 s			6 CLICK-R
7 Space			
8 s			
9 e			
10 n			
11 t			
12 e			
13 n			
14 c			
15 e			
16 Space			
17 w			
18 i			
19 l			
20 l			
21 Space			
22 b			
23 e			
24 Space			
25 e			
26 l			
27 i			
28 m			
29 i			
30 n			
31 a			
32 t			
33 e			
34 d			
35 Space			
36 a			
37 s			
38 Space			
39 t			
40 h			
41 o			
42 u			
43 g			
44 h			
45 Space			
46 b			
47 y			
48 Space			
49 a			
50 c			
51 e			
52 i			
53 d			
54 e			
55 n			
56 t			
57 .			
58 Ctrl-Q			
59 S			
60 Ctrl-B			

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Figure 14: Recovering from an accidental action



## ● Review

grams. Full comparison tests of these programs should prove fascinating.

Nevertheless, several conclusions are possible at this point. Figure 17 is a summation of the effort involved in editing the sample document. This figure makes it clear that we are entering a new era of word processing on the PC. *Microsoft Word* is a dramatic and obvious improvement in performance compared to *WordStar* and the mouseless version of *Visi-Word*.

If you regard *WordStar* as the standard and set the effort involved in editing the sample document with this program at 100 percent, *VisiWord* requires 132 percent of the *WordStar* effort. *Word-KEY*, on the other hand, requires only 53 percent of the *WordStar* effort. The index is even more striking when you introduce the mouse. *Word-MOUSE* requires only

Operation: Set up and justify indented paragraph			
WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 CursorUp	1 CursorUp	1 CursorUp	1 =>near L
2 CursorUp	2 CursorUp	2 Alt-N	Border
3 CursorUp	3 CursorUp		2 CLICK-R
4 CursorUp	4 F4 (Indent)		3 Alt-N
5 CursorUp			
6 CursorUp			
7 Ctrl-O			
8 G			
9 Ctrl-B			

Figure 15: Indented and justified paragraphs

38 percent of the *WordStar* effort to edit the document. If you accept the validity of counting the number of actions as a measure of effort, that is quite an impressive performance.

The introduction of the mouse is clearly a step forward in word processing. The device, however, would

probably slow you down if you used it when typing the first draft of a document; constantly removing your hand from the keyboard is not particularly efficient. However, as this study demonstrates, the mouse is effective for making revisions once a document has been created.

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Operation: Double space and justify whole document

WordStar Actions	VisiWord Actions	Word-KEY Actions	Word-MOUSE Actions
1 F10 (End of file)	1 Home	1 Shift-F-10 (Document)	1 =>near L Border
2 Ctrl-O	2 Home	2 Esc	2 CLICK-LR
3 J	4 Esc	3 F (Format)	3 =>Format
4 Ctrl-O	5 L (Layout)	4 P (Paragraph)	4 Click
5 S	6 F (Format)	5 J (Justify)	5 =>Paragraph
6 2	7 D (Double space)	6 Shift-Tab	6 CLICK
7 Ctrl-O	8 CursorDown	7 Shift-Tab	7 =>Justified
8 H	9 Y (Justify)	8 Shift-Tab	8 CLICK
9 Ctrl-B	10 Esc	9 1	9 =>line spacing
10 Ctrl-N	11 Q (Quit)	10 2	10 1
11 Ctrl-B	12 Esc	11 Enter	11 2
12 Ctrl-B			12 Enter
13 Ctrl-N			
14 Ctrl-B			
15 Ctrl-B			
16 Ctrl-N			
17 Ctrl-B			
18 Ctrl-B			
19 Ctrl-N			
20 CursorDown			
21 CursorDown			
22 Ctrl-N			
23 CursorDown			
24 CursorDown			
25 Ctrl-N			
26 Ctrl-B			
27 Ctrl-B			
28 Ctrl-N			
29 Ctrl-B			
30 Ctrl-B			
31 Ctrl-B			
32 CursorDown			
33 Ctrl-O			
34 G			
35 Ctrl-B			
36 Ctrl-N			
37 Ctrl-B			
38 Ctrl-B			
39 Ctrl-N			
40 Ctrl-B			
41 Ctrl-B			
42 Ctrl-N			
43 Ctrl-B			
44 Ctrl-B			

Figure 16: Changing the format of a complete document

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Feature	WordStar	VisiWord	Microsoft Word
<b>Cursor Movement</b>			
Character by character	•	•	•
Word by word	•	•	•
Screen by screen	•	•	•
Jump to beginning of line	•	•	•
Jump to end of line	•	•	•
Jump to specified page	•	•	•
Jump to beginning of document	•	•	•
Jump to end of document	•	•	•
Point with mouse	•	•	•
<b>Word Wrap</b>	•	•	•
Paragraph Reformat	Manual	Automatic	Automatic
Insert Mode	•	•	•
Typeover Mode	•	•	•
Move Text	•	•	•
Copy Text	•	•	•
Delete Text	•	•	•
<b>Text Selection for Editing</b>			
Character	Delete only	Delete only	•
Word	Delete only	•	•
Line	Delete only	Delete only	•
Sentence	•	•	•
Paragraph	•	•	•
Block	•	•	•
Block column	•	•	•
Mouse selection	•	•	•
<b>Undo Command</b>	•	1 line max.	Unlimited
<b>Find &amp; Replace</b>			
One/all occurrences	•	•	•
N times	•	•	•
Within selected text range	•	•	•
Ignore case	•	•	•
Whole word only	•	•	•
Wild card characters	•	•	•
Backward through document	•	•	•
<b>Windows</b>	1	2	8
Browse/edit different documents	•	•	•
Browse/edit within same document	•	•	•
Move/copy text between windows	•	•	•
Footnote window	•	•	•
<b>On-line Help Screens</b>	•	•	•
Context sensitive?	•	•	•
<b>Video display</b>			
Line breaks	•	•	•
Line counter	•	•	•
Character counter	•	•	•
Margins	•	•	•
Page breaks	•	•	•
• = YES			
• = NO			

Table 1: Comparison of features



Feature	WordStar	VisiWord	Microsoft Word
On-screen character attribute display			
Normal	•	•	•
Bold	•	•	•
Underline	•	•	•
Double underline	•	•	With CG adapter
Italic	•	•	With CG adapter
Strike-through	•	•	With CG adapter
Small caps	•	•	With CG adapter
Subscript	•	•	With CG adapter
Superscript	•	•	With CG adapter
Visible ruler	•	•	•
Horizontal scroll	•	•	•
Text Macros	•	•	•
Galleries/Text Formatting Macros	•	•	•
Command Macros	•	•	•
Glossaries/Macro Indexing	•	•	•
Style Sheets/Format Templates	•	•	•
ASCII Input	•	•	•
Readable ASCII Output	•	•	•
Full Support of Tree-Structured Directories	•	•	•
Text Formatting			
Flush left	•	•	•
Flush right	•	•	•
Centered	•	•	•
Justified	•	•	•
Multiple-column strips	•	•	•
Left tab stops	•	•	•
Right tab stops	•	•	•
Center tab stops	•	•	•
Decimal tab stops	•	•	•
Printing			
Automatic footnotes	•	•	•
End of page/document option	—	—	•
Headers	•	•	•
Multiple line	•	•	•
Choice for odd/even pages	•	•	•
Footers	•	•	•
Multiple line	•	•	•
Choice for odd/even pages	•	•	•
Gutter option	•	•	•
Continuous form paper	•	•	•
Single sheets	•	•	•
Multiple copies	•	•	•
Background printing	•	•	•
Print pause	•	•	•
Printer selection option	•	•	•
Microspace justification	•	•	•
Proportional spacing	•	•	•



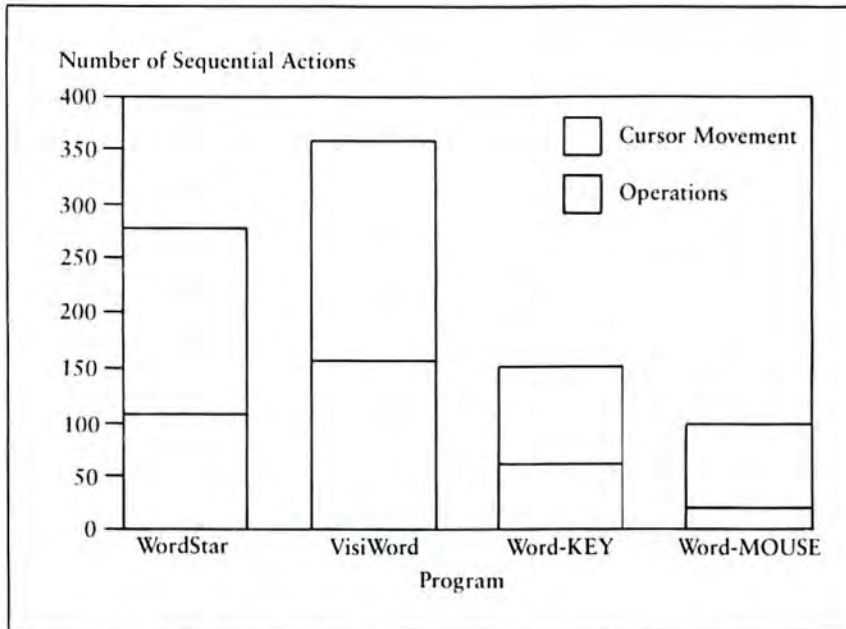


Figure 17: Summation of the effort required to edit the sample document

The choice of command assignments to the mouse in the Microsoft product is natural and easy to learn and remember. The device is a pleasure to use. I must confess that I entered this project with a bias against the mouse. I thought it was a cute gimmick that would benefit software marketing departments more than real computer users. It looked like it might be fun to play with when I wasn't engaged in serious work. But I have been converted. If other mouse implementations are as effective as *Word-MOUSE*, we can expect some major innovations in software in the near future. ●

#### WordStar

MicroPro International Corp.  
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San Rafael, CA 94903

800/227-2400, 415/499-1200

List Price: \$495, complete package including *SpellStar*, *MailMerge*, and *Star Index* \$895

Requirements: 64K one disk drive

#### VisiWord

VisiCorp

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List Price: \$375

Requirements: version 1.0, 192K; version 1.1, 128K; one disk drive

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<b>Total Revenue</b>	<b>135</b>	<b>160</b>	<b>225</b>	<b>305</b>	<b>435</b>	<b>555</b>	<b>725</b>	<b>945</b>	<b>1195</b>	<b>1430</b>	<b>1680</b>	<b>2055</b>	<b>9845</b>
<b>Cost of Sales:</b>													
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Micro Systems Div	15	15	20	40	55	75	100	140	185	230	300	335	1510
Industrial Sys. Div	25	35	35	50	75	100	125	150	175	200	225	275	1470
<b>Total COS</b>	<b>120</b>	<b>140</b>	<b>155</b>	<b>200</b>	<b>265</b>	<b>340</b>	<b>435</b>	<b>535</b>	<b>710</b>	<b>915</b>	<b>1050</b>	<b>1295</b>	<b>6160</b>
<b>Operating Expenses:</b>													
Components Div	100	125	150	170	190	200	200	200	205	200	205	190	2135
Micro Systems Div	75	85	95	100	105	105	110	110	115	115	120	120	1255
Industrial Sys. Div	50	65	75	90	105	100	100	105	110	105	100	100	1105
<b>Total Op. Exp.</b>	<b>225</b>	<b>275</b>	<b>320</b>	<b>360</b>	<b>400</b>	<b>405</b>	<b>410</b>	<b>415</b>	<b>430</b>	<b>420</b>	<b>425</b>	<b>410</b>	<b>4495</b>

## Introducing IBM PC- Compatible Hardware To Run Spreadsheet Software

It should be a simple thing, really, to see a full 132 column spreadsheet on your IBM PC. You shouldn't have to scroll up, down and sideways to get the full picture. Now you can see it all with **SuperVision**, a monochrome video interface board from **California Computer Systems**. It easily replaces your

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Personal  
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Display



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**Effortless** The PC Modem Plus™ system contains everything you need to communicate with the IBM Personal Computer—modem, communications software, telephone cable and complete instructions.

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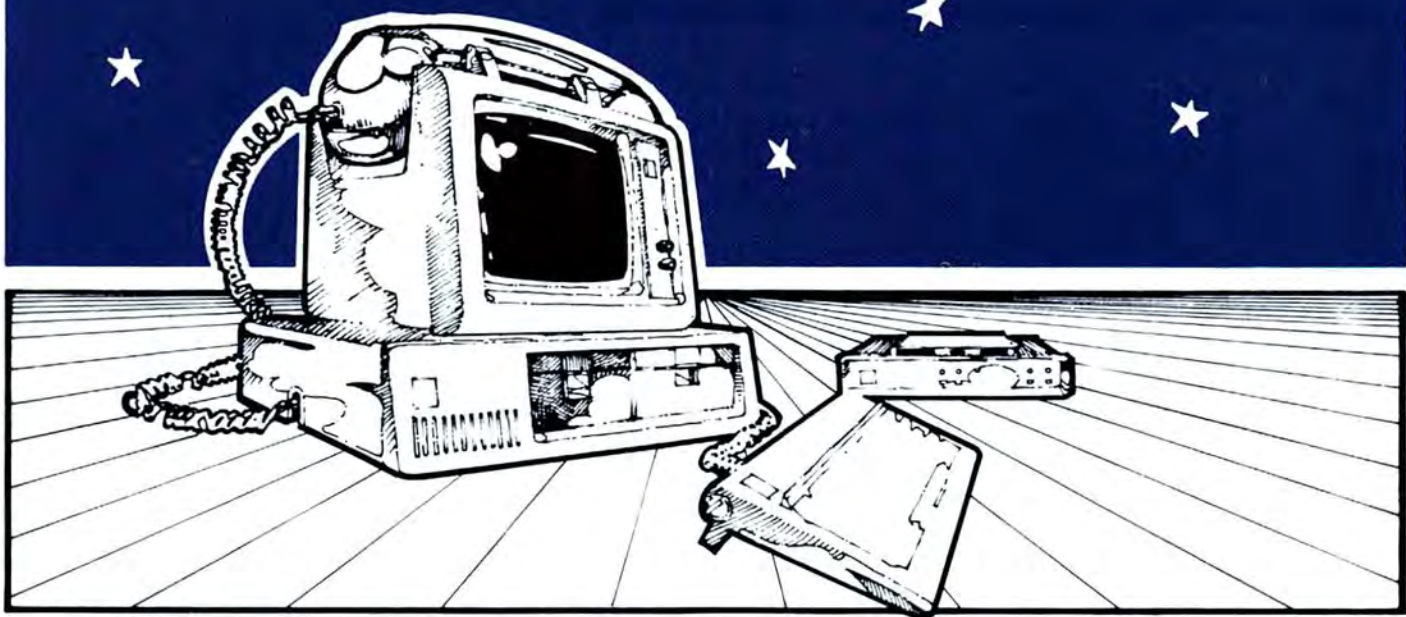
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- Wholesalers and distributors
- Customer service or support depts.
- Real estate agents
- Accounts receivables depts.
- Collection agencies, etc.

### HARDWARE REQUIREMENTS

IBM Personal Computer with 128k, at least one diskette drive, 80 column monochrome or color monitor, and a Hayes Smartmodem or Novation Smart-Cat. Printer is recommended.

PCAT™ is a trademark of ARLINGTON Software+Systems. IBM is a trademark of International Business Machines. Hayes Stack Smartmodem is a trademark of Hayes Microcomputer Products, Inc. Smart-Cat Modem is a trademark of Novation Inc. Arlington Software+Systems, 97 Bartlett Ave. Arlington, MA 02174 (617) 641-0290

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# Reader Friendly

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You are using or soon plan to use an IBM Personal Computer or IBM-compatible personal computer. You've just scratched the surface, just started to explore the vast potential of this remarkable machine.

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Now there's a way—with PC WORLD, the lively, authoritative, new magazine devoted exclusively to IBM PC and IBM-compatible PC users.

Every month PC WORLD will keep you posted on the most interesting, intriguing, and potentially useful applications for the IBM PC and compatible PCs. And it will explain them to you with a minimum of technical jargon—and with a degree of clarity you'll appreciate if you try them out on your own PC.

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**Finally. The End To  
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From Janus.**







# JANUS: THE C

Does your computer system require a two-sided, single density disc? Or a one-sided, double density disc? Are you sure? What happens if you get the wrong one?

**Janus Red**  
One-sided, single density diskettes, soft sector and unformatted with write control notch.

## JANUS RED, ONE SIDED/SINGLE DENSITY

- **Adler Royal** 700, 2000, 7000, SE 6000
- **Alanthus** GSI Series
- **Apple** I, II, III
- **A/M Internatl.** 3225 Documentor
- **Anker Data Sys.** 42701
- **Atari** 400, 800
- **Billings** Micro System, TP410
- **Columbia Data** 500, 900, MX Series, Commander
- **Comlog** 5000
- **Commodore** Pet, 3040, CBM 2030, CBM 2031, CBM 2040, VIC 20, P128, B128, Super Pet (Single Density), BX256 (Single Density), 4040, 80 W/P, Wordcraft
- **Compal** WORDPAL 8, 8100, 8200
- **Compugraphic** MDT 401/350, 402

- **Computer Corp.** 12M, Microdisk 2/M
- **Computer Dev.** Mini Term 1206
- **Computershop** Starlite
- **CPM Marketing** MCS PT
- **Cromemco** System 3, Z/2D, Z/3D
- **Crown Comm.** EZ Com
- **Franklin** ACE 100, ACE 1000, ACE 1200, MicroDisk/2M
- **Future Data** Micro Data 2080, GSI MDD050
- **G.S.I.** MDO 60, MDO 50
- **Hands On** SA-I, SA-II, 743, LA 30K
- **Hewlett Packard** 8290-1
- **IMSAI** PC 80, PCS 80, 34-35
- **Intelligent Sys.** 8030, 8031, 8051, 803, 813
- **I.T.T.** 2200, 3460, 3471
- **Matchless Sys.** MS-80
- **Microkit** Microdisk 2M
- **Micro Sys. Dev.** MSD-100
- **Motorola** Exorset 30

- **New Engld. Dig.** Able Series 40, 80
- **Nicolet** Explorer
- **Olivetti** P6040, AFD 6102, FDU 7403, FDU 2020, FDU 5600
- **Olympia** 6020
- **Panasonic** Time 2000
- **Smoke Signal** BFD-68, BFD-69, (Single Density) Chieftain I
- **Texas Inst.** TI-99
- **Vector Graphic** H/1, 1++
- **Vista** V80
- **Wordplex** Wordplex II
- **Xerox** 820
- **Zilog** MCZI/90K

## JANUS GREEN, ONE SIDED/DOUBLE DENSITY

- **Alpha Prof.** Alpha Sprint
- **Anderson Jacobsn.** AJ460
- **Atari** 1200XL, 600XL
- **Burroughs** TP420, MT900



# COLORS END THE C

The people at Janus know that something as potentially simple as buying a floppy disc can become needlessly complicated. The right disc will utilize the full power of your computer or word processor. The wrong disc can virtually shut it down.

**Janus Green**  
One-sided, double density diskettes, soft sector and unformatted with write control notch.

- **Commodore** 8050
- **Compucolor** I, II, IV
- **Computer Sys.** PC/8088
- **Computhink** Pet Drive
- **Corona Data** Portable Computer
- **Data General** Enterprise 1000
- **Dynabyte** DB 8/2
- **IMS** Series 5000 (Single Side)
- **I.B.M.** Personal Computer 160KB
- **Intelligent Sys.** Intercoler 3600, 3621
- **Intertec** Superbrain II
- **KayPro** 400T (Single Side)
- **Lobo** Model 51
- **MPI** PC-8001
- **Nippon Electric** IF800 MOD20
- **OKI Electronics** Executive, Osborne I
- **Osborne** FD501, FD502
- **Olivetti** The Beaver, 3500, 3600
- **Perkin Elmer** 5000
- **Randal Data**

- **Radio Shack**
- **Redactron**
- **Seequa**
- **Smoke Signal**

- **Telecon**
- **Texas Inst.**

## JANUS BLUE, TWO SIDED/DOUBLE DENSITY

- **Altos** 580-10, 586-10, 584-14, Series 5-15D
- **Billings** BC 12 FD
- **C. Itoh** Mini- (2s)
- **Columbia Data** 1600-1, 1600-4, VP Portable
- **Commodore** Super Pet, BX256 (Double Density)
- **Compal** 8200
- **Compaq** Portable Computer
- **Computhink** Mini Max I
- **Comtek** General Automation

- TRIS-80 III
- R111 340
- Chameleon
- BFD-68, BFD-69 (Double Density)
- Chieftain IV
- Zorba
- Professional Computer (Single Side)

- **Cromemco** Z2H
- **Eagle** Personal Computer
- **ECS Microsys.** ECS 4500
- **Fujitsu** Affinity 16
- **GNAT** System 10
- **Hewlett Packard** 8290-2
- **IBM** Personal Computer 320, 360 KB
- **IMS** Series 5000 (2S)
- **Info 2000** Performer
- **Informatn. Tech.** Superstar (2S)
- **Intelligent Sys.** 8351, 8352, 8351H, 8352H
- **Intertec Data** Compustar, Comstar II
- **KayPro** 4
- **Logic Systems** IBEX 7101
- **Motorola** Exorset 30A
- **MPI** Model 52
- **Otrona** Attache
- **Panasonic** JD-700, JD-740
- **Quay Corp.** 520
- **Qume** Datatrack 5



# CONFUSION.

## The Janus Guide to 5.25 Inch Diskette Selection.

Because a \$5 part should never stop a \$5,000 system or a \$5,000,000 company, Janus created the color system. This chart could save you hundreds of dollars.



### Janus Blue

Two-sided, double density diskettes, soft sector and unformatted with write control notch.

### Janus Orange

All other diskettes with less common configurations and special requirements.



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- Redactron R III 340, R III 315, R III 335
- Texas Inst. Professional Computer
- Toshiba T-200
- Wang Wangwriter, Alliance 250

#### JANUS ORANGE, MISC. ALL OTHERS

- A/M Internatl. The Whiz
- Alanthus S-550
- Archives Business System
- Compal WP 56D
- CompuCorp. Omega 20, 655 625 Mark II 675
- Computek 21
- Computerm System 32-180, System 32-620, System 32-630
- Comp. Data Acc. Versatile Series
- Computer Mart Abacus I
- Computer Max Micro Max

- Digilog Systems Micro Comm II
- Digital Sup. Sys. Informer II
- Durango F85
- Eagle II, III, IV, V
- Exidy Sorcerer
- Findex System 100
- Hazeltine 1500
- Intell. Bus. Mach. MNM-5
- Lobo 400T
- North Star Horizon 1, 2
- Polymorphic Horizon 1D, 2D
- QYX Advantage
- R2E 881, 8810, 8813
- Realistic Intelligent Typwrt
- Redactron Level 1, 2, 3, 4, 5
- Sanyo Micral C, CM, 80-30 (1s), 80-20(1s)
- Tri Data Micral 80-30(2s), 80-20(2s)
- Vector Graphic Fort 80
- Victor Technol. Redactor II-240 (1s)
- Vista Redactor II-250, 240 (2s), Redactor III-320
- Vydec
- Wang
- Westrn. Telematic
- Zenith

- Sanyo WPS-300
- Tri Data Flexible 21
- Vector Graphic Vector 1+, Memorite 1
- Vector 1++
- Vector MZ
- System B
- System 1600, 2600, 3005, 5005, 5032, 4/10, 4/20, 4/30, 4/40, 4/60, 5005/E, 5010/E, 5032/E
- Victor Technol. 9000
- Vista V200 (1s)
- V200 (2s)
- Vydec 4200
- Wang PCS II, III OIS
- Westrn. Telematic Datamate
- Zenith Z-87



# Janus Floppy Discs.

We're Janus. And we make floppy discs of the very best quality you can buy. Period.

To back this claim, we offer our —

## **Unconditional Guarantee.**

Every Janus floppy disc comes with an iron-clad guarantee. If anything ever goes wrong with your Janus disc — anything, anytime, anywhere, your fault or ours — we will replace it. Free. No questions. No strings. No kidding. Just send it back to Janus (or return it to your Janus dealer).

## **And We Didn't Stop There.**

We wanted to solve the problem of floppy disc confusion. The Janus solution is color-coding, which makes it easy for people to select the right diskette and virtually eliminates the possibility of using the wrong diskette in your computer.

Janus is also sponsoring one of the largest

new software contests in the country. Some very smart software designers will share \$34,500 in awards. (Details follow.)

And, there's "Janus Gold Certificates" — credits you earn each time you purchase Janus diskettes. Use them to obtain the innovative software developed from the nationwide "Janus Call for Software" contest.

Best of all, Janus quality and Janus innovation are now available in local stores.

You can spend less for other diskettes. But today's "bargain" is often tomorrow's problem. After all, if it's worth putting on a diskette, it's worth buying a diskette you can count on. From Janus.





# 34,501 Good Reasons to Enter the "Janus Call For Software" Contest.

## The First 34,500 are Simple.

That's how many total dollars in prize money we're offering to winners who submit the best original software programs in five different categories, written for the IBM PC<sup>®</sup> (MS-DOS 1.1) and the Apple II+<sup>®</sup> (DOS 3.3). Along with cash rewards, winners will have their programs published by Janus and be eligible for royalties.

The Categories:	1st Prize	2nd Prize
Business applications	\$6,000	\$1,500
Home applications	\$6,000	\$1,500
Games and entertainment	\$5,000	\$1,500
Education	\$5,000	\$1,500
System software	\$5,000	\$1,500

All prizes will be awarded. While a software package may not win a prize, it could be accepted into the Library of Janus Software with royalties for the author based upon sales.

## How to Enter.

Simply call toll-free (800) 338-0100 or write to the "Janus Call for Software" at the address below. Everything you need to enter will be sent upon your request. Entry forms may also be secured from your Janus dealer.

## Who May Enter.

Anyone who has a completed software package may submit it in abstract form to the

"Janus Call for Software," except for employees and immediate families of Janus Dysc Company, and its affiliates or agents.

## Contest Dates.

This contest will begin on October 1, 1983 and

end on November 30, 1983 for initial entries. Finalists will be notified on or about January 1, 1984 with two additional weeks to submit completed and documented entries. Final judging and awards will be made on or about March 1, 1984.

## The 34,501st Reason to Enter?

Fame.

It goes well with fortune. And together they can provide a real payoff for that terrific software program you've been working on for so long.

But you have to enter to win. So do it today.

Simply call toll-free (800) 338-0100.

Or write "Janus Call for Software," 1860 Barber Lane, Milpitas, California 95035. Be sure to include your name, street address, city, state, zip code, and telephone number.



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# The best reason to choose mbp COBOL for your IBM/PC:

GIBSON MIX Benchmark Results			
Calculated S-Profile (Representative COBOL statement mix)			
Execution time ratio			
mbp COBOL	Level II** COBOL	Microsoft*** COBOL	R-M**** COBOL
1.00	4.08	6.18	8.26

## Convincing, isn't it?

The Gibson Mix Benchmark Results chart just about says it all, doesn't it?  
Compared with COBOL interpreters,



**mbp COBOL:  
4 times faster.**

mbp's COBOL Compiler executes programs at least four times faster. With mbp on your IBM/PC,\* applications that used to take four hours now take one.

Why? Because interpreters translate and execute a program one statement at a time, every time the program runs.

By comparison, mbp's COBOL Compiler generates machine language object code, so the entire program is translated only once. It then can be executed as

often as you want in a fast single step—with no retranslation.

### Develop programs faster.

Bechtel, Chase, Citicorp, Connecticut Mutual, Sikorsky—companies that make their own comparative evaluations—chose mbp. Certainly faster running speed was important to them, but that wasn't the only reason for the choice.

Here's a Connecticut Mutual spokesperson's comment:

"...It took us approximately 5% the time to convert (COBOL) programs from the mainframe computer to mbp as it did to convert them to Microsoft's COBOL..."

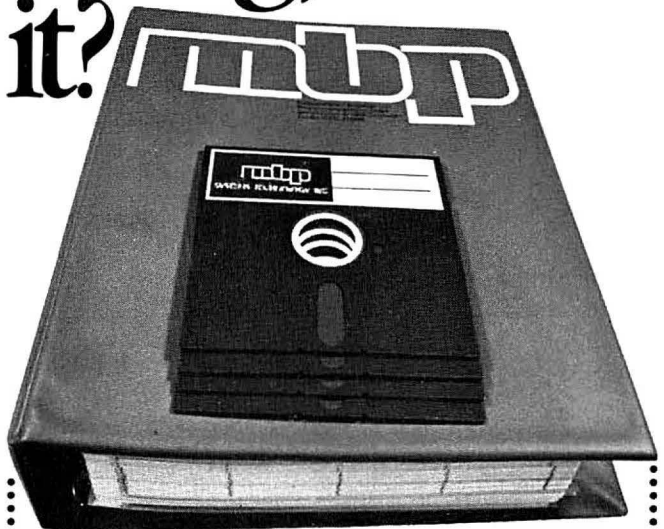
Put another way, mbp saved 95% of the conversion time.

### mbp: the complete COBOL.

GSA certified to ANSI '74 Level II; a sophisticated Screen Management System (SMS) and an Interactive Symbolic De-Bug Package included standard; Multi-Keyed ISAM Structure; listing options allow source & object code, map & cross-reference checking; mbp has them all and much more.

After you compare mbp's advantages, compare its price: \$500. Convinced?

128K system with hard disk required. \*IBM/PC is an IBM TM; \*\*Level II is a Micro Focus TM; \*\*\*A Microsoft TM; \*\*\*\*A Ryan-McFarland TM.



## 4 times faster. \$500.

Please send me complete mbp COBOL information and performance data with Gibson Mix results.

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Circle 100 on reader service card



# Bird of a Feather

*Eagle PC-1 joins the flock of PC compatibles.*

*Danny Goodman*

The people at Eagle Computer are proud of their products, and with good reason. The public has shown remarkable confidence in the company; on the sales floor or on the trading floor Eagle Computer looks like a winner.

Eagle's initial success was built on its early 1600 series computers. Today another model is helping maintain Eagle's reputation. Unlike the 1600 series, the Eagle PC-1 is trying to win points by emulating a similarly named machine.

But it takes more than a good circuit design and pretty cabinet to make a personal computer competitive with the venerable IBM PC.

After using the Eagle PC-1 for a few weeks, an experienced IBM PC user can detect a few of Eagle's good intentions. For an inexperienced user, however, what appear at first to be some of the Eagle PC-1's high points in ease of use may make it a less than satisfying purchase in the long run, especially if future applications software is not adapted specifically for the Eagle PC-1.

## The Console

In a crowd of PC lookalikes that seem to go out of their way to imitate the IBM PC, the Eagle PC-1 is pleasantly different. While a basic IBM system normally consists of three

units—console, keyboard, and monitor—the Eagle PC-1's console has an unusual cantilever design that leaves ample space below the half-height disk drives to tuck the keyboard out of the way when it is not in use. The console, which is smaller than the IBM System Unit, takes up only 266.5 square inches of desk space, compared to IBM's 312 square inches. The only obvious similarity between the two is the Eagle's emulation of the IBM two-tone color combination, which is less an acknowledgment to IBM than to results of years of office environment studies by industrial designers.

## Monochrome Monitor

The Eagle PC-1 supports both color and monochrome monitors, depending on which board is installed in the console. The monochrome monitor and its adapter support monochrome graphics with a resolution of 720 by 352 pixels, something the IBM Monochrome Display Adapter does not do. The display is produced on a green phosphor screen with a non-glare face, and Eagle provides a cleaning chamois for the screen. In a side-by-side comparison the Eagle monochrome monitor displays text with noticeably better focus than that of its IBM counterpart.

## The Keyboard

Eagle departed from the standard IBM format in the PC-1's keyboard as well. The Eagle PC-1's keyboard is larger than the IBM PC's by almost the same percentage that its console is smaller than the IBM PC's. Detachable and connected to the console by a pliant coiled cord, the Eagle PC-1 keyboard is a bit ungainly but can be placed in your lap.

Two small hinged feet on the underside of the keyboard can be swung out to increase the angle from the desktop. They must be retracted, however, before the keyboard is slipped into its "garage" in the console.

Whether you prefer the soft feel of the Eagle PC-1 keys over the snappy feedback of the IBM PC keyboard is a matter of personal taste. The pressure needed to register an Eagle PC-1 key is so slight that simply resting your fingers on the home keys (ASDF-JKL;) may trigger an unwanted character into your text. Typing at a steady, fast pace may also cause extra characters to crop up.

The Eagle PC-1 keyboard layout (see Figure 1) abandons most of the conventions (good or bad) established by the IBM PC. Most noticeably, the IBM PC's ten side-mounted function keys translate on the Eagle PC-1 into a set of 24 function keys in a slightly unorthodox arrangement.





Nineteen keys stretch above the top row of keys, while <F20> through <F24> continue at the bottom right of the keyboard, beneath the cursor control keys and the numeric keypad.

The numeric keypad, complete with a large zero key, is dedicated to a numeric purpose. Plus, minus, and asterisk (multiplication in computer math) keys are provided to the right of the numbers, as is a <Help> key, which is under applications software control.

The cursor movement keys—<CursorUp>, <CursorRight>, and <CursorDown>—are located in a vertical row between the alpha keys

and the numeric keypad. The <CursorLeft> key is combined with the <Backspace> key to the left of the <CursorRight> key. With some applications software, the single key combination of <Backspace> (read Rubout) and <CursorLeft> will delete a character to the left. There is also a <Home> key, which functions on only some programs. A large key on the bottom row, <Enhance>, is dedicated to the Eagle word processing program, *EagleWriter*. Two editing keys, <Ins> and <Del>, are also on the bottom row.

Users who are justifiably annoyed by the IBM PC keyboard's idiosyncracies will appreciate the Eagle PC-1's layout of the standard alphanumeric keys. No extra key is inserted between the Z and <Shift>; <Shift>, <Return>, and <Ctrl> keys are all significantly larger than the regular keytops; most key legends are spelled out (e.g., <Return> and <Escape>); and the two toggle keys, <AlphaLock> and <ShiftLock>, are of the push-on/push-off variety, so that a look at the keys tells you if they are on or off. <ShiftLock> is a handy key because it gives you use of



## ● Review

all the shifted keys, not just capital letters. This function is a timesaving feature for programmers who often need the shifted symbols above the row of numbers.

### Technical Specs

The Eagle PC-1 is configured with a minimum of 128K RAM. Like the IBM PC, the computer is based on the Intel 8088 microprocessor. Built into the Eagle PC-1 console as standard features are two serial ports and one parallel printer port. There is no provision for cassette storage.

which each drive is alternately activated and must come up to speed before any disk reading or writing takes place. The drives are not particularly quiet, however.

The Eagle PC-1 is generally a quiet-running machine because it doesn't have a power supply fan. The IBM PC's continually blowing fan can be a background annoyance in an office, while the Eagle PC-1 sits quietly, awaiting the next instruction. The executive who has a customer data base on tap, for example, won't mind keeping the Eagle PC-1 on all day while he or she awaits an incoming customer call.

open area at the rear right of the console. A magnetically latched trap door on the side of the console offers easy access to the peripheral connectors, so you can reach them without pulling the console away from the wall. Adding a peripheral board entails removing five screws on the bottom of the console. A separate metal panel lifts off, revealing three connectors and a bit of the main printed circuit board. The rest of the components are out of sight and are not easily accessed without removing numerous screws. Plastic guides are already installed for the longer boards.



Figure 1: Eagle PC-1 keyboard

Standard mass storage for the Eagle PC-1 is one double-sided 5¼-inch, half-height floppy disk drive. The disk drive is rated at 360K of formatted storage space, but when I formatted a blank disk with the supplied 48-tracks-per-inch formatting routine, a CHKDSK (check disk) utility revealed 399,360 bytes (or 390K) available on the disk. A second floppy disk drive can be added to the system as well as either a 10- or 40-megabyte hard disk drive.

With two floppy disk drives installed, both disk drive motors are activated each time a disk action takes place. This is probably done to save time in disk-to-disk transfers in

### Hardware Slots and Compatibility

The trade-off for the Eagle PC-1's small desktop footprint is that it has room for only three expansion slots. One is automatically used by the disk drive controller, and a second is needed for the monitor. That leaves only one slot for further expansion. Of course, it helps that a parallel port and two serial ports are already available on the back panel. But if you want to add a board that contains some extra RAM and a clock/calendar function, no further expansion is possible.

Access to the expansion slot area is unobstructed. The boards run parallel to the rear panel, and connectors to the outside world are located in an

Unfortunately, the Eagle PC-1 user guide lacks information about adding memory to the console, either on the motherboard or with the aid of expansion boards. I tried inserting a Quadboard into the Eagle PC-1's center slot. Clearance between boards would have been sufficient except for a multiconnector plug coming off the disk drive controller that grabs the leads on the underside of the Quadboard. A bit of careful bending of both boards is required to get the middle one into position.

Once installed, the Eagle PC-1 resists using the Quadboard's memory. Though not mentioned in the user guide, the problem stems from the



Eagle's memory configuration. Until the motherboard is fully populated (i.e., to 512K), the Eagle will not recognize or use add-in memory. The IBM PC and other microcomputers treat board memory in a similar manner. The clock function, however, works well with the Quadboard POWERUPCLK.COM program supplied on disk, using the Eagle PC-1's MS-DOS operating system.

### Setup and Operation

The user guide clearly illustrates how to connect the three pieces of the Eagle PC-1 system. It's not likely that cabling will present a problem to even the novice user.

At power on the computer greets the user with 'floppy disk read error,' a message that the user guide does

---

An effort is made to keep the operating system in the background.

---

not predict. Next you are asked to insert a system disk into the left drive. The machine attempts to read a disk in drive A approximately every 15 seconds, so you can take as much time as you need. Inserting the MS-DOS or CP/M-86 system disk brings you immediately into the respective operating system prompts (date and time for MS-DOS; A> for CP/M-86). One advantage of using the Eagle software (*EagleCalc* and *EagleWriter*) is that MS-DOS is already installed on the disk. You will not have to transfer system files to initialize disks or take the time to first boot up the computer with the operating system and then change disks.

With both Eagle applications programs it's evident that an effort was made to keep the potentially frightening operating system in the background. Having MS-DOS already on the disk is one indication. Another is the reduction of many standard DOS

functions to menu selections—a definite advantage for the nontechnical user (see Figure 2). Even selecting option 5, Quit, doesn't bring you back to DOS. Instead, a screen message advises you to remove all disks and turn off the power. More experienced users who are accustomed to changing from one application to another by way of the operating system might question this methodology. But in going from *EagleWriter* to *EagleCalc*, for example, you can ignore the power-off message, change disks, and reboot by pressing the <Control>-<Alt>-<Delete> keys simultaneously, as on the IBM PC.

### Eagle MS-DOS

Eagle MS-DOS version 1.25 is roughly equivalent to PC-DOS 1.10 in operation, but there are numerous differences in command syntax and utility files. What made my exploration of the disk a bit more difficult was that the technically worded manual failed to explain all the commands. For example, the manual instructs you to type FORMAT B:/S to format a blank disk. But the formatting program file on the MS-DOS disk is called FORMAT48.COM. Few novices would figure out that the proper command is FORMAT48 B:/S.

One of the most useful files is not mentioned in the MS-DOS manual at all. It is FDSKUTIL.COM, a collection of floppy disk utilities presented in menu form. Your choices are: performing read-only tests on either disk drive, formatting a disk in either drive, copying disks with or without formatting, and exiting the routine back to DOS. This is another noble effort to place the operating system in the background for the novice and is an oasis in a desert of unfriendly DOS commands. An AUTO-EXEC.BAT file (and a similar HELP.BAT file for assistance after performing DOS operations) could have easily been created to present a more instructive first MS-DOS

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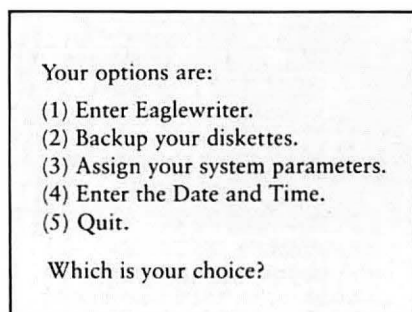


Figure 2: Eagle PC-1 main menu

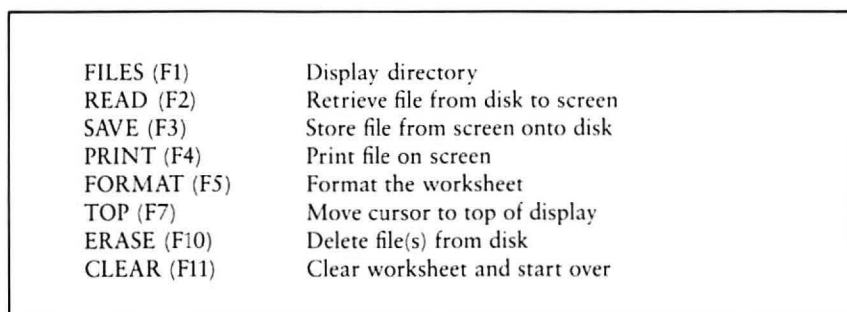


Figure 3: Eagle PC-1 function keys

screen. This would direct the novice through some of the available commands and keep the operating system in the background.

A few time trials were run for those who are interested in a performance comparison between the Eagle operating system and PC-DOS. Formatting a double-sided disk on the Eagle PC-1 is a few seconds faster than on the IBM PC. But the IBM PC is clearly faster at making a backup copy of a program disk.

The *EagleWriter* word processing program and its IBM counterpart, *Spellbinder*, were also put to the test. The Eagle disk consisted of 38 files spread over 208K of disk space, while the IBM version had 43 files taking up 278K. Using the Eagle MS-DOS FDSKUTIL.COM selection to copy a disk from drive A to drive B took an astonishingly long 4 minutes, 19 seconds. The fuller IBM disk using the PC-DOS DISKCOPY command took only 53 seconds.

## Eagle Software Implementations

*EagleCalc* is a 64-column by 255-row electronic spreadsheet adapted from Lattice Inc.'s *UniCalc*. The command language is easier to learn than *VisiCalc* because subcommands are presented via on-screen prompt lines. *EagleCalc* doesn't have the wide range of commands of some spreadsheets, but it should be adequate for most applications. The Eagle program, however, is a far cry from sec-

ond-generation spreadsheets such as *Multiplan* and even more powerful integrated applications programs such as 1-2-3.

To simplify the command structure of this basic spreadsheet, the *EagleCalc* implementation uses eight function keys with dedicated legends (see Figure 3). These dedicated function keys come heavily into play in the *EagleWriter* word processing program, which uses both keys with legends and the remaining blank keys. On-screen command lines identify which is which.

*EagleWriter* is not a particularly easy word processing program to use, but the dedicated keys make it more palatable than the IBM PC version of *Spellbinder*. In the IBM version you must constantly switch among two levels of Edit modes and a Command mode to accomplish any function. The dedicated keys on the Eagle help keep you in the correct mode, but you must often pay more attention to the program than to your document.

Like *EagleCalc*, *EagleWriter* is only adequate when compared with programs emerging from the labs of major software developers. Since both programs are based on 8-bit designs, you can't help but conclude that neither program is utilizing the powers of the 16-bit Eagle PC-1.

## IBM PC Software Compatibility

I ran a number of software compatibility tests on the Eagle PC-1 and the IBM PC. First be aware that any IBM program that uses IBM

BASIC will not run on the Eagle just by copying IBM's BASIC.COM file to the Eagle disk. The IBM BASIC.COM and BASICA.COM files found on the PC-DOS disk are supplements to the BASIC language in the IBM's ROM and are not complete languages alone. To run BASIC programs, and any program that uses BASIC for any portion of the program, you must have Eagle's optional GW BASIC software, which in theory makes the Eagle compatible with IBM BASIC.

What's more, the formatting of an Eagle data disk is not compatible with the PC. In one test I used *EagleWriter* storage disks on the IBM PC's *Spellbinder* program. The IBM program accessed and manipulated documents as expected, but when it came to saving revisions, a 'Directory Full' error prevented me from storing my work. Taking that same disk back to the Eagle allowed full transfer of documents on and off the disk.

Among the dozen or so IBM word processing programs available, few worked to 100 percent efficiency. The Eagle PC-1 handled *Benchmark 3.0*, *VolksWriter*, *Select*, and *EasyWriter 1.1* well. Those that didn't work correctly had problems interpreting cursor controls and function keys or had one particular function (such as Search and Replace) that caused the computer to freeze up.

But using IBM programs that worked successfully (see Table 1) brought up a troubling point. Because the Eagle PC-1's function keys



Category	Title	MS-DOS	CP/M-86	Publisher
<i>General Business</i>	Sales Tracking Package	•	•	Logan & Davies
	Optimum Label Package	•	•	Logan & Davies
	Sales Analysis	•	•	MBSI
	Search Systems Package	•	•	Logan & Davies
	Sensible Management	•		O'Hanlon
	Client Retrieval System	•	•	Fax Int'l
	49er's Prospecting Package	•		Excalibur
	General Business System	•	•	CYMA
<i>Accounting/ Inventory</i>	General Accounting Systems	•	•	ADS
	Sensible Bookkeeper	•		O'Hanlon
	Realworld Package	•	•	Micro Business Software
	TCS Accounting Software	•		Rocky Mountain
	Versaform	•		Applied Software Technology
	Acct. Package		•	Uveon Computer
	Software Fitness Program	•	•	Open Systems
	General Ledger	•	•	CYMA
	Accounts Receivable	•	•	CYMA
	Accounts Payable	•	•	CYMA
	Payroll	•	•	CYMA
<i>Spreadsheets/ Financial</i>	Wondercalc	•		Businessoft
	Sensible Planner	•		O'Hanlon
	UniCalc	•		Lattice
	SuperCalc 2	•		Sorcim
	FPL	•	•	Ashton-Tate
	Bottom Line Strategist	•	•	Ashton-Tate
	Milestone		•	Software Digital
	Datebook II		•	Software Digital
	VisiCalc 1.0	•		VisiCorp
<i>Data Management</i>	dBASE II	•	•	Ashton-Tate
	Condor III-20	•	•	Condor Computer
	Visidex	•		VisiCorp
	T.I.M. III	•		Innovative Software
	EasyFiler	•		IUS
	Office Filer	•		Software Digital
	SimpliFile	•		Durant Software
<i>(continues)</i>				

Table 1: IBM PC-compatible software for the Eagle PC-1

are dedicated to specific functions according to a legend, they don't apply to programs not specifically configured for the machine. It's difficult to remember that <F1> is for Help when you see 'FILES' printed on the key. Of course, if the library of Eagle software encompassed a wide range of programs, the function of <F1> would be the same on every program, making the computer a breeze to use and future software a snap to learn. But this is not the case.

It's possible, of course, that the Eagle PC-1 could become fantastically popular, with software publishers tumbling over each other to get applications programs configured for the Eagle PC-1 keyboard. If you're an impatient prospective buyer, you should consider that likelihood a bigger risk than buying a machine closer to the IBM PC in terms of software, hardware, keyboard compatibility, and expandability. ☹

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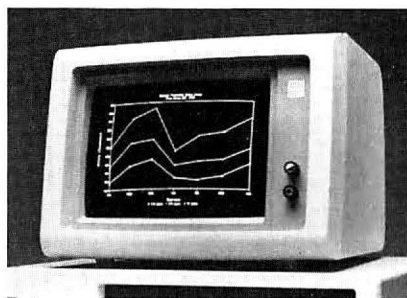
*Eagle PC-1*  
*Eagle Computer Inc.*  
 983 University Ave.  
 Los Gatos, CA 95030  
 408/395-5005  
 List Price: \$2995  
 System Includes: 128K RAM, one double-sided disk drive, monochrome monitor and board, MS-DOS, CP/M-86, EagleCalc, and EagleWriter



Category	Title	MS-DOS	CP/M-86	Publisher
<i>Job and Industry</i>	Private Membership Club	•	•	ADS
	Veterinarians	•	•	ADS
	Small Bookkeeping Services and Public Accountants	•	•	ADS
	Retail Florists	•	•	ADS
	Churches	•	•	ADS
	Medical and Chiropractic Practice Management	•	•	CYMA
	Dental and Orthodontic Practice Management	•	•	CYMA
	Client Accounting	•	•	CYMA
	Construction Management	•	•	CYMA
<i>Word Processing</i>	Textplus	•		Owl Software
	EasyWriter II	•		IUS
	EasySpeller II	•		IUS
	Visual Edit Utility	•		Control Technology
	Spellbinder	•		Lexisoft
	WordStar	•		MicroPro
	WordPlus	•		Professional Software
	SuperWriter	•		Sorcim
	Volkswriter	•		Lifetree
	Benchmark 3.0	•	•	MetaSoft
<i>Graphics</i>	VisiTrend/Plot	•		VisiCorp
<i>Data Comm.</i>	Crosstalk	•		Microstuf
<i>Languages</i>	GW BASIC	•		Eagle
	Business BASIC Compiler	•		Microsoft
	MS-Pascal	•		Microsoft
	C Compiler			Microsoft
	COBOL	•		Microsoft
	FORTTRAN	•		Microsoft
	CBASIC-86 1.2		•	Digital Research
	CBASIC Compiler		•	Digital Research
	PL/1-86		•	Digital Research
	Pascal/MT + 86		•	Digital Research
	CIS COBOL		•	Digital Research
	Level II COBOL		•	Digital Research
	Sensible Solution	•		O'Hanlon
	C Compiler	•	•	Lattice
	C-Food Smorgasbord	•	•	Lattice

Table 1 (continued)





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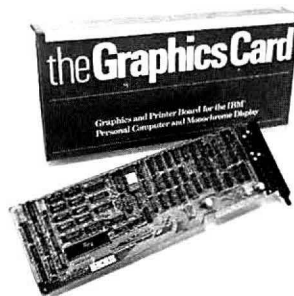
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# TK!Solver EXPLA

## TK!Solver does for equations what word processing did for words.

The first thing you should know about the TK!Solver™ program is that it is not a spreadsheet. Instead, it does something completely unheard of (until now)—it turns your personal computer into a voracious equation processor.

The next thing you should know is that if the TK!Solver program can't make life with your personal computer easier (and pay for itself), even if you use it only 15 minutes a week, you are a very rare person.

And finally, you should know exactly what equation processing is, and how it works. If you keep reading this, you will.

**Equation processing with TK!Solver, or problem solving made easy.** The best way to understand what the TK!Solver program is, is to understand what it does. The following simple example is designed to do just that. If you're still a little in the dark after reading it, stop in at your local computer store for a very enlightening hands-on demonstration.

Begin by setting up your problem. The TK!Solver program lets you do it quickly, easily, and naturally. For example, a car costs \$9785. What would be the monthly payment on a three-year loan if the down payment is 25% and the interest rate is 15%?

**STEP 1.** Formulate the necessary equations to solve your problem and enter them on the "Rule Sheet" simply

(1r) Rule: "CAR LOAN

64

VARIABLE SHEET				
St	Input	Name	Output	Unit
				Comment
	9785	price		dollars
		down	2446.25	dollars
		loan	7338.75	dollars
	25	dp		percent
		payment	254.40018	dollars
	15	i		percent
	3	term		years

RULE SHEET

S Rule

"CAR LOAN

price-down= loan  
down/price=dp  
payment= loan\*(i/(1-(1+i)^-term))

by typing them in (as in the screen photo). For example: "price-down = loan."

**STEP 2.** Enter your known values the same way on the "Variable Sheet." For example: "9785" for price. You may also enter units and comments, if you want.\*

**STEP 3.** Type the action command ("!" on your keyboard) to solve the problem.

**STEP 4.** TK!Solver displays the answer: the monthly payment is \$254.40.

**Backsolving, the heart of TK!Solver.** Now that you've defined

the problem and solved it, TK!Solver's unique backsolving ability also lets you think "backwards" to solve for any variable, regardless of its position in the equation. For example, if you can only afford a monthly payment of \$200, you can re-solve the problem in terms of that constraint. The TK!Solver program will solve the problem, displaying your choice of a higher down payment, a longer loan term, or a lesser interest rate. This unique backsolving capability forms the basis of TK!Solver's remarkably flexible problem-solving ability.



# SOLVER MAINTAINED:

Also, as you can see from the example on the screen, TK!Solver deals not only with single variables, but with entire equations and sets of simultaneous equations. It also deals with much more complicated problems than this one. How complicated? That's up to you. What kinds of problems? That's up to you, too, but popular applications include finance, engineering, science, design, and education.

**Other extremely useful and interesting things TK!Solver does.** Aside from its basic problem-solving abilities, the TK!Solver program performs a number of pretty fancy tricks. Like: *Iterative Solving*; in which TK!Solver performs successive approximations of an answer when confronted with equations that cannot be solved directly, like  $\exp(x) = 2 - x \cdot y$  and  $\sin(x \cdot y) = 3 - x - y$ . Like: *List Solving*; in which TK!Solver attacks complete lists of input values and solves them all, allowing you to examine numerous alternative solutions, and pick the one you like best. Like: *Tables and Graphs*; using the values you produced with the List Solver, the TK!Solver program will automatically produce tables and graphs of your data. You can look at your formatted output on the screen or send it to your printer with a single keystroke. And like: *Automatic*

\*You can easily define appropriate unit conversions on the unit sheet.

*Unit Conversion*; in which TK!Solver lets you formulate problems in one unit of measurement, and display answers in another. Very convenient what with all this talk about going metric.

The TK!Solver program also provides a wide variety of specialized business and mathematical functions like trig and log and net present value.

Then, there's TK!Solver's on-screen Help facility that provides information on commands and features any time you want it. Just type "?" and a topic name.

And of course the TK!Solver program combines all these features in one *integrated program*. **TK!SolverPacks make problem-solving a picnic.** TK!SolverPack™ application packages are specially developed by experts in specific fields. Each package contains a diskette with about a dozen models that include the necessary equations, values, and tables for solving a particular problem. The models are usable as-is or you can easily modify them.

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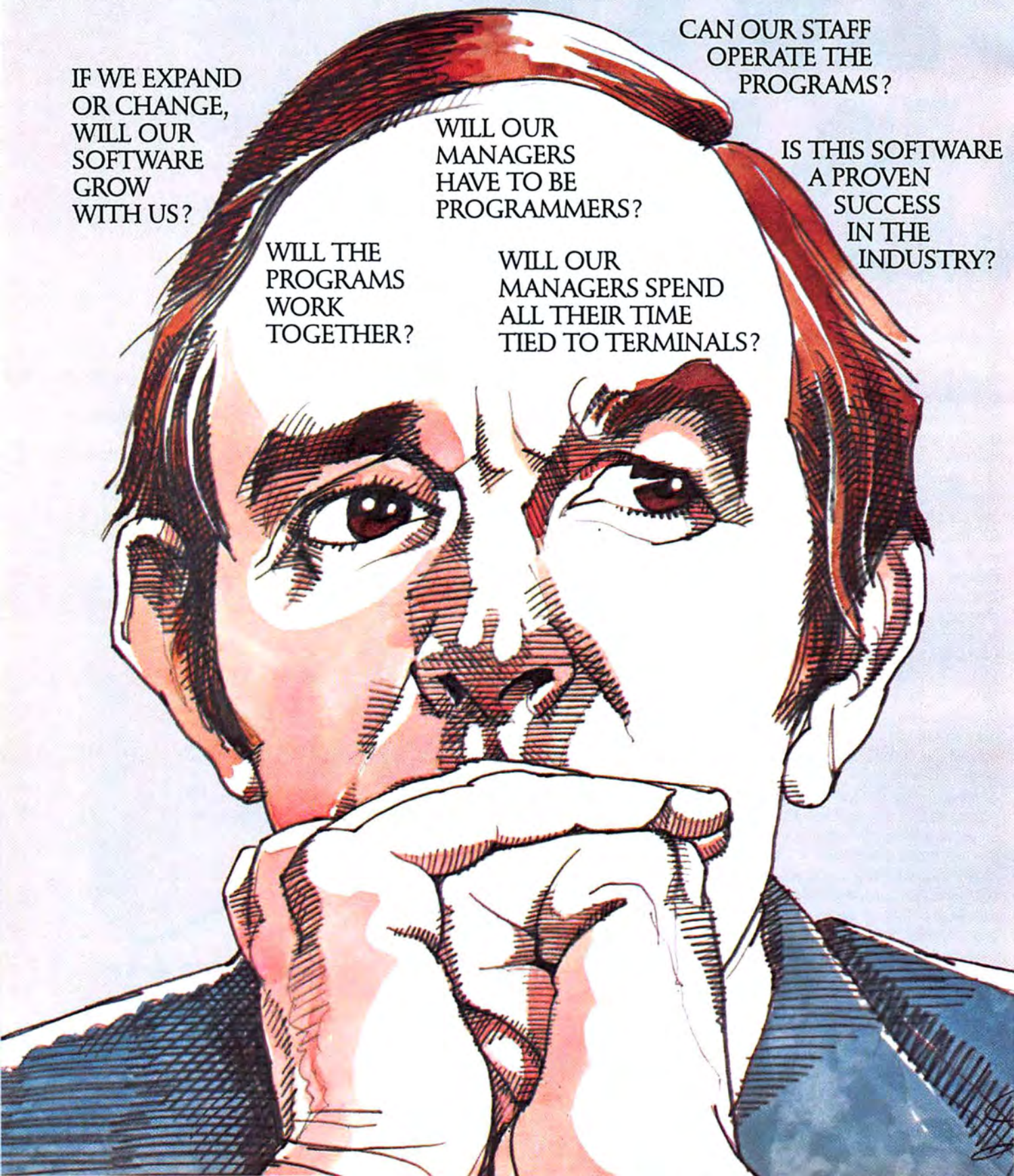
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MANAGERS  
HAVE TO BE  
PROGRAMMERS?

CAN OUR STAFF  
OPERATE THE  
PROGRAMS?

IS THIS SOFTWARE  
A PROVEN  
SUCCESS  
IN THE  
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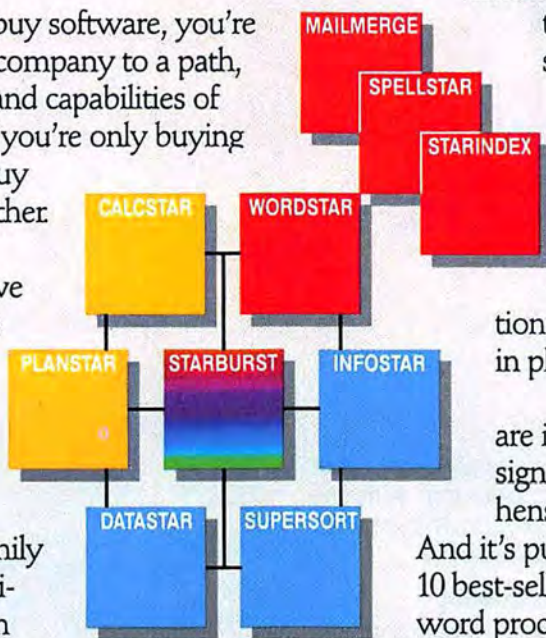
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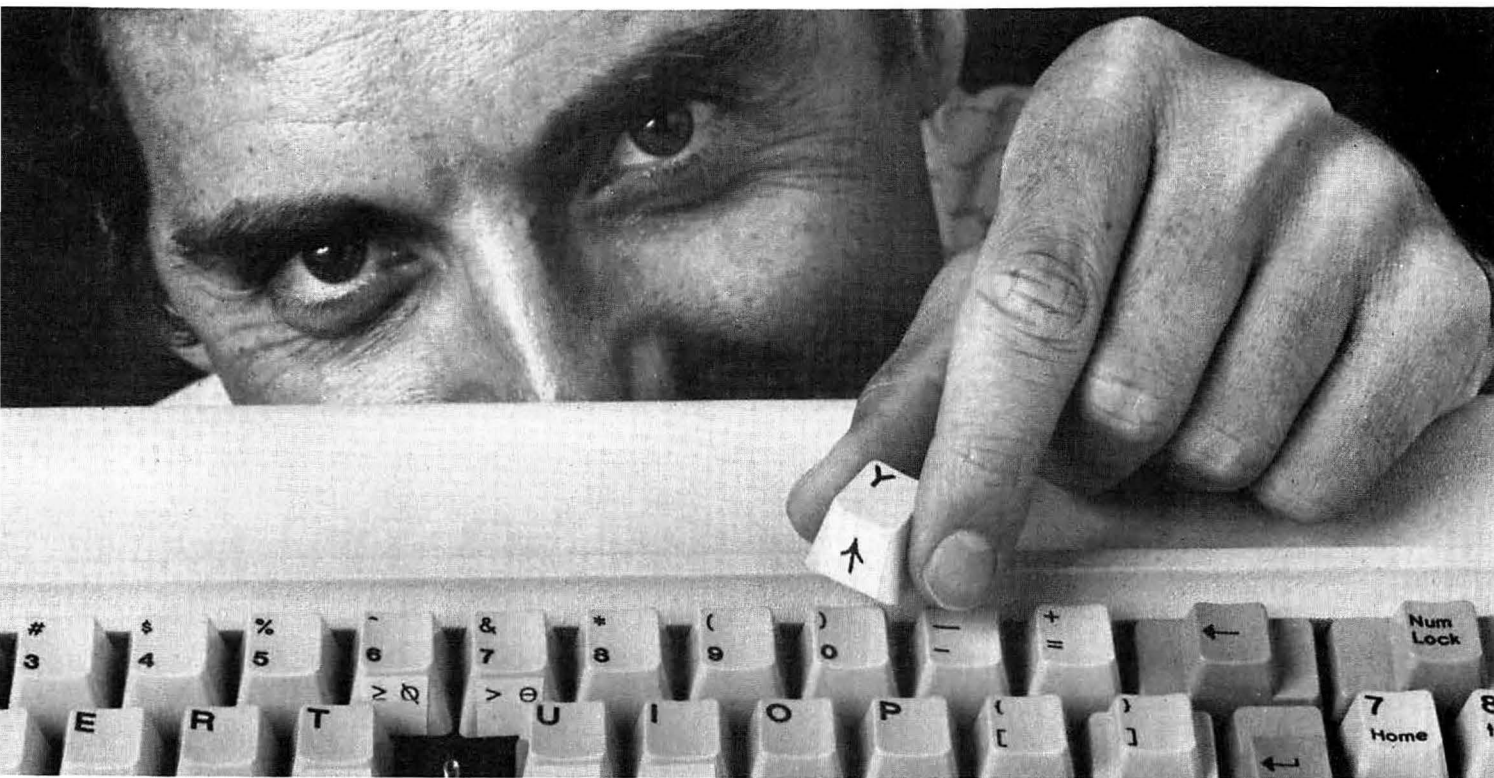
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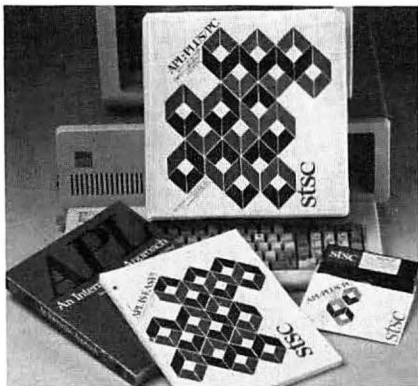
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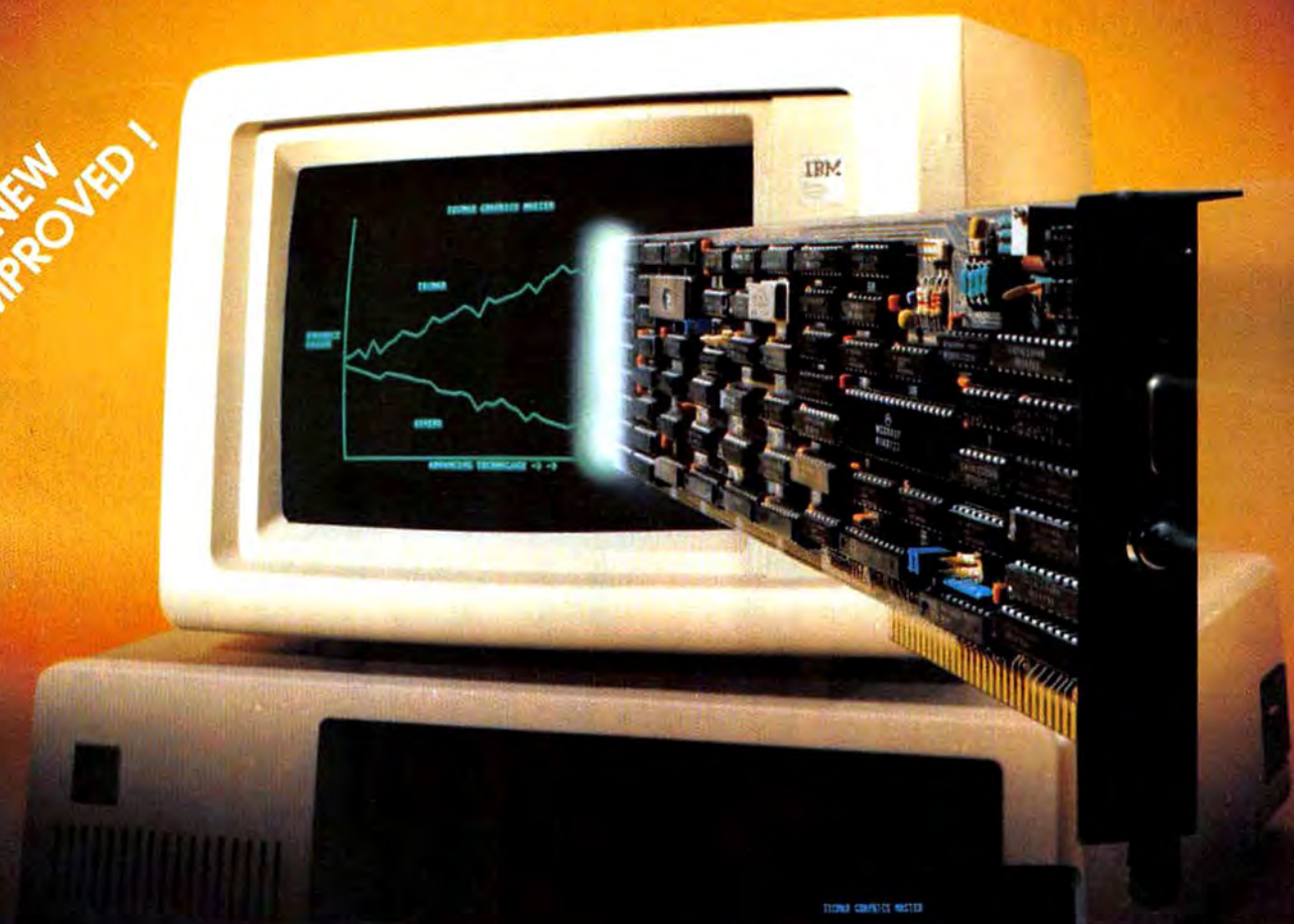
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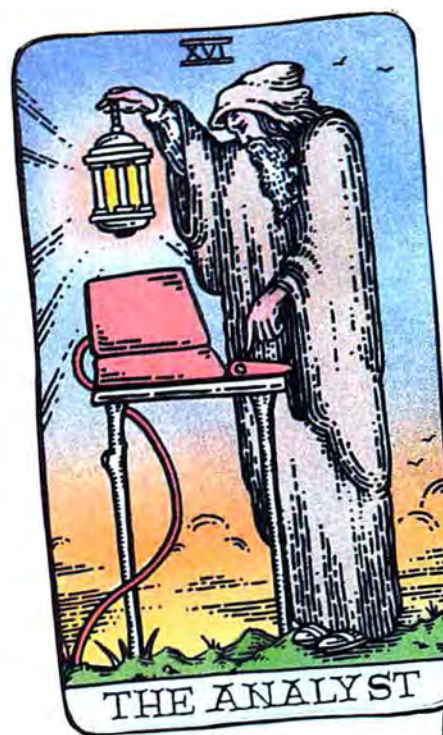
*A close look at the Dow Jones Market Analyzer*

Andrew T. Williams

The goal of every hard-working investor is, of course, to find the Big One—the stock that goes from zero to 100 in 60 minutes and then splits 40 for 1. To this end, publishers, advisors, experts, gurus, pundits, economists, and other bona fide soothsayers (including several astrologers) stand ready to advise you, the investor, on which stock to buy and when. This august group of information providers has now been joined by the personal computer and the necessary investment software.

Dow Jones, the publisher of the widely respected *Wall Street Journal* and the owner of the Dow Jones News/Retrieval service, the largest financial electronic data base in the country, has recently entered the investment software derby. And with the *Dow Jones Market Analyzer*, it looks like they have entered the market with a bang.

After automatically retrieving the necessary information from the Dow Jones News/Retrieval data base, the *Market Analyzer* graphs the price action and transaction volume for individual stocks. The historical price/volume graph for a particular stock or stock market average is the bread and butter of a group of stock market prognosticators known as techni-



cal analysts, or technicians. From this information the technician tries to divine the future price movements of a stock in much the same way as a gypsy tries to divine your future by examining the lines in the palm of your hand.

## Overview

The *Market Analyzer* puts exotic technical analysis within easy reach of the individual investor who knows what to do with the information. The



program is menu driven; you select functions from those presented on a menu. The *Market Analyzer* provides two general types of activities: the first is a communications function that obtains the necessary price and volume information from Dow Jones News/Retrieval, and the second puts the data in graph format (called "charting" in the stock world).



To obtain historic quotes on a particular stock, choose the Maintenance option from the main menu and follow the instructions as they appear on the screen. You must specify the symbol of each stock you wish to use and answer some additional questions about the stock. The program handles up to 100 stocks at a time. When you are finished, choose the Histories option from the maintenance menu to be prompted through a logon procedure. Everything is automatic (including submitting your password) except for dialing the local

on weekends to retrieve 120 days of information (about 6 months of trading). Service at 1200 bps is also available.

If you're retrieving information for six or eight stocks, log on and then go play with your kids. The *Market Analyzer* automatically logs off when it's finished and keeps track of any irregularities in the data, such as stock split information.

Several utilities come with the program, including one to adjust data

quick and easy, and most investors will probably use it. Multiple-day updating is also possible; use it when you go on vacation or when you wish to update every few days.

### Mirror, Mirror...

The heart of the *Market Analyzer* is its charting functions. Once the program has the price and volume history for a stock, it can plot charts on individual stocks or charts that compare the performance of up to five stocks. Stocks can be compared to each other (called comparison charting), or they can be compared to a base, such as the Dow Jones Industrial Average (called relative strength charting).

When selecting individual charts you can have them prepared in linear or semilogarithmic form (equal percentage changes are shown as equal vertical distances). You can also choose the number of trading days displayed (the default is the number of days of information available).

The price/volume chart shown in Figure 1 forms the basis for technical analysis, but it is only the basis. Technicians use this information to calculate indicators that give them clues to future price movements. Among the most common of these indicators are moving averages. The *Market Analyzer* can calculate a simple moving average over any specified period of time, from a few days to several months. Figure 2 shows two moving averages, one for 12 days and one for 50 days. The 12-day moving average is the wavy one on top, and the 50-day moving average is the steadily rising line toward the bottom of the chart.

The *Market Analyzer* also calculates and plots weighted moving averages and exponential moving averages.



Tymnet or Telenet phone number. For some reason, the program forces you to type the phone number each time you log on to Dow Jones News/Retrieval.

Once you're logged on, the *Market Analyzer* retrieves the quotes automatically. At 300 bits per second (bps) it takes about 5 to 7 minutes at 15 cents per minute in the evening or

for stock splits. If you need to abort a retrieval in the middle, the *Market Analyzer* remembers where it left off so you can collect the remaining data at a later time.

Another utility uses Dow Jones News/Retrieval to update the information automatically on up to 400 stocks at a time. To make life tougher you can also obtain the information from the newspaper and enter it manually. In either case, you must first enter the information onto a temporary work disk and then transfer it to the data disk. Automatic updating is



## ● Review

### Lines, Lines, Lines

The *Market Analyzer* can plot a number of straight lines that are useful in analyzing and interpreting price movements. One of the most helpful is the regression line. It is the straight line through the data that minimizes the square of the deviations from the line and is a good measure of the overall direction of price changes. Horizontal lines can also be plotted for any price. They can indicate where stop loss orders have been placed or where areas of resistance to further price increases or decreases have been identified.

Other types of lines can be constructed with the *Market Analyzer*, including trend lines, parallel lines, and speed resistance lines. Each line is a tool that can be used by a technical analyst to determine the future trend in stock prices and to indicate when that trend is changing.

### Volume Information

Technical analysis looks at the trading volume of a stock as well as its price movements. The *Market Analyzer* can calculate most of the standard volume measures, such as the on-balance volume indicator (the *Market Analyzer* calls it the cumulative volume indicator), the negative volume indicator, and the price-volume indicator. These indicators are plotted either in bar graph form or as a line graph in the area where the daily volume information is usually plotted. See Figure 3 for an example of the cumulative volume indicator plotted as a graph.

### The Lazy Man's Technical Analyst

The technical analyst's life is greatly simplified by the *Market Analyzer's* automatic retrieval of historical quotes, its plotting of price/volume information, and its calculation of moving averages, regression lines, and volume indicators. But the *Market Analyzer* has an additional feature that makes the easy even easier.

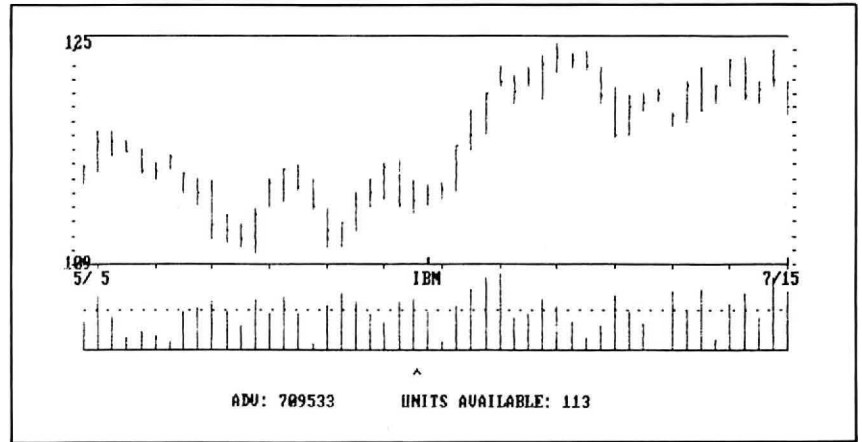


Figure 1: Fifty days of IBM stock market action. The bar graph at the bottom represents the number of shares traded each day, and the dotted line through the volume is the average daily volume.

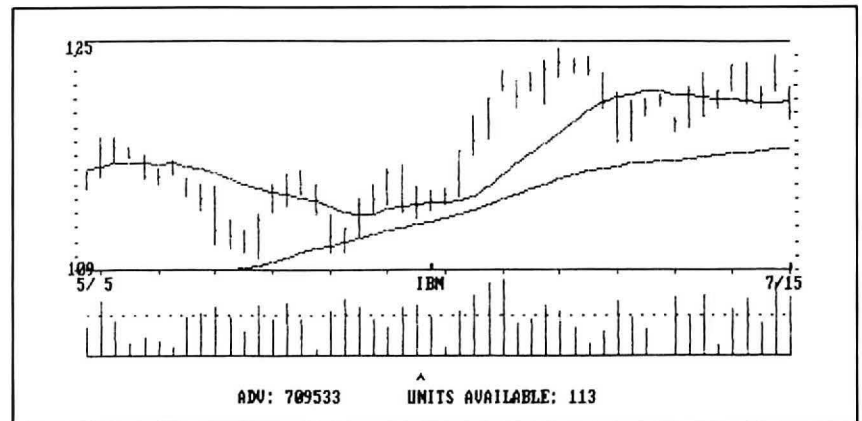


Figure 2: The Market Analyzer can plot a number of different curves and lines. In this figure the top line is the 12-day moving average of closing IBM prices, and the bottom line is the 50-day moving average of those prices.

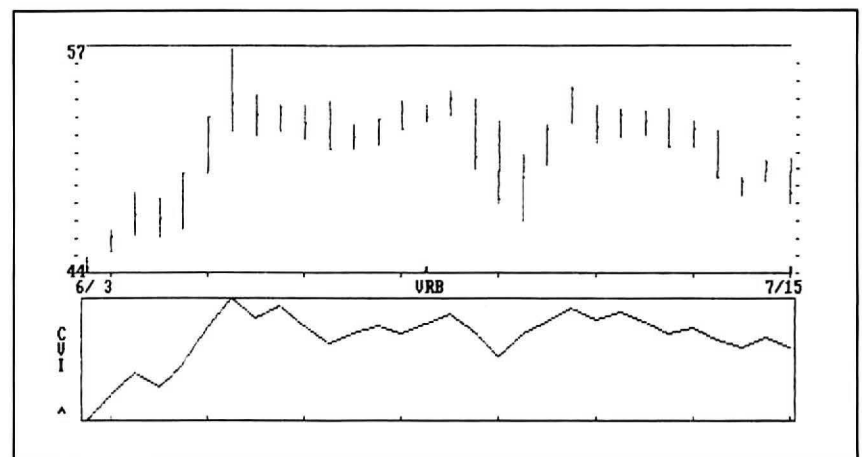


Figure 3: The Market Analyzer can calculate and plot five different volume indicators. This figure displays the line graph of the Cumulative Volume Indicator for Verbatim Corporation.



You can select a set of parameters—number of days to be analyzed, type of chart, type of moving averages or regressions to be plotted, and volume indicator to be prepared—and then sit back and have all these functions performed automatically on the stocks you select. This can be done for all the stocks on a disk or for a subset of stocks that you select. You can even include the print command in the automatic run to print the charts for each stock while you lie around the pool having a Ramos Fizz.

## Two Problems

The *Market Analyzer* is an excellent program, but it does have a couple of problems. The manual mistakenly tells you to exit the graphing mode with <Ctrl>-C. Use a <Ctrl>-A instead; <Ctrl>-C deactivates the current work disk and limits your subsequent choices to exiting to the main menu or activating a different

data disk. If you do use <Ctrl>-C, you can recover by selecting the Different Data Diskette option and activating your current disk.

The program's other problem has to do with "EZ Terminal," a communications mode that lets you access the data bases of the Dow Jones News/Retrieval service. EZ Terminal, which is part of the *Market Analyzer*, works well most of the time, but when it comes to saving a screen to a disk, there's a possibility of a miscue. The command to save a screen to disk is <Esc> 1, and the command to disconnect from Dow Jones is <Esc> <Esc>. When you issue the <Esc> 1 command, nothing happens to indicate that the command has been issued; the program saves everything later. The problem is that you aren't sure whether the page has been saved. Then if you either hold down the <Esc> key or press it a couple of times in frustration, you will issue the command to disconnect from Dow Jones News/Retrieval.

## One Gem

The EZ Terminal mode of the *Market Analyzer* introduced me to one useful and undocumented feature of Dow Jones News/Retrieval. If you type a question mark when receiving information from Dow Jones News/Retrieval, transmission will be suspended and you can issue a command. This suspension is particularly useful when you're in news mode getting a listing of all headlines on a particular stock. When you see a story you want to read, you can just type '?' to order it up without waiting for the entire list of headlines to be displayed. This also works with sign-on information and news stories.

## Hardware Requirements

To use the *Market Analyzer* you need an IBM PC with at least 64K of RAM. A color monitor isn't necessary, but without it distinguishing between several stocks on a comparison chart is difficult. One disk drive is required, but two are needed to prevent a great deal of disk swapping.

## Two Are Better Than One

Dr. Clay Burch, professor of mathematics, president of RTR Software, Inc., of El Paso, Texas, and the author of the *Dow Jones Market Analyzer*, provides the following instructions for setting up the program to operate with a two-monitor system.

1. Follow the instructions in the manual for creating a program disk.

2. Load the *Market Analyzer* from the program disk, and when the main menu is displayed choose option 8, Stop. You will then see the BASIC prompt 'OK'.

3. Type the following:

```
LOAD "MENU <Enter>
30 POKE &H410, (PEEK(&H410) AND
&HCF) OR &H10
```

Verify what you have typed so far, then type:

```
Enter>
SAVE "MENU
<Enter>
```

4. Load the *Market Analyzer*. The menu and the graphs should now appear on your graphics monitor.

## Suggested Reading

If you want to find out more about technical analysis, read some of the following:

Appel, Gerald and Hirschler, W. Frederick. *Stock Market Trading Systems*. Dow Jones-Irwin, Homewood, Illinois, 1980.

Dines, James. *How the Average Investor Can Use Technical Analysis for Stock Profits*. Dines Chart Corporation, New York, 1974.

Granville, Joseph E. *A Strategy of Daily Stock Market Timing for Maximum Profit*. Prentice-Hall, Englewood Cliffs, New Jersey, 1976.

Malkiel, Burton G. *A Random Walk Down Wall Street*. W. W. Norton, New York, 1975.

Finally, you need a serial port and a modem to retrieve quotes from Dow Jones News/Retrieval.

A printer is optional, but with one you can print the historical price/volume information and obtain printouts of the graphs. To print the graphs you need either an Epson printer or an IBM printer equipped with Grafrax Plus. You also need either DOS 1.10 or DOS 2.00 and BASICA. (The current version of the *Market Analyzer* doesn't support a hard disk or the other special features of the IBM PC XT.)



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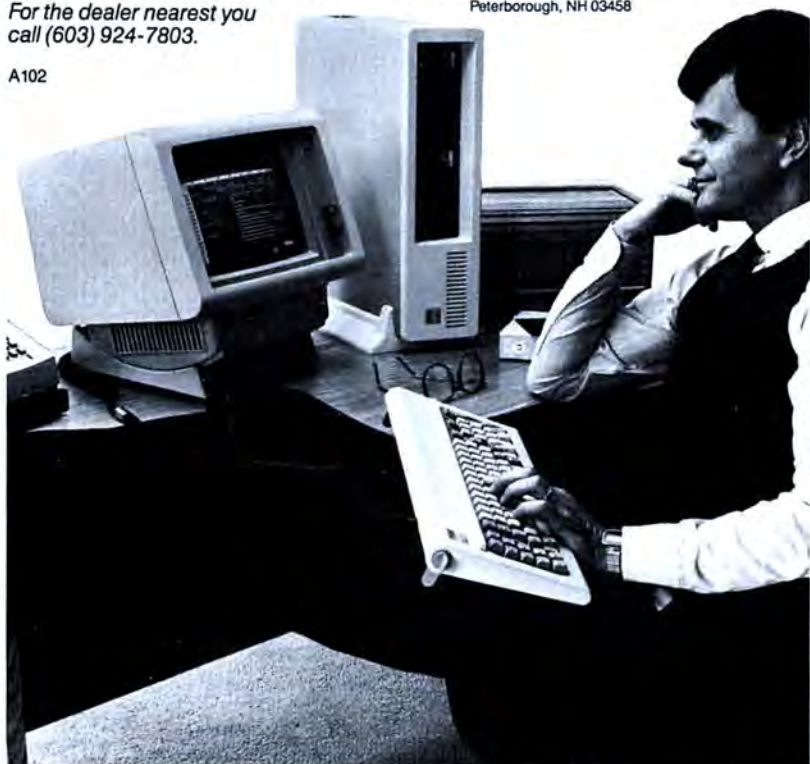
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# be flexible

## ● Review

The *Market Analyzer* comes with four disks (master disk, program disk, data disk, and work disk), a manual, a quick reference card, a membership in the Dow Jones News/Retrieval service, and 1 hour of free, unrestricted use of the service. Getting the program going is easy, and the manual is complete, with both an index and a table of contents.

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Princeton, NJ 08540

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RS-232 serial port



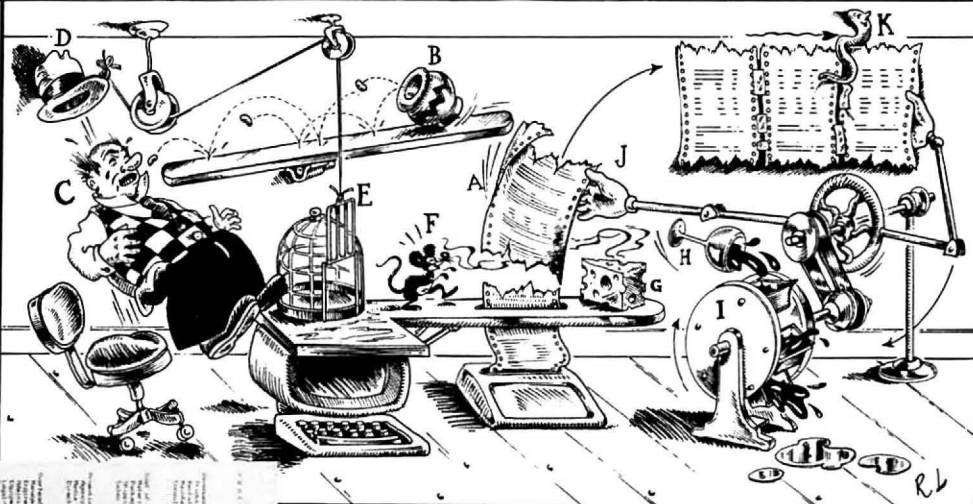
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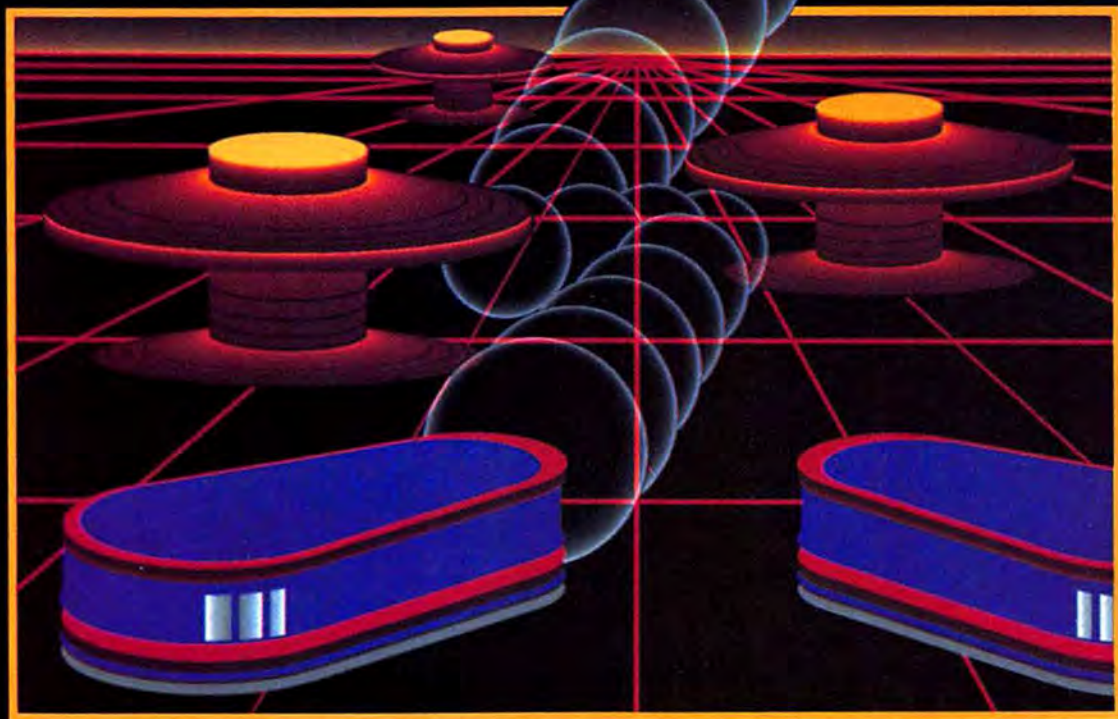
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# Fancy Footwork

*Footnoting your documents was once a tedious task, but now there are programs that make this process easier.*

**Joshua B. Freeman**

Scholars, lawyers, and consultants routinely use footnotes in their reports and articles. As early purchasers of IBM PCs, however, these people were disappointed to discover that the first word processing programs for the IBM PC made no special provisions for footnoting. *Volkswriter* did not display page breaks on the screen; the only way to place footnotes on each page was to keep a running count of lines and juggle text and notes. *WordStar*, on the other hand, let you know where each page ended, but writing a document with more than a few footnotes was laborious. Due to those program limitations writers found that the only advantage to using a computer for footnoting was that you could correct mistakes more easily than on a typewriter.

Now footnoters need not despair. Several newer word processing programs, such as *The FinalWord* and *WordPerfect*, include procedures for the convenient and flexible handling of footnotes. One program does footnoting for *WordStar*. Finally, the extraordinary power of the PC has been used to make footnoting more than just an afterthought in creating a document.



## Footnote with WordStar

Pro/Tem Software's *Footnote* is designed to be used with *WordStar*, one of the most popular and versatile word processing programs. Like its host program, *Footnote* is not copy protected, so it can be used with the IBM PC XT and other hard disks.

*Footnote* modifies *WordStar* files. Using it to footnote, therefore, is a multistage process. To create a footnoted document, write with *WordStar* as you normally would. However, instead of using numbers (or footnote calls) to indicate that a



footnote will appear later, insert the '@' symbol; the program will substitute the correct numbers when the text of the footnote is entered.

When you've finished typing in the text, you can use one of two ways to enter footnotes. The easiest way is to end and save the text and open a new file for the footnotes. (This second file must have a different name from the text file, not just a different extension.) Enter the text of the footnotes sequentially, separating them from one another with a blank line. Each footnote should start with the '@' symbol instead of a number, and the footnote file must end with a hard carriage return.

A slightly more complicated method allows footnotes to be entered simultaneously with the text. At any point after writing a paragraph or group of paragraphs containing footnote calls, you can set aside an area to hold the corresponding notes. To do this, press <Enter> at the end of a paragraph and ^PR<Enter>. The ^PR is a signal to *WordStar* that the text following that symbol is a footnote. *Footnote* uses the R patch area on the *WordStar* print menu. If you've already customized *WordStar* to use that area, you'll have to change your patch to prevent conflicts. Next insert the footnotes, making sure to leave a blank line between them. After inserting the last one, press <Enter> and type .pa<Enter> on the following line to end the page. Then you can resume writing the text. Using this method you can add as many footnotes as you need, as long as each one appears sequentially and after the appropriate call.

### Inserting Footnotes

Once the text and footnotes are entered and the file is saved, you can use the *Footnote* program to create order out of the chaos you've just created.

First run the Number Notes routine by typing either 1 or N from the *Footnote* menu. The program asks you for the name of the file and the number to use for the first footnote.

*Footnote* goes through the file, numbering the calls and notes consecutively and then returns to the *Footnote* menu. If the calls and notes are in the same file, the program assigns the same number to each pair of calls and notes and reports any discrepancy between the total number of each. If the calls and notes are in separate files, you must use this routine twice.

### Formatting

Once the footnotes are numbered, you can format the document in one of three ways. If the calls and notes are in the same file and you want the text of the footnotes on the bottom of each page, format the document with the routine labeled "Format footnotes in textfile" by typing 2 or F from the *Footnote* menu. That option arranges the notes and text throughout the file. If the calls and notes are in separate files and you want the text of the footnotes to appear at the bottom of each page, type 4 or M to 'Merge endnotes into text.' Finally, if the calls and notes are in the same file but you want them in separate files, choose 'Remove notes from textfile to endnote file' by typing 3 or R from the menu.

If you choose one of the first two options, the reformatted file is saved under the original text file name, and the old text file becomes a .BAK file. If you choose the R option, you're asked to name the file in which the notes will be saved; the text file name stays the same. If you later want to print out your text and end notes at the same time, you have to merge the files using either *WordStar* block moves or the DOS COPY command.

To return to *WordStar* type 6 or X from the *Footnote* menu and press any key. If you edit the document you've just footnoted, you'll see some changes: where '@' symbols had previously appeared are now numbers surrounded by the special print char-

acters ^T, which indicate superscripts in *WordStar*. If you have combined the footnotes and text in the same file, the notes appear at the bottom of the pages with the corresponding calls, separated from the main text by a ruler line running about a third of the way across the screen. *Footnote* also arranges pages so that they end with a complete footnote; however, if there is no room on a page for the entire last footnote, the program splits the note and completes it on the bottom of the next page. Documents that have already been footnoted can be edited with *WordStar* to

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*Footnote* arranges pages so that they end with a complete footnote.

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add or delete text and footnotes or to move blocks. *Footnote* must then be used to renumber and reformat the footnotes.

If your printer supports superscripting and you have the *WordStar* program properly installed, both the footnote calls and the numbers preceding each note are superscripted when the footnoted document is printed. If your printer can't produce superscript, the calls and preceding numbers appear in the proper position but on the same line as the text.

### Variations

You can make a few changes in the style of the calls and footnotes with the Change Options routine on the *Footnote* main menu, but these changes must be done before you run *Footnote* to number the footnotes and format the document. Calls can be superscripted, underscored, and followed by a slash, or just underscored and followed by a slash. The



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numbers preceding the corresponding footnotes appear in the same style, unless you tell the program to print them in the form recommended by the *Chicago Manual of Style*—a non-superscripted, nonunderscored number followed by a period. You can also change the symbol used to enter calls, change the number of lines appearing on each page, or instruct the program not to split footnotes. These, however, are the only changes you can make. You cannot, for example, extend the ruler line separating

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*Footnote* lacks a direct method for varying the line spacing of text and footnotes.

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notes from text across the whole page, nor can you indent the footnotes, a style commonly used in academic writing.

*Footnote* also lacks a direct method for varying the line spacing of text and footnotes. This is a serious weakness since many people like to double space text and single space footnotes at the bottom of the page. There are several ways to get around this problem, although all are awkward. One is to enter text and footnotes single spaced, putting a blank line between each paragraph and after each .pa<Enter> ending a footnote. Then use *Footnote* to number the calls and footnotes and separate the text and footnotes into different files, and finally run *Footnote* again to recombine the files. An easier method is to enter the text and notes into separate files from the beginning, but that means you can't write notes as you go along.

### The Quirks

*Footnote* is a bit complicated to use, but it comes with a clearly written manual and a tutorial. After a couple of hours of using the program, you should be able to produce documents to your specifications. However, if you get stuck, it might be due to some of the program's quirks. For example, if you're using justified text and have more than nine footnotes, the justification isn't done when *Footnote* replaces the '@' symbols embedded in the text with double digits.

A different problem arises if you have inserted print control characters for underlining, boldface, or the like in the text of a footnote. If the program splits the footnote between a pair of these characters, the entire next page of text prints in the manner called for by the print commands. A similar mess occurs if the program places the footnotes between two print control characters in the text. For these reasons, you must always check the text on screen before printing.

*Footnote* is not the fastest program in the world. Using it to number and format three pages of single-spaced text with nine footnotes took over a minute and a half. When working with long documents, you have to be prepared to wait.

### FinalWord

If you're not already hooked on *WordStar*, you may want to skip *Footnote* and try one of the newer word processing programs that include a footnote function. *The FinalWord*, by Mark of the Unicorn, has received considerable attention for its unusual features: simultaneous viewing and editing of two documents, extensive loss protection from system

crashes, and a variety of built-in document formats. The program also has procedures for dividing documents into chapters, sections, and subsections (all of which are automatically listed in a table of contents) and for creating an index.

*The FinalWord* handles footnotes as part of its advanced formatting routine with embedded formatting commands. When you enter text to be printed with advanced formatting, you must follow certain conventions. Paragraphs, for example, must be separated by blank lines, or the formatter combines them with one another.

With *The FinalWord* you enter footnotes when you create the main text. Wherever you want to place a footnote call, type @foot followed by the text of your footnote surrounded by a pair of delimiter symbols. *The FinalWord* gives you a choice of seven delimiter pairs, including single and double quotes; parentheses; and square, curly, or angle brackets. A typical footnoted sentence looks like this: '@foot<This is a sample footnote.>' Be careful when choosing delimiters because you can't use the same characters again in the text of the footnote.

When you've finished editing your document, press <F8> to go to the main menu, L for the layout menu, and A for advanced printing. *The FinalWord* saves your file, formats it, and prints it based on these commands. If you haven't changed any of the program's default style parameters, the calls appear as superscripted numbers (starting with 1) and the footnotes are printed at the bottom of the appropriate pages below a short rule. Normally footnotes are single spaced no matter how many line spaces are used in the main text. To inspect the formatted text on screen before printing, you can use the Verify Advanced Print option on



the layout menu, but you'd better have your fingers poised on <Ctrl>-<NumLock> to stop the text as it whizzes by.

### Have It Your Way

There are two ways to change the default style parameters in *The FinalWord*. Permanent changes can be made using the configuration program that comes on the program disk. That method is amply documented in the manual. To change a specific document, you can place formatting commands at the start of a file or at the point they are to take effect; for example, the default style is for footnotes to be printed at the bottom of the page. Footnotes can be placed at the end of your text by typing the command

`@style(notes end)`

before your first footnote. Using the command '@note' instead of '@foot' when first entering text has the same effect. Notes appear enclosed by brackets within the body of the text if you write

`@style(notes inline)`

The command

`@style(footpush no)`

results in nonsuperscripted calls. As a default *The FinalWord* inserts extra space above any line containing a superscript. The command `@style(scriptpush no)` will prevent the program from inserting that extra space.

Style commands can be combined with one another, including those commands not related to footnoting. For instance, the string

`@style(justification no, notes end, spacing 2 lines, scriptpush no)`

prints a nonjustified, double-spaced document with notes at the end and without extra line spacing for superscripts. You can use any of *The FinalWord's* delimiters in style commands, and they can be embedded within footnotes to vary the line spacing of the footnotes. In addition, you can change the numbers assigned to foot-

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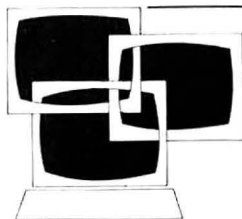
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## ● Review

notes by using a @ set command. For example,

@ set(footnote 12)

assigns the number 13 to the next footnote.

### Limitations

By combining various formatting commands, you can come up with a wide variety of document styles, but

the options just described are the only ones for footnoting. As with *Footnote*, there is no way to change the ruler line and the footnotes themselves always appear in the *Chicago Manual* style. What's more, if you're typing a complex document with many footnotes, you'll find yourself entering a seemingly endless stream of formatting commands.

Far more serious limitations, however, are the ones on footnote length.

The current version of *The FinalWord* cannot properly split footnotes between pages. When a note extends beyond the bottom of a page, the program warns you while it's formatting. Sometimes it prints the file in its own garbled way; at other times it refuses to print at all. Switching to the end notes format doesn't necessarily help either, since end notes cannot be more than 300 characters long or more than one paragraph.

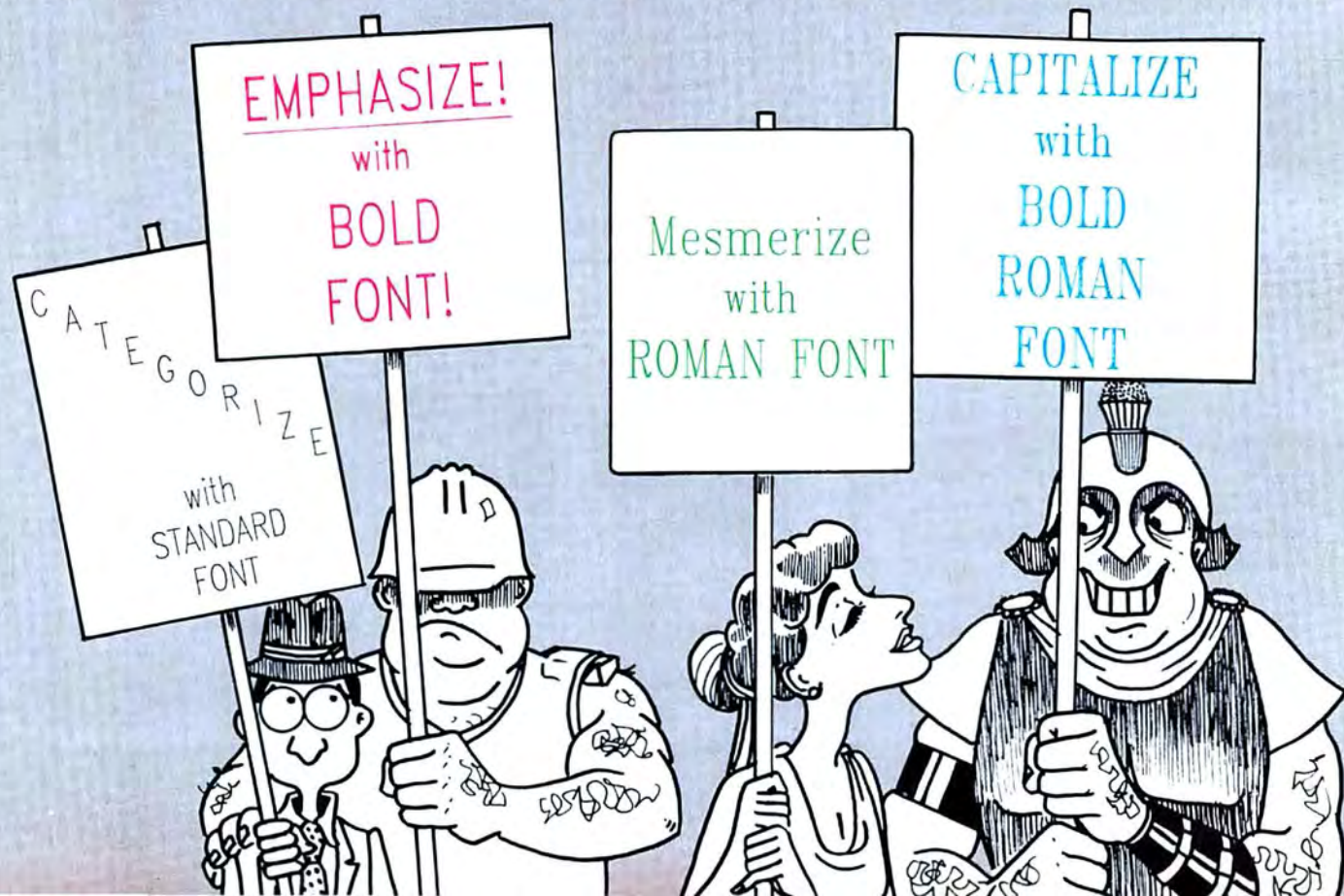
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An updated but unreleased version of *The FinalWord* is said to eliminate both problems. Perhaps this new version will also offer more detailed documentation. Although tutorials and a massive manual are now provided (the installation guide alone is 58 pages), only some of the commands are fully documented, and certain procedures are obscure. Learning to use *The FinalWord* with its many menus and buffers takes

some practice. As things stand now, if you want to produce documents with footnotes of more than a few sentences quickly and easily, *The FinalWord* is not for you.

## WordPerfect

Satellite Software International's *WordPerfect* produces only true footnotes (those at the bottom of each page), and it has few options for

changing the footnote format. However, it produces those simple footnotes with elegance and ease. *WordPerfect* comes with a rather skimpy manual, a template, and stick-on key covers for your keyboard. You probably won't need this kind of help, however, because it is the easiest word processing program to learn and use that I've encountered. Its only problem is the few printers covered in the installation

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## ● Review

routine. My printer, a C-Itoh F-10, was not among those listed, but I installed it as a Diablo letter quality printer, and it worked fine.

*WordPerfect* is unusual in that it allows you to create a file before naming it. Starting up the program is also done in a slightly unusual way. If you have two floppy drives, you must first change your default drive using DOS to drive B. Then put *WordPerfect* in drive A and a blank, formatted disk in drive B. Type A:WP and the program appears with a status line. A similar procedure, described in the manual, is used for hard disks.

### Playing Your Options

*WordPerfect* uses a function key command for footnote operations. When you reach the point in the text where you want to enter a footnote call, press <Alt>-<F10> and a three-choice menu appears on the status line. To create a new footnote, choose option 1. The screen goes blank so that you can enter the text of the note. No special commands or preceding characters are necessary. When you're done, press <Alt>-<=>, the *WordPerfect* Exit/Restart command, to return to your text. In the text a call number appears in the appropriate place, but the footnote text isn't displayed. Option 2 on the footnote menu allows you to edit the text of a footnote by entering the number of the note. Option 3 allows you to set the number to be assigned to the next footnote (the initial default is 1), with notes and calls numbered consecutively thereafter.

Although *WordPerfect* is generally a screen-oriented editor, it does not include an option previewing formatted pages with footnotes before printing. Pressing <Shift>-<F2> displays the function codes that *WordPerfect* has inserted in the docu-

ment and the text of any footnotes, but only about six lines are displayed at a time. Once you're familiar with the function codes, seeing the codes is helpful, but not as desirable as seeing a formatted preview.

Printing with *WordPerfect* is remarkably easy. You don't need to save a file first; just press <Ctrl>-<PrtSc>. The program asks if you want the whole document printed or

---

*WordPerfect* has no problem splitting footnotes between pages as long as the text of one note does not exceed one full page.

---

just the page currently displayed. You're also given an opportunity to change the printing attributes using a menu that displays the current settings. When the program prints it leaves the document on screen. *WordPerfect's* built-in print spooler enables the program to queue printing jobs, edit while printing, and print files without first displaying them.

### Printing Footnotes

*WordPerfect* prints all footnotes in the same basic style. If your printer supports superscripting, the calls are superscripted; otherwise, they appear in-line. The footnotes themselves are placed below a ruler line, similar to the one used by the other programs, and they begin with a numeral (superscripted if desired) followed immediately by text. If you create the footnotes with blank spaces at the beginning, the printed notes are indented by the same number of characters. *WordPerfect* has no problem splitting footnotes between pages as long as the text of one note does not exceed one full page.

*WordPerfect* automatically repositions and rennumbers footnotes and calls if you delete, insert, or move footnoted text. The correct numbers always appear when you print, but they don't change on the screen unless you scroll past the affected areas or refresh the screen by pressing <Shift>-<F1>. As in *The FinalWord*, *WordPerfect* normally single spaces all footnotes, regardless of the line spacing of the main text. However, you can adjust this by changing the page attributes (with a menu called up by pressing <Shift>-<F7>) after you have pressed the footnote function key, but before you have typed in the first note. Similarly, the program normally uses as many line spaces between footnotes as it does within them, but you can vary this by pressing <Enter> once for each extra space you want inserted between the notes.

*WordPerfect* is a delight to use. Because most of the program and a copy of your current file are kept in RAM, there is very little disk activity. Unlike most word processing programs written for other machines and adapted for the PC, *WordPerfect* displays special printing styles on screen: boldfaced text appears highlighted, and underlined text appears underlined. Formats and other parameters are easily changed from menus that display current choices, and the newest version of the program allows you to change the start-up defaults and edit simultaneously but not view two documents. Powerful file-merging procedures and a Math mode (a simplified spreadsheet program) are built into *WordPerfect*, and an optional spelling checker is available.

After weeks of writing footnotes using various programs, I've developed my own preferences. The most important factors to consider when choosing a program, however, are what programs you already have and what you will need to get the job



done. If you've already invested time and money in *WordStar*, *Footnote* is a relatively inexpensive and effective tool for handling footnotes. If you're starting from scratch, both *The FinalWord* and *WordPerfect* are more than adequate. The choice depends on how much memory your computer has, what special features you want, and the degree to which the program's footnoting styles and limits meet your particular requirements. ●

*Joshua B. Freeman is a professional historian.*

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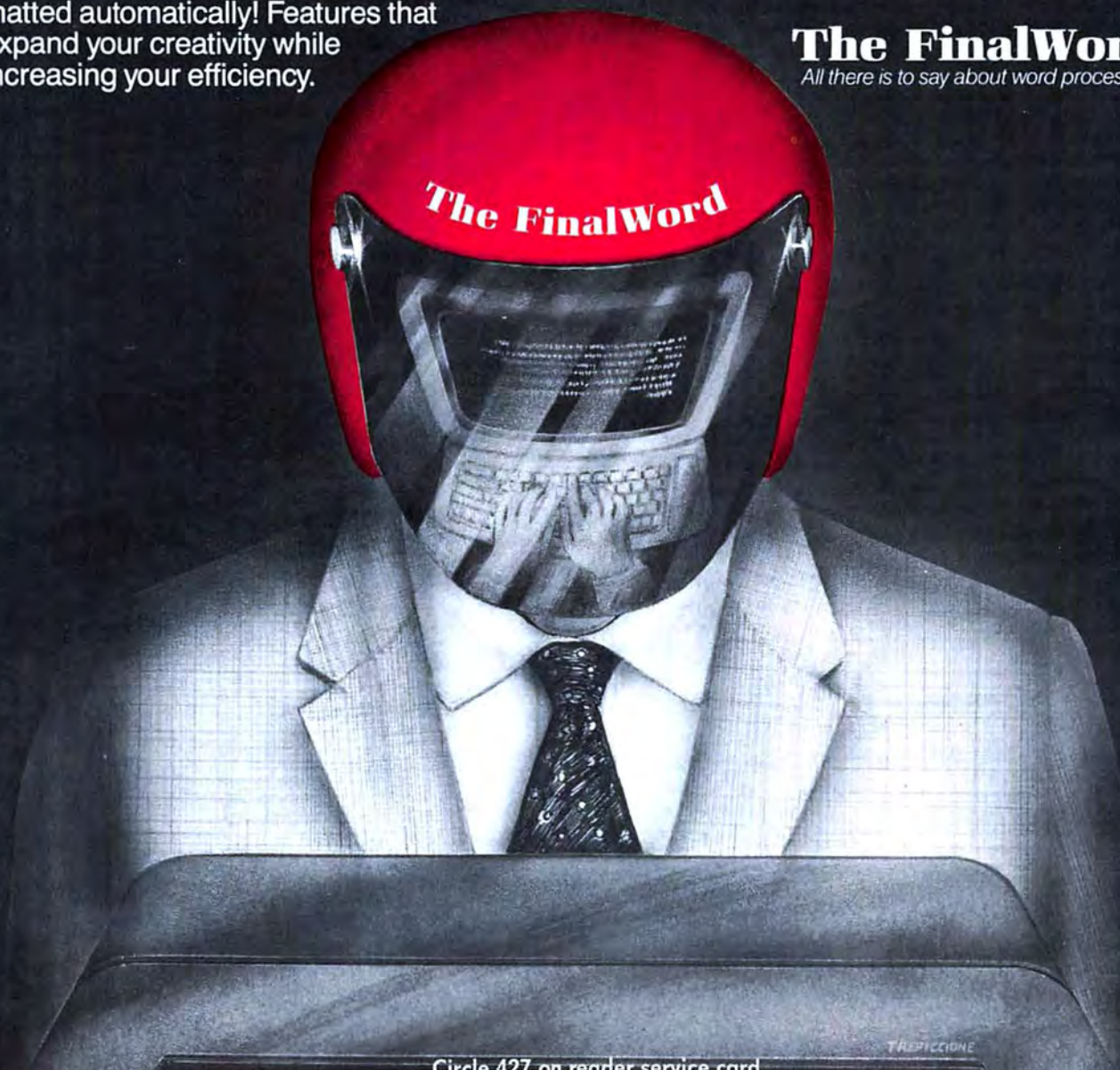
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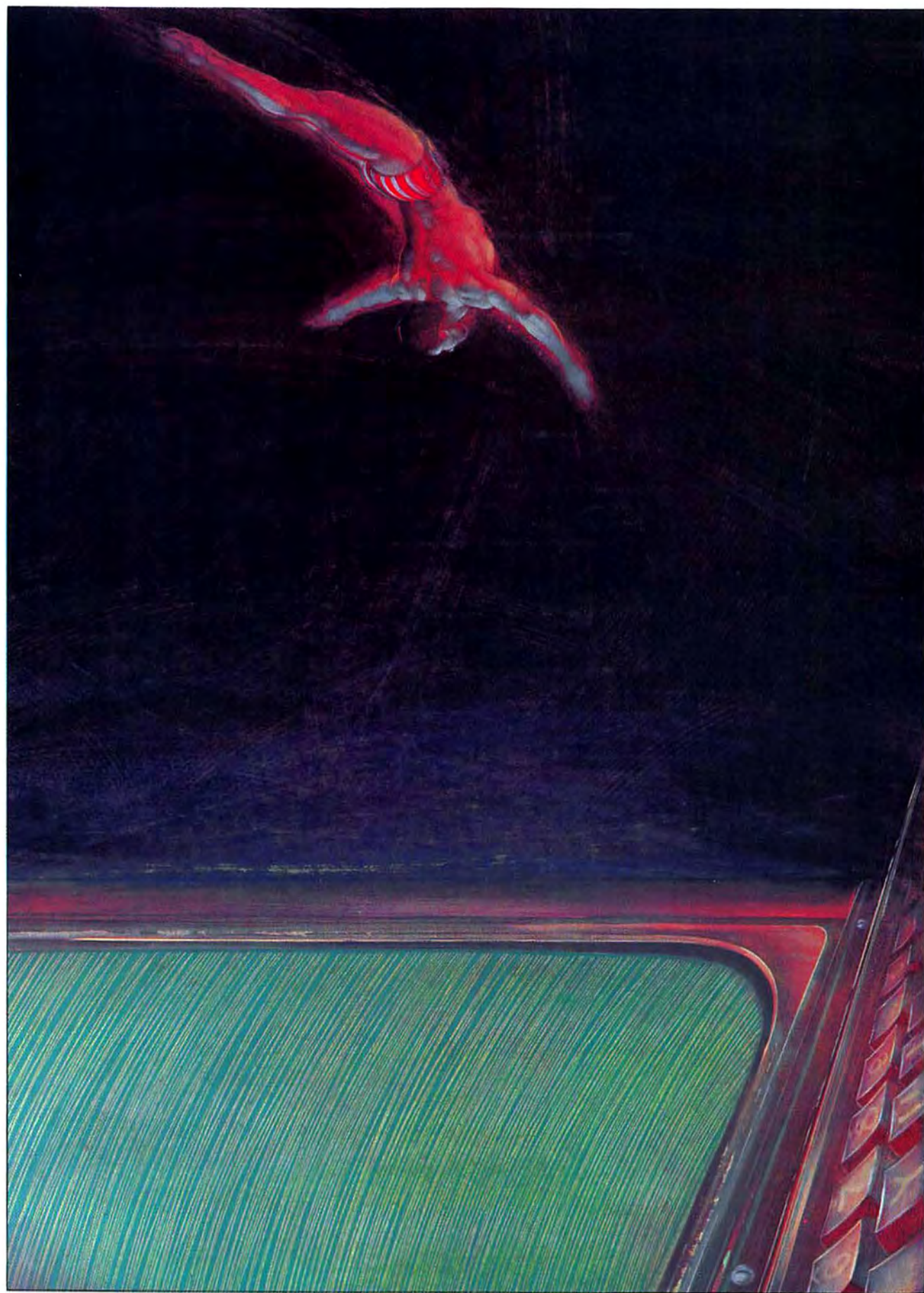
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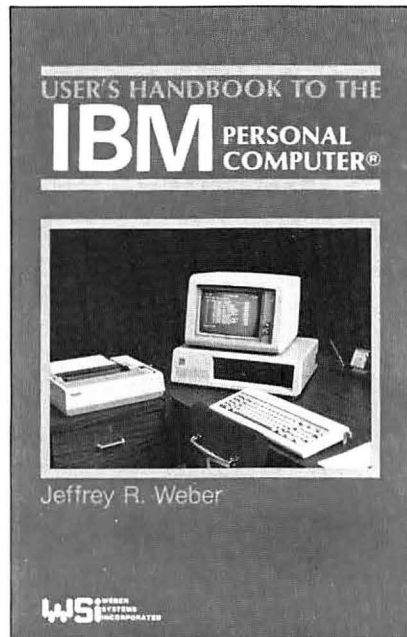
Richard Cook

You've just bought an IBM Personal Computer. Great! But then you realize that you can't even explain the difference between a silicon chip and a buffalo chip let alone write a program in BASIC. The three books reviewed here, *User's Handbook to the IBM Personal Computer*, *IBM Personal Computer: An Introduction to Programming and Applications*, and *The IBM/PC Guide*, can help you recover from new-owner blues and lay firm foundations for your computer education.

## User's Handbook

The *User's Handbook to the IBM Personal Computer* is compact and concise. The information is presented in a straightforward manner with clear definitions. The *User's Handbook* also has many illustrations that help you understand the text.

In Chapter 1 author Jeffrey R. Weber defines and describes the hardware and software of the IBM PC system. In Chapter 2 he explains how to install and connect the various PC components. (You might find it comforting to know that four pages and ten illustrations in this chapter show you how to unpack the system unit, keyboard, monitor, and printer



from the packing cartons.) Chapter 3 is devoted to troubleshooting and Chapter 4 to operating the computer. Chapters 5 through 9 cover DOS and BASIC functions and commands.

The *User's Handbook* is more like a dictionary or encyclopedia than a tutorial or textbook, so it is a good reference book to have nearby when you want a quick answer to a problem or procedural question. The book has a detailed index and four appendices, two on the ASCII character codes and one each on DOS and BASIC error messages.

The *User's Handbook* contains the essential information needed to get started with your PC; however, since it is more a reference manual than a tutorial, information will not jump out of the pages, grab you by the hands, and lead you down the PC path. You will have to do more reading, particularly in the areas of programming in BASIC and using DOS, so don't spend your \$13.95 for the *User's Handbook* under the assumption that it's the only introductory manual you will need. However, the *User's Handbook* is a fine compendium of useful information that you will appreciate having in your library.

## IBM Personal Computer

*IBM Personal Computer: An Introduction to Programming and Applications* is a tutorial text that not only explains terms and concepts and introduces you to BASIC programming, but also repeatedly tests you on what you are learning. The tests, which are designed to be performed on the PC, give you hands-on practice and make you think carefully about everything you read.



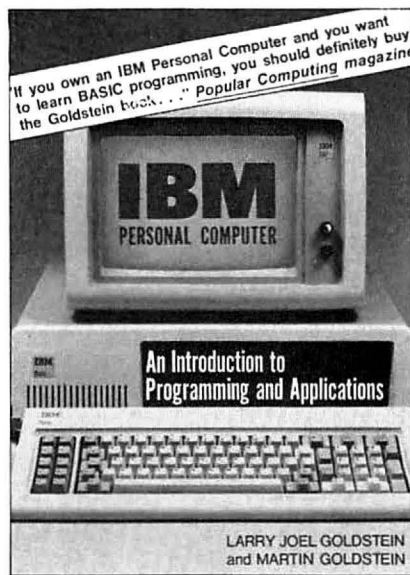
## ● Review

Authors Larry Joel Goldstein and Martin Goldstein divide their book into 14 chapters, which are further divided into sections. At the beginning of each section a concept is introduced and explained, then a "Test Your Understanding" problem is presented. Next, the book gives one or two examples that clearly illustrate the section's concepts. Finally, homework exercises are provided that give you additional problem-solving practice. Answers to the "Test Your Understanding" problems are given at the end of each section.

As you might guess from its title, the book is divided into two parts: an introduction to BASIC programming and an explanation and exploration of the types of things you can do with the PC. The Goldsteins state in their preface: "The beginner should gain, in addition to learning BASIC programming, an overview of as many real-life applications as possible." This is a good book to purchase if you want to learn about computer graphics (Chapters 6, 11, and 13), word processing (Chapter 7), games (Chapter 8), or computer-generated simulations (Chapter 10). But if you need a book focused solely on programming, this is not the one.

Although it is clearly written, the *IBM Personal Computer* will not pamper you during your quest for computer information. The authors assume that you have enough confidence and motivation to work your way through the material with a minimum of illustrations and cheerful encouragement.

Key words, such as BASIC commands, parts of the computer system, and computer terms not familiar to newcomers, are printed in boldface throughout the book. Programming dos, don'ts, and hints appear where needed, and an especially helpful beginner's programming checklist is included. The authors provide many



programs to stimulate the reader's interest; you can use them to balance your checkbook, play computer roulette and tic-tac-toe, or create a telephone directory. A simple word processing program is also included.

The *IBM Personal Computer* is a valuable book for anyone who wants to know what the PC can do and how. After reading this book you should be able to recognize useful applications, design simple programs for those applications, and know where your understanding is weak as well as where to go for additional information.

## The IBM/PC Guide

Who says that reading a computer book can't be fun? Not James E. Kelley, Jr., whose book will have you laughing as you learn.

*The IBM/PC Guide* is written for people who are tired of plowing through dry, humorless textbooks in which the most exciting thing is an exclamation mark. Kelley enjoys a good pun, or even a bad one, as evidenced by some of the chapter and section titles: Strings and Related Knotty Issues, Right Justification Isn't a Moral Issue, Filespecs Aren't Safety Glasses, Don't Wait! Iterate!

This is the book to buy if you want to learn about computers and programming but feel the computer revolution has left you hopelessly behind and out-of-date. *The IBM/PC Guide* is perhaps the friendliest, most approachable introductory book about personal computers.

Kelley seems to be genuinely excited about his subject. His excitement is infectious, and his positive approach and enthusiasm are very reassuring as he leads you through the jungle of RAM and ROM, floppy disks, DOS, and BASIC.

Of course, humor and a grin will take you only so far; you will still need to learn the material, and this is where *The IBM/PC Guide* excels. Kelley explains each operation and programming point completely before moving on to the next. He will deliberately instruct you to make an error so that you can learn from it and shake your natural beginner's fear of making mistakes. Even when you err without Kelley's help, he always seems to have anticipated your problem and provides clues to the solution.

As an important part of his learning program, Kelley advises that you refer to the IBM PC reference manuals, telling you exactly where to look in them for additional informa-



tion about specific subjects. He suggests keeping a notebook to hold computer printouts, notes, and observations.

Attached to the inside front cover of the book is a learning aid called the Basic Utilities Disk, which contains demonstration programs and sample data files. This disk saves you the time-consuming job of typing the demonstration programs into your PC. Many of these programs can be enhanced and expanded as your programming prowess improves.

Each of the book's 11 chapters is divided into sections and subsections. Reading suggestions, chapter reviews, and projects or tests are found at the end of each chapter. Kelley strongly emphasizes the importance of understanding what you read and repeatedly tests, questions, and challenges you as you read his book. The benefits are obvious: you must work and think through every page. If you stick to his program you are bound to learn your lessons well.

*The IBM/PC Guide* is one of the best introductory books available. I recommend that you buy Kelley's book the same day you buy your PC. ●

#### *User's Handbook to the IBM Personal Computer*

Jeffrey R. Weber

Weber Systems Inc., Cleveland, 1982  
294 pages; \$13.95

#### *IBM Personal Computer: An Intro- duction to Programming and Applications*

Larry Joel Goldstein and Martin  
Goldstein

Robert J. Brady Co./Prentice-Hall,  
Bowie, Maryland, 1982  
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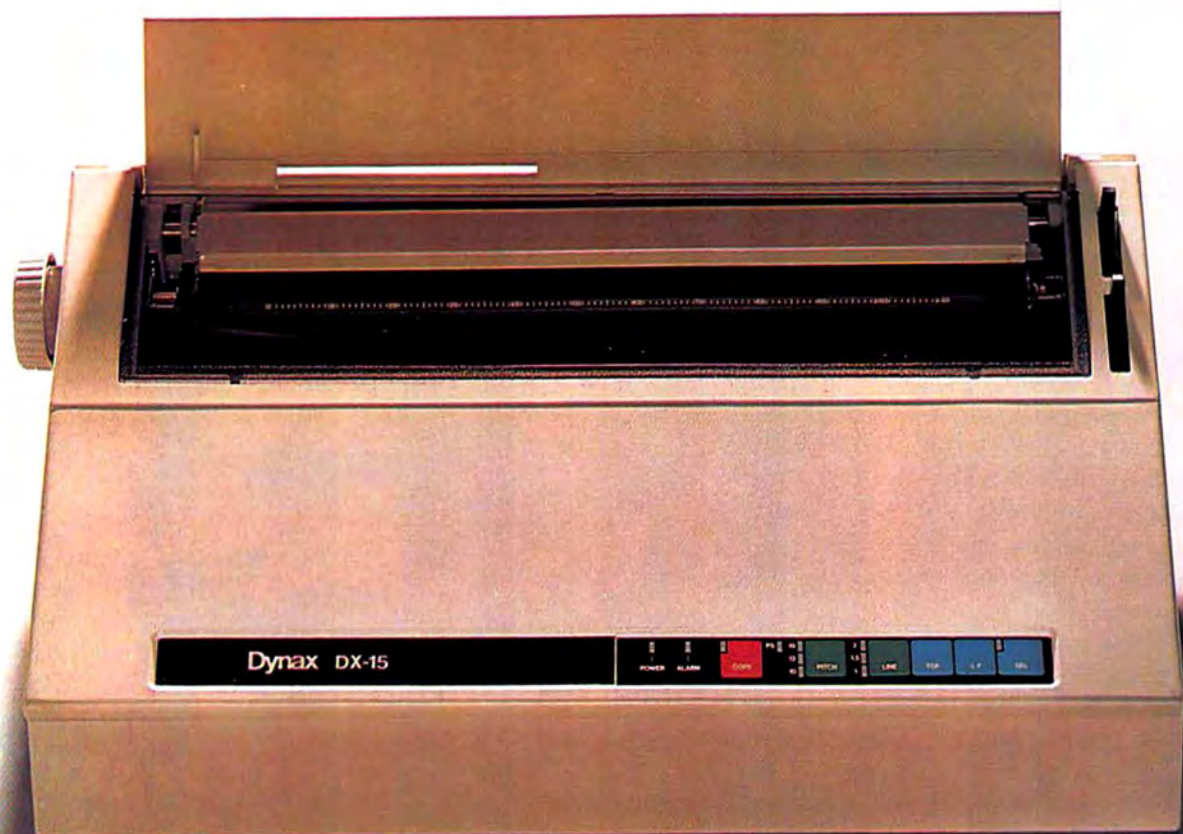
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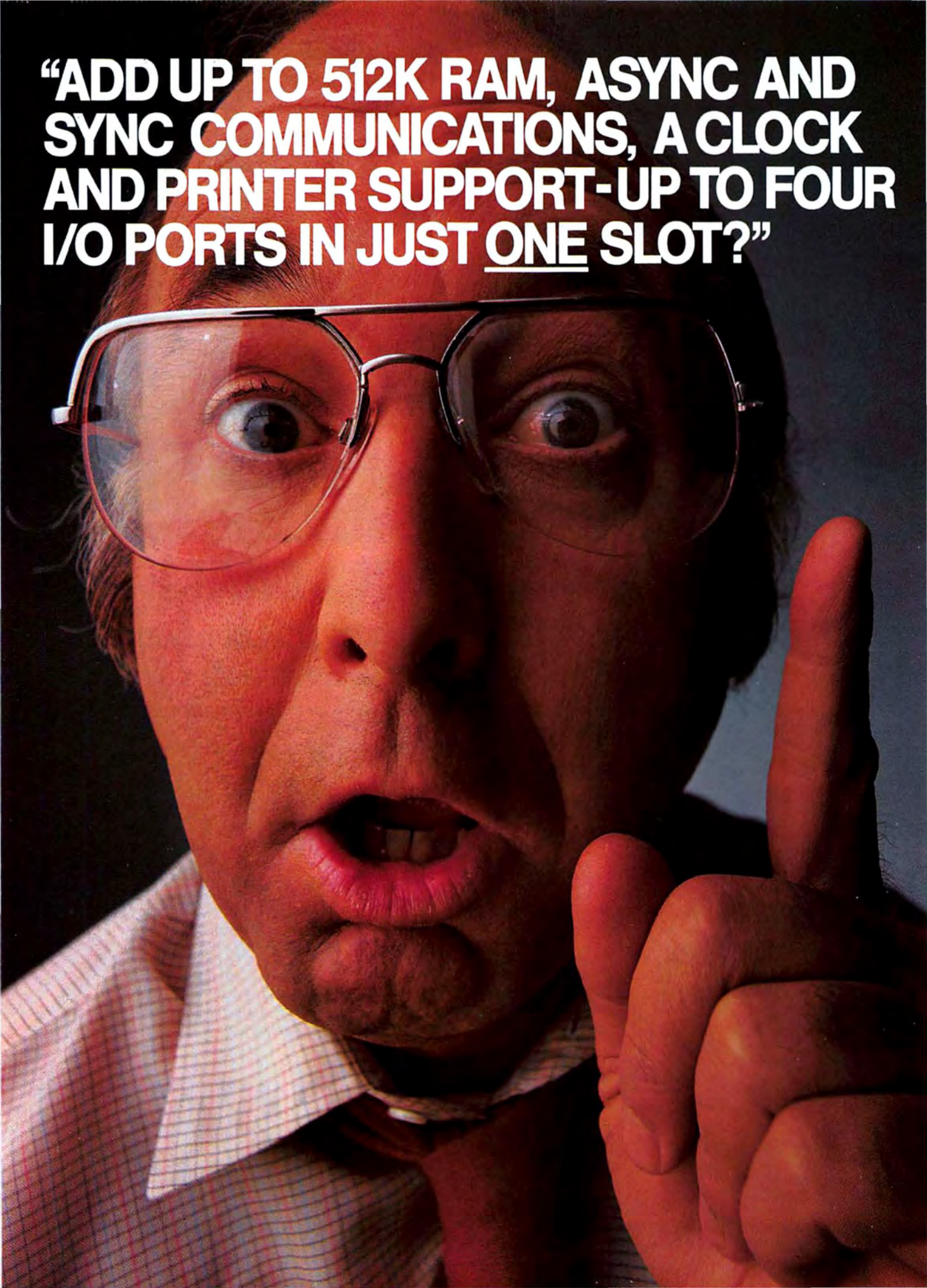
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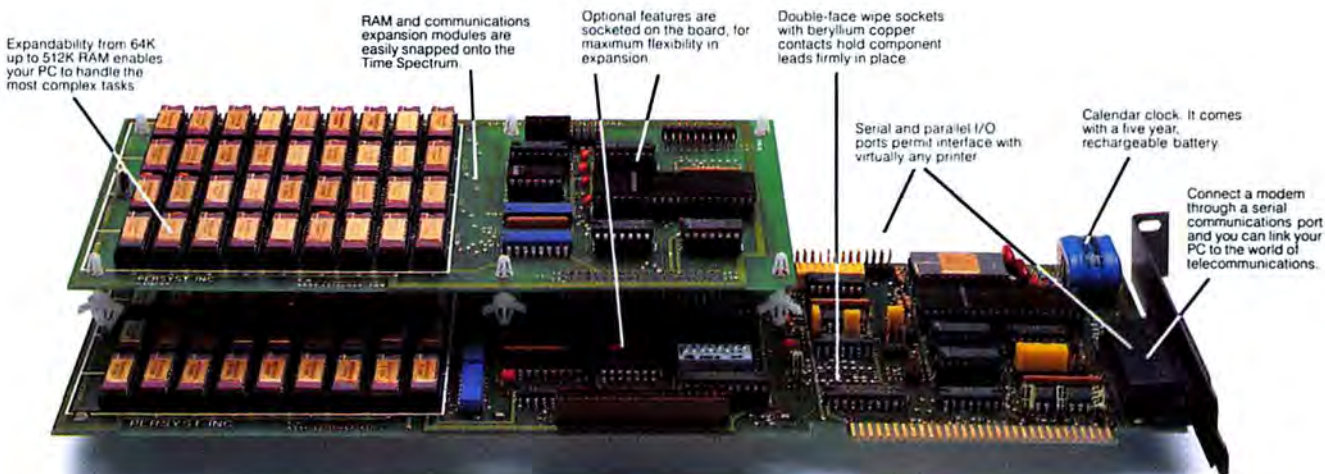
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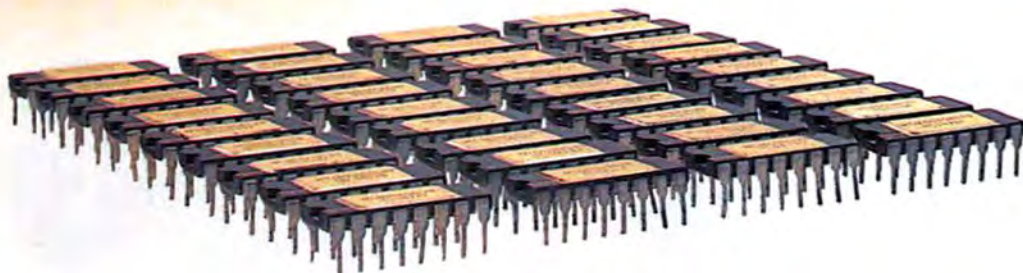
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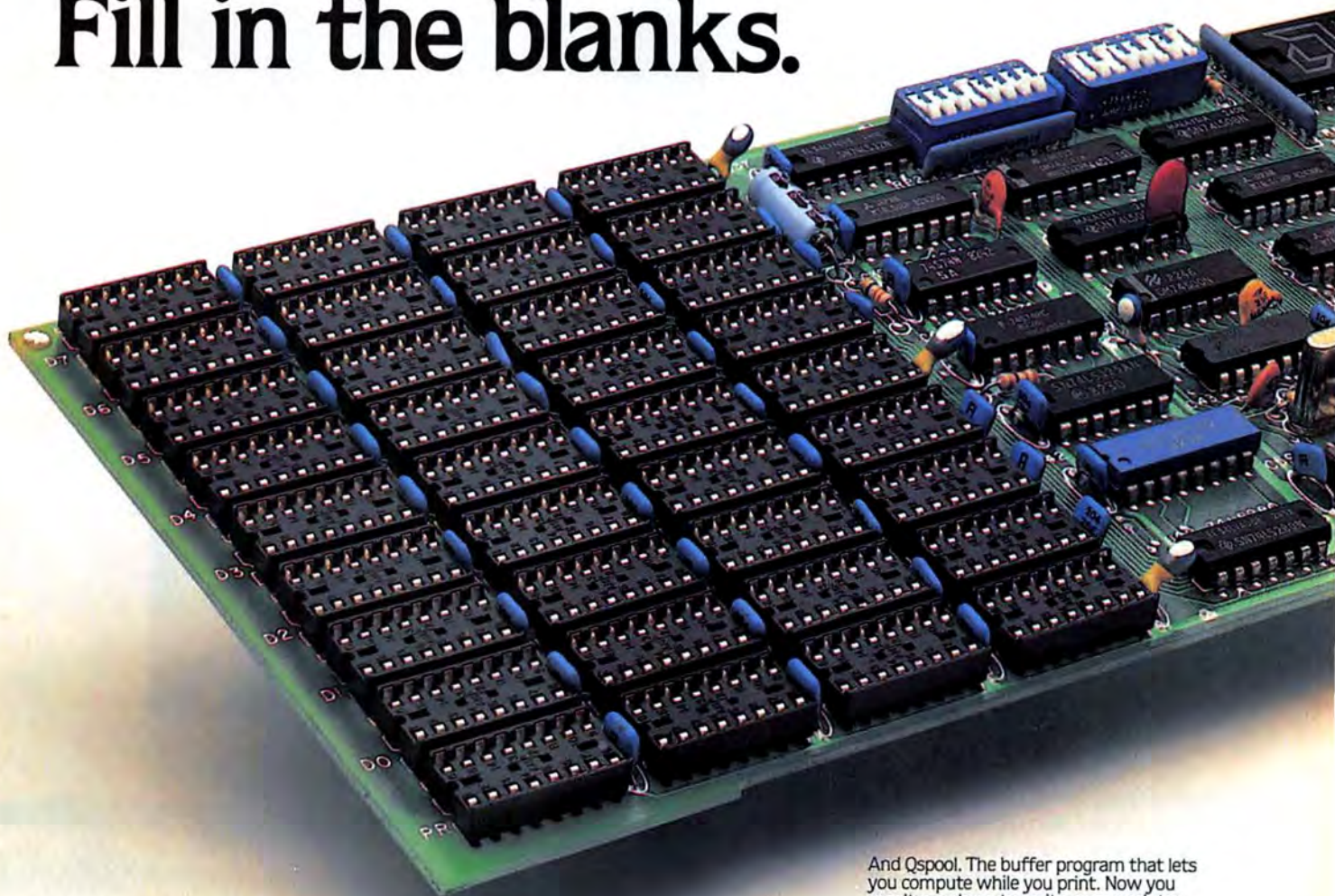
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# Going for the Record

David Jenkins

*Managing data has traditionally been the preserve of the professional programmer. But anyone who owns a computer needs to manage data, be it invoices or a Christmas card list. Indexing is the method that makes the madness manageable. Indeed, it is the core of modern data base management.*

Putting information into a computer is easy. Getting it out quickly and in usable form is another matter. As computers have developed more power and speed, the amount of data being stored and manipulated has increased by leaps and bounds.

Computers are good at handling large volumes of repetitive information such as lists, invoices, and payroll records. But data seldom comes in neatly tied bundles. Data entry usually occurs randomly. For example, you may receive bills throughout the month and enter them when it's most convenient. When it comes time to ex-

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Indexing is at the heart of the data base program's ability to give you fingertip access to information.

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tract the information, it doesn't matter how it went in; you need to see it in some specific order—by date paid, alphabetically by vendor, or by zip code.

Taking randomly entered information and putting it in order is usually accomplished by sorting or indexing. Sorting has been used since the dawn of the computer age and is still common on many mainframe computer systems. Indexing, on the other hand, is a relatively new

and rather complex way of dealing with the same problem, but it offers several advantages, particularly for microcomputer applications.

Data base management has been available to professional programmers since the 1960s. In the early days of microcomputing sorting was generally used when you needed information in a different order. It wasn't until 1980 that data base managers—using indexing methods—were able to manage data in a way that was practical for programmers and nonprogrammers alike.

Indexing is a central part of data base management systems used with personal computers. It is at the heart of a data base program's ability to give you fingertip access to information. In fact, without indexing, computing would be very dreary.

## Unsorting Sorting

Finding a single item is a problem when you are dealing with unsorted data. If you want to find a specific person from a random list of names, the computer must look at every record in the file in order of entry, checking each name for a match. This type of sequential search is time consuming, even on a small file of 50 to 100 names.

Sorting is a matter of putting information into numerical or alphabetical order (see Figure 1). A sorted file offers two major advantages: you can print or display information in the new sorted order, and you can find a particular record quickly.

A sort relies on a *key*, a field that defines the search. If a file of names and addresses is sorted with the first name as the key, the sort program takes the records in the file and places them into a new file, with the records shuffled into alphabetical order by first name. For example, the first record in a sorted file might belong to Alan



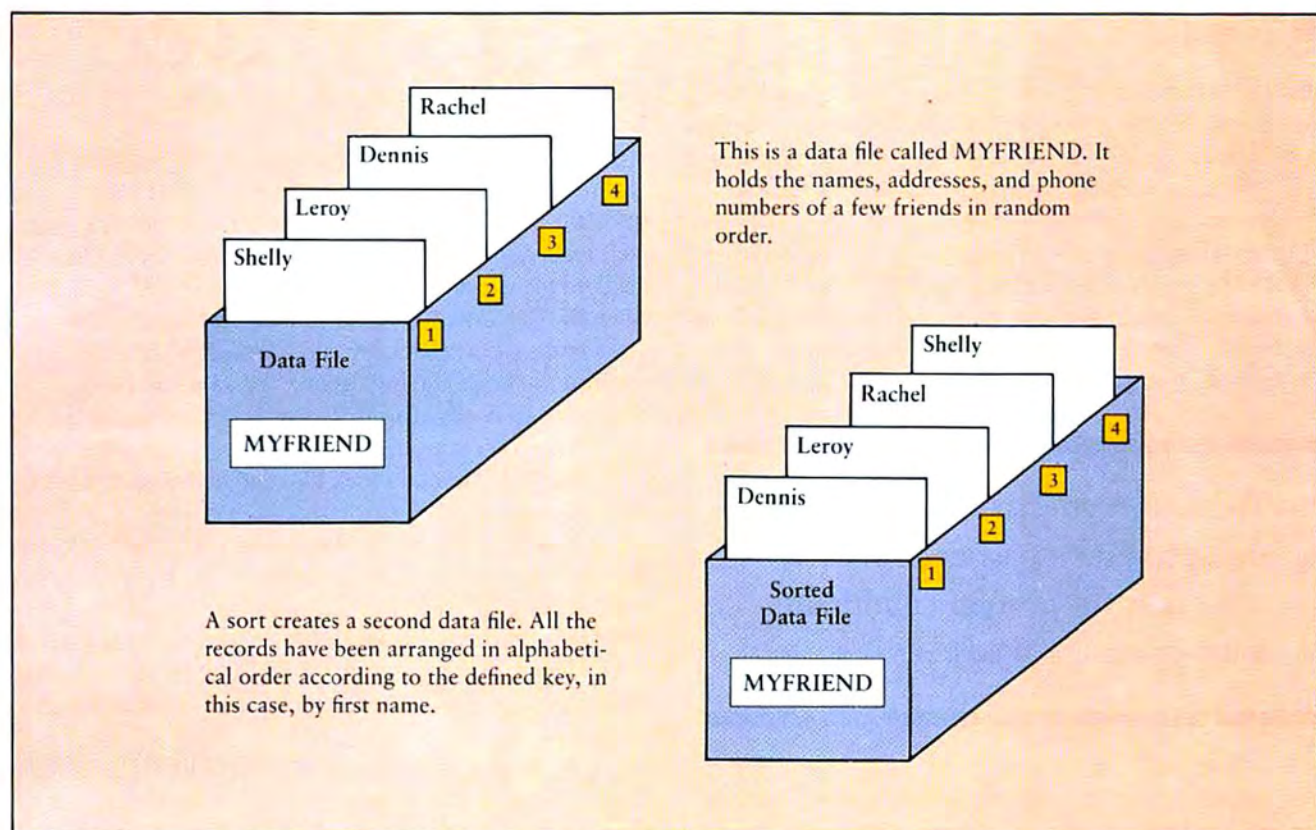


Figure 1: A sort reorders the records in a file according to a key.

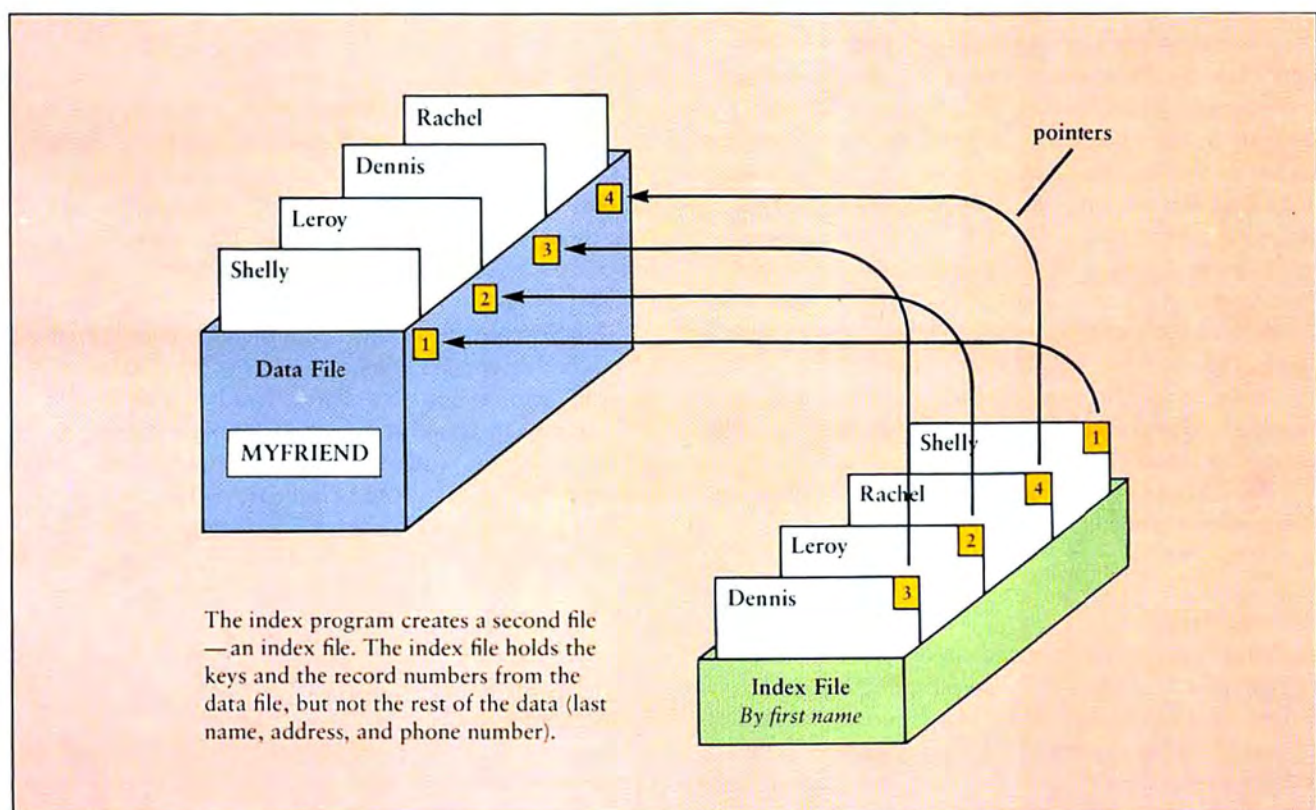


Figure 2: Creating an index file



## ● Hands On

and the last record to Zachary. Alan's address would move into the first record with Alan; Zachary's address would be in the last record. The computer can then print a list in order, starting at the beginning of the file and reading each record in sequence.

Searching a sorted file can be done very quickly. The classic method is the binary search. Instead of checking every record sequentially, the program looks at the middle record and determines whether the key you are looking for is in the upper or lower half of the file.

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To be time effective, searching an index to find a particular record must take the absolute minimum number of disk reads.

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You can then go to the midpoint of the half in which the key resides. In this way the remaining part of the file is divided into halves. A binary search works only when the information is ordered; otherwise the middle record tells you nothing about its neighbors.

In practice, managing files by sorting is cumbersome. Adding a new record to a sorted file is a tedious and time-consuming process. Every record has to step aside as the new data elbows its way into line. Each time data is needed in a different order, you must also ensure that the disk has enough room to store the data. Disk swapping is often necessary. When is sorting appropriate? If a data file rarely changes, sorting is the proper technique. For instance, if a city council is elected and holds office for a year, you might enter all the names randomly, run the sort, and delete the unsorted file.

But data files are seldom static; a list of friends or business acquaintances frequently grows, and a file of invoices in a repair shop is always changing as new repairs come in and old ones are completed. A more flexible, efficient tool is needed.

### Indexing Strategy

Indexing evolved as a means of coping with the constant changes in a data base. In its simplest form, an index consists of a key and a pointer (see Figure 2). Instead of moving the data accompanying the key on which the order is based, the data in the file is stored randomly. An index file is created that matches each record in the data file. But this index file consists only of a key (for exam-

ple, Dennis) and a pointer to the associated data (Dennis' address, phone number, etc.). The pointer marks for the computer where each piece of information can be found.

When you use a data management program such as *dBASE II*, you first define the data file (e.g., `CREATE MYFRIEND` as in Figure 1) and describe the composition of each record (name, address, and phone number). Once the data file is defined, you can create index files (e.g., `INDEX ON FIRSTNAME TO FIRSTNDX`, in which `FIRSTNDX` is the name of the index file and `FIRSTNAME` is the name of the key). Having defined the data and index files, you can notify *dBASE II* that you want to use the data file in conjunction with the index file (`USE MYFRIEND INDEX FIRSTNDX`). Several index files can be associated with the same data file.

Finding the phone number of Rachel in the *MYFRIEND* files involves two commands to *dBASE II*. The first command, `Find Rachel`, searches the index file, finds Rachel, reads the pointer associated with Rachel, and positions *MYFRIEND* at the appropriate record. The second command, `Display Phonenum`, quickly extracts and displays the number.

Each time you add a record to *MYFRIEND*, *dBASE II* adds that key and its pointer to the index file. If you change a first name (e.g., Robert to Bob), the program automatically changes the key in the index file and repositions it.

### Vive la Difference

The difference between sorting and indexing is apparent to a data base user when a record is added to an already-ordered list. If the only tool available is a sort program, the entire list must be re-sorted. With indexing, each time there is a change in the file, the program adjusts the index; you need to make only an incremental change to the file (see Figure 3).

Finding your place quickly in the data base is important, whether you are entering or retrieving data. The limiting factor is disk access time. Reading data from a disk involves mechanical motion (a spinning disk, a moving head), so that type of operation is always slower than electronic transfers in RAM. To be time effective, searching an index to find a particular record must take the absolute minimum number of disk reads. Attaining this level of efficiency involves using indexes in a special way.

### B-Tree Structures

A B-tree is so named because a search for a key is similar to climbing a tree to reach a particular leaf. Bear in mind that you never go backward. Once you've chosen a branch, you need to consider only its sub-branches. Computer scientists traditionally draw B-trees upside down, as in Figure 4.



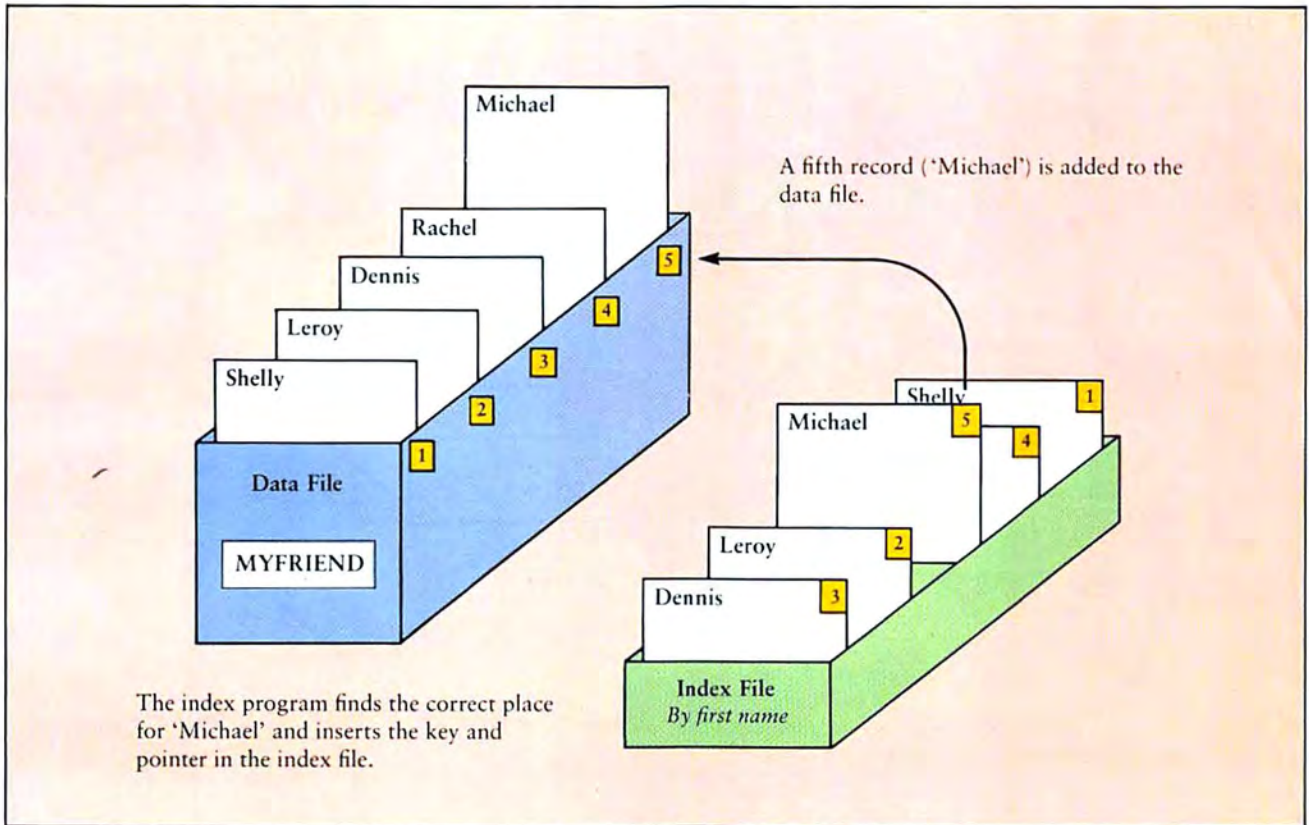


Figure 3: An indexing system can insert a new record without re-sorting the file.

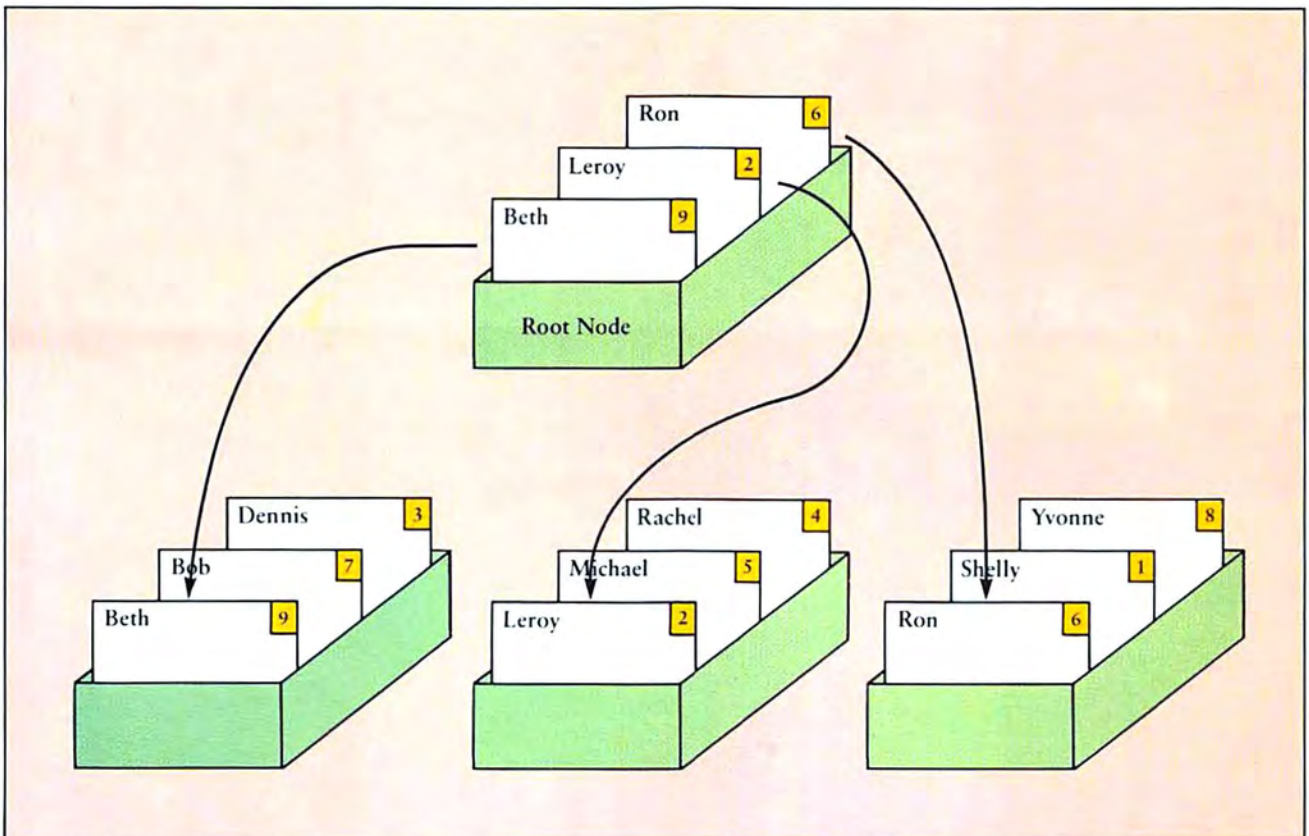


Figure 4: Each level of the B-tree is an index into the next level. Thus, the file is rapidly subdivided into branches.



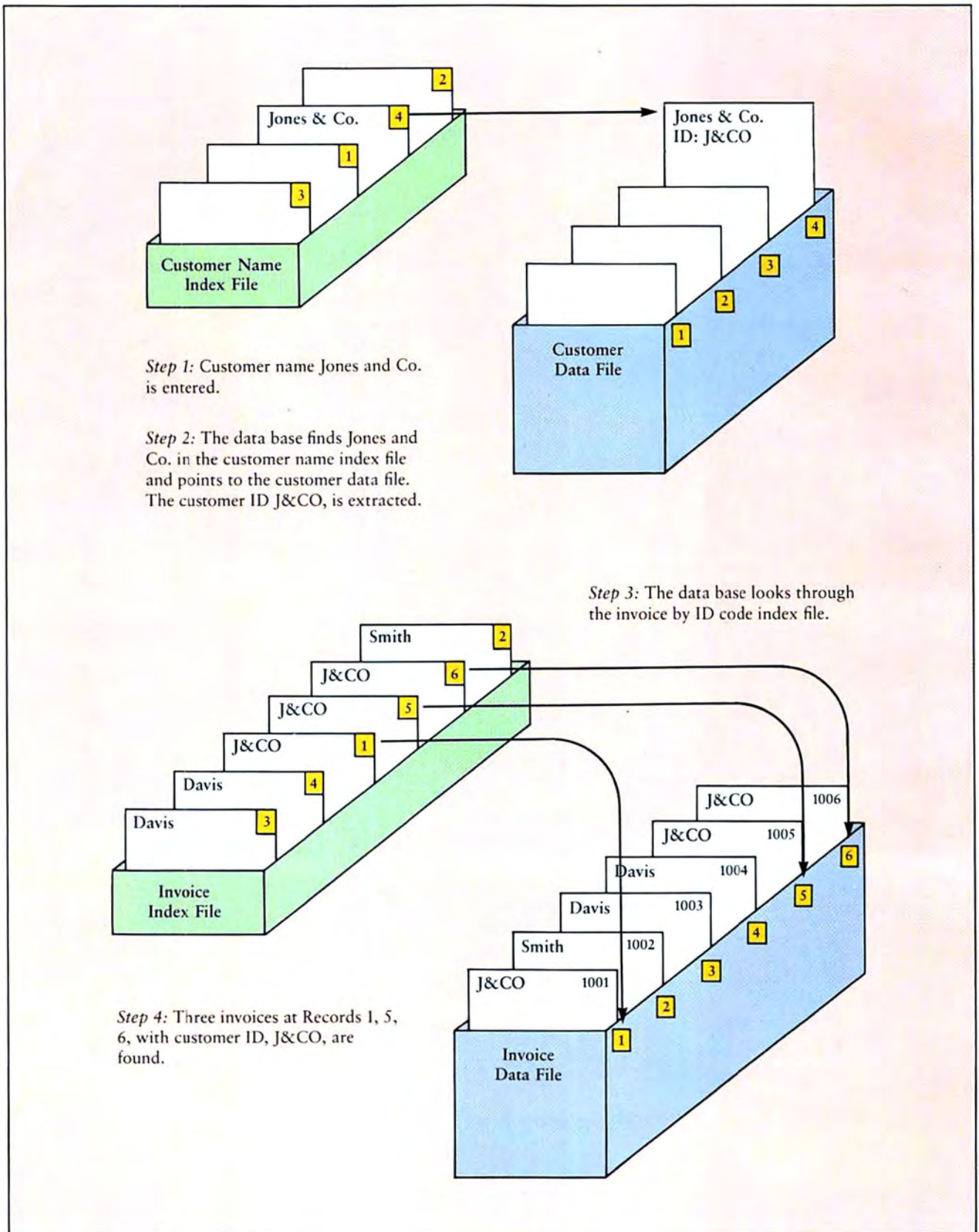


Figure 5: A customer invoice cross-reference



Information is held sequentially in a B-tree. In addition, the B-tree branches the levels of indexing so that any part of the data can be found quickly. In Figure 4 two levels of indexing are illustrated. Each level divides its portion of the data into three parts. Each junction or branching point is called a *node*. The top level is the root node, and every search has to pass through it. The root node in Figure 4 has three keys: Beth, Leroy, and Ron. Everything between Beth and Leroy is pointed to by the lower-left node, and everything between Leroy and Ron is in the middle node. Ron and everything above it is in the rightmost node.

Suppose you ask the indexing program to find the information on Michael. The program first looks at the root node. Since Michael is between Leroy and Ron alphabetically, the program need only examine the middle node. In this case, the tree has two levels, and Michael is found in the next node examined. If each node contained 5 keys, the root node would subdivide the index into fifths, the second level into 25ths, and so on. You could find 1 key out of 125 by examining only three nodes. If each node contained 20 keys, in four levels you could find 1 key in 20<sup>4</sup>, or 160,000.

The important point to remember about B-trees is that indexes are subdivided into other indexes, which allows you to cut through a file rapidly. Fast access to any key depends on the tree being in balance. As keys are added the index grows; the B-tree nodes fill up. The B-tree splits a full node, creating two nodes half full. Each of those nodes can then grow until they are full. The tree will continue to grow a new level to accommodate the extra keys. (With 10 keys to a node, 1000 keys are stored in three levels.) Indexing is a complex beast, and writing an indexing program is more like lion taming than walking the dog.

### Managing the Unmanageable

Indexing has several important benefits. Data is maintained in several orders simultaneously. A mailing list of friends, for example, can be ordered by name and city. But more importantly, a data management program uses indexing to cross-reference files. This capability is what makes a data base manageable.

Suppose you want to print a list of all invoices for Jones & Co. (see Figure 5). Customer information is in one file and invoices in another, with each file having an index file relating to it. The program first looks at the customer file through the customer index by name. This leads to the record with all the information on Jones & Co. In particular, it gives the customer identification code for the company, J&CO. The data base switches to the invoice file indexed by customer identification code and searches for the first occurrence of J&CO. This procedure points to record #1 : invoice 1001. The program

returns to the invoice index file, looks at the next key (also J&CO), and finds record #5 : invoice 1005. The following record leads to invoice 1006. The next key is not J&CO, so the search stops. The program knows that there are no other invoices for J&CO because the invoice file is ordered and all J&CO invoices occur together in the invoice index file.

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Indexing is a complex beast, and  
writing an indexing program is  
more like lion taming than  
walking the dog.

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### Changing the Balance

Indexing on a personal computer gives you the ability to find information fast. The personal computer is more than adequate for a great many data base needs, whether finding one customer from a list of 1000, maintaining a mailing list of 200 people in name and zip code order, or displaying all checks according to the date paid.

The advantage of indexing isn't simply that faster is better. The balance between you and the computer changes. The computer works on your terms. Changing information in the data base or retrieving it does not require sitting through a lengthy sort program. Requests to the data base are answered quickly, and getting to the information you want doesn't require a command of some obscure computer syntax. You decide what information is entered and how you want to extract it by the keys you define. The computer becomes personal, working in real time, bending to your way of doing things.

Granted, not all data management problems are resolved so quickly and easily, but many are. It's significant that the three most popular software products in the personal computer market (word processing, spreadsheet, and data base programs) all work in real time, so that the user is in control of the computer. After all, isn't that what personal computers are all about? ●

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*David Jenkins is a computer consultant based in Berkeley, California, who specializes in dBASE II applications. He currently directs several programming projects for PC World and is writing a series of dBASE II utility packages for future publication.*



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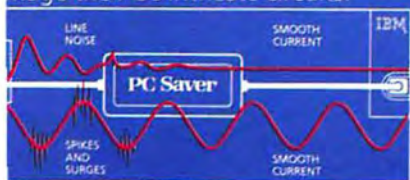
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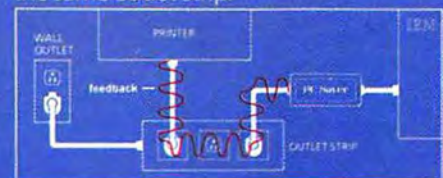


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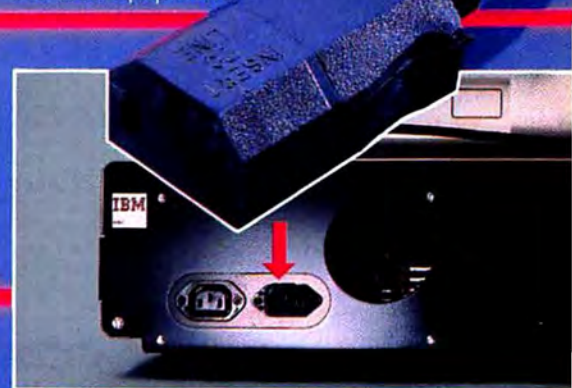
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# Smartmodem 450

*How to make your Hayes Smartmodem 300  
run 50 percent faster*

*Larry Jordan*

Although Hayes Microcomputer Products does not advertise it and IBM BASIC does not directly support it, the Hayes Smartmodem 300 (or a Smartmodem 1200 running in the 300 bps mode) can operate at 450 bps. Most people cannot read a terminal display much faster than 450 bps (approximately 450 words per

minute) anyway. So the only real advantage of 1200 bps over 300 bps is for file transfers. If most of your communications is with local bulletin boards or directly with other PC owners, this 50 percent increase in data throughput might be enough to keep you from upgrading from a 300 bps to a 1200 bps modem.

The standard data transfer rates used with serial communications are discrete values: 110, 150, 300, 600, and 1200 bps. The 450 bps is not one of those standard discrete values and is not one of the "valid speeds" specified in the IBM BASIC manual for the OPEN "COM command. This nonstandard rate of 450 can be easily





```

OUT &H3FB,(INP(&H3FB) OR &H80) 'Enable divisor registers.
OUT &H3F8,0 'Low order byte of X'0100'
OUT &H3F9,1 'High order byte of X'0100'
OUT &H3FB,(INP(&H3FB) AND &H7F) 'Disable divisor registers.

```

#### Listing 1

```

200 'PC-TALK.III 450 Baud merge file by Dorn W. Stickle of
    Amarillo,TX
425 CLOSE #1:OPEN COMM$ AS #1:PRINT #1,MODMINIT$;:IF BAU450 THEN
    GOSUB 11000
5026 PRINT"    5 - 450,E,7,1 (text)        6 - 450,N,8,1
    (binary)
5055 IF Q$="F" THEN PRINT Q$:GOSUB 5815:PRINT:PRINT"Parameters
    reset to: ";:DORN=0:GOSUB 5100:GOTO 5095
5060 DORN=0:Q=VAL(Q$):IF Q<1 OR Q>6 THEN BEEP:GOTO 5045 ELSE
    PRINT Q
5081 IF Q=6 THEN PAR$="N":DTA$="8
5086 IF Q=5 OR Q=6 THEN GOSUB 11000
5090 PRINT:PRINT"New parameters are: ";:GOSUB 5100
5095 PRINT GO$:GOSUB 2800:GOTO 515
5100 COLOR BG,FG:IF DORN=1 THEN 5101 ELSE PRINT
    MID$(COMM$,6,10);:COLOR FG,BG:PRINT:PRINT:GOTO 5105
5101 PRINT "450,"+PAR$+", "+DTA$+", "+STP$;:COLOR FG,BG:PRINT:PRIN'
11000 OUT &H3FB,(INP(&H3FB) OR &H80):OUT &H3F8,0:OUT &H3F9,1:OUT
    &H3FB,(INP(&H3FB) AND &H7F):DORN=1:RETURN

```

#### Listing 2: PC-Talk 450 bps merge file

achieved, however, through use of the mysterious BASIC OUT command. The Hayes Smartmodem 300 will respond at that speed, just as it does at 300 bps.

#### How It's Done

A Hayes Smartmodem 300 is capable of receiving commands at any data rate up to 1200 bps. The Smartmodem's microprocessor senses the speed (bps) used with the AT attention command and automatically switches speed to match. The modem will respond to commands at 300, 450, 600, or 1200 bps, or any other speed between 50 and 1200 bps. The Smartmodem 300 will also attempt to transmit data at the same rate it receives the AT command if it is instructed to go into the on-line data mode.

The Smartmodem 300's limit for reasonably accurate data transfer, however, is 450 bps. At 450 the data transfer error rate is acceptable for conversation-mode interaction with another computer, but above 450 bps the error rate is unacceptable. Files can be transferred at 450 bps, but an error-checking protocol such as Xmodem must be used to correct data transfer errors. Files transferred with the Smartmodem and the Xmodem protocol should be as error free at 450 bps as they are at 300 bps.

Once the communications software and the Smartmodem 300 are operating at 450 bps, the next hurdle is to get the two to "talk" to each

other at 450 bps through the serial communications adapter. IBM and most other vendors use the INS8250 LSI chip to control serial communications. This chip is capable of running at any speed from 1 to 19,200 bps (IBM says 50 to 9600 bps, but they are keeping secrets).

The 8250 contains a Baud Rate Generator capable of taking the IBM PC clock input (1.8432 MHz) and dividing it by some number (the divisor) to get any speed (bps) you want (refer to the *IBM Personal Computer Technical Reference manual*, pages 2-135 through 2-137, for more specific details). To select 450 bps you must determine the correct divisor, then place that divisor into a 2-byte register in the 8250 chip. This is done using the OUT command in



## ☉ Hands On

both BASIC and assembly language. The OUT command allows data to be sent to the 8250 I/O ports used to set the bps rate, control the modem, and send and receive data from the modem.

To reset the 8250 chip, you first have to enable the chip's divisor registers, and then, after changing the speed (bps), you have to disable the divisor registers to lock in the new rate. After interpolating a divisor

---

### The Hayes Smartmodem 300 can operate at 450 bps.

---

value of 100 (hex) from Table 23 of the *IBM Technical Reference* manual and identifying the COM1: divisor registers as 3F8 and 3F9 from page 2-136, you are ready to start "talking" to the 8250 chip. You start by telling the 8250 Line Control register, address 3FB, that you are about to load a new divisor. To do this you change bit 7 in this register from a 0 to a 1. You then load the low- and high-order divisor registers. To lock in the new bps rate and begin communications at that rate, you then change bit 7 of the Line Control register back to a 0. The BASIC commands that achieve this sequence are shown in Listing 1.

#### Fast Talking

A merge file for *PC-Talk III* is included as Listing 2 to illustrate the implementation of 450 bps with the IBM PC. This merge file, developed by Dorn Stickle of Amarillo, Texas, places a 450 bps option in the *PC-Talk III* parameters list (accessed with the <Alt>-P command).

After merging the 450 "patch" into the interpreted version of *PC-Talk*, the program can be recompiled using

the instructions on page 63 of the *PC-Talk III* manual. With the 450 bps option, you can access local RBBS-PC bulletin boards at 300 bps and then switch the data transfer rate to 450 bps by selecting the New Baud option on the bulletin board's main menu. When calling a system that allows you to switch from 300 to 450 bps, one caution should be followed: be sure that the Smartmodem switch 1 is in the down position (the Smartmodem ignores Data Terminal Ready, or DTR, status) before initiating the call. If switch 1 is up (Smartmodem monitors DTR status) when the IBM PC changes communications parameters, the telephone connection with the host will be lost. The DTR signal is momentarily dropped while the modem divisor registers are being changed, and with switch 1 up, the Smartmodem drops the carrier signal as the DTR signal drops. ☉

---

*Larry Jordan is a freelance writer who manages power plant start-up engineers for NUS Corporation. He coauthored the book Communications and Networking for the IBM PC, published by The Brady Company.*

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*Smartmodem 300  
Hayes Microcomputer Products  
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Norcross, GA 30092  
404/449-8791  
List Price: \$289*

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*PC-Talk III  
The Headlands Press, Inc.  
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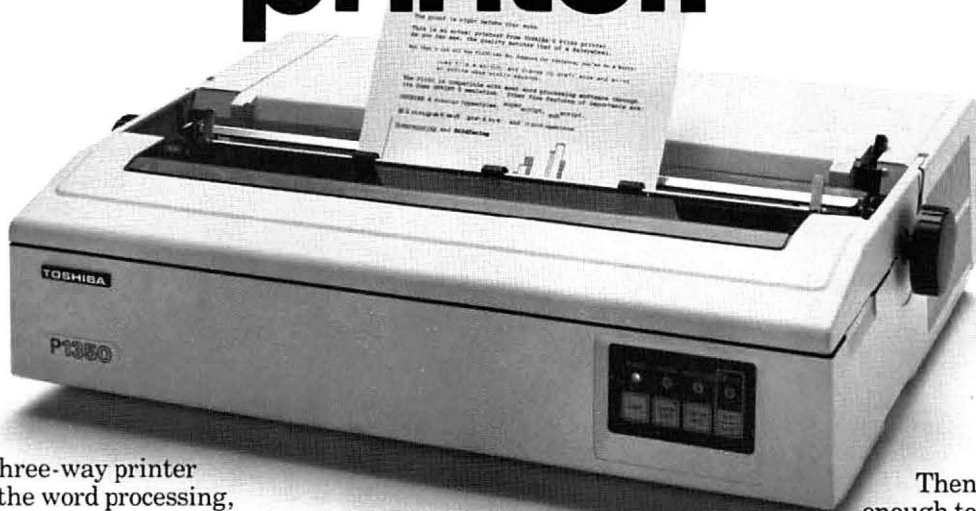
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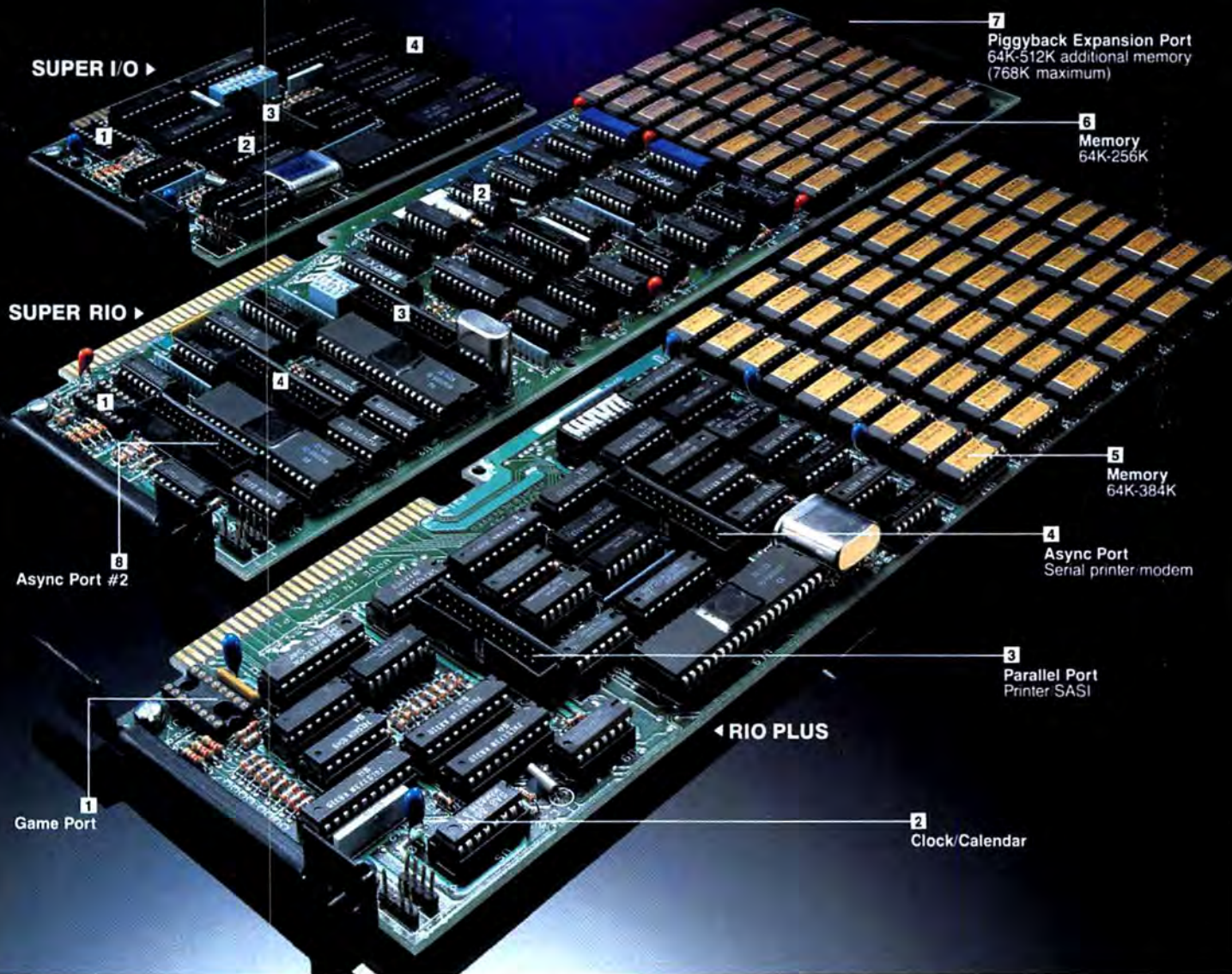
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# Correspond in Color

*Low-cost methods of using color graphics and text to enhance everything you print*

Mark Skiba

Many observers have said that we are in the midst of an information explosion. We are bombarded daily by magazines, memos, and reports, and at least part of the blame for this phenomenon can be traced to personal computers. Word processing, spreadsheet, and data base programs have made the task of generating information dramatically less time consuming. Yet our capacity to absorb this knowledge has not increased. We find ourselves drowning in a sea of information while asking the question, "Haven't you read my memo?"

Graphics offer an obvious aid to this dilemma. One glance at Figure 1 delivers the concepts of the previous paragraph in a fraction of the time required to read it. This article demonstrates how to use the PC to generate more information with fewer words. The approach outlined here uses a variety of applications software packages combined with some operating system utilities to produce mixed graphics and text on a dot matrix printer.

## Generating Graphics

Sources and types of graphics are as numerous as forms of information. Of course, there's the old tried-and-true method of generating graphics by hand. This can be a tedious and inaccurate process, however, especially when the information is already stored on the computer.

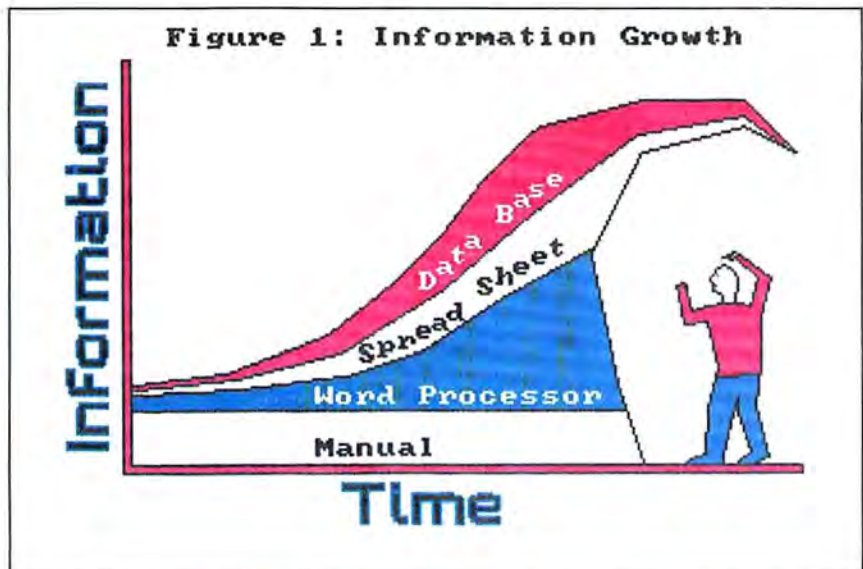


Figure 1: Information growth

Charts and graphs form one general category of graphics used to represent numerical data (see Figure 1). Numerous packages are available that interface with spreadsheets and data base programs to produce a variety of informative graphs quickly, such as *dGraph* from Fox and Geller, which works with *dBASE II*, and *StretchCalc* from Multisoft, which works with *VisiCalc*.

For more general graphics, such as the type shown in Figure 2, a simple two-dimensional graphics editor is commonly used. *PC-crayon* from PC

Software is an example of such an editor. Using these packages with an interface device such as a digitizer or a mouse can be extremely helpful.

Many other forms of graphics are beyond the scope of this article. Even BASIC provides some powerful tools for generating graphics. The future is wide open for new forms of graphics that support special applications.

## Putting It on Paper

A chart on your screen may look terrific, but if you can't put it on paper it may be useless. Commercial graphics packages usually provide some



## ● Hands On

hard copy support, but often this support is less than optimal and is limited in options. The integrated system seeks to overcome these limitations by modifying the operating system so that it will support your printer for all graphics. The Graphics command in DOS 2.00 for the IBM dot matrix printer is an example of this approach. The Graphics command modifies the operating system so that when the <PrtSc> key is pressed, the display on your screen is dumped to the printer.

Just getting hard copy, however, is usually insufficient for the real world of letters, memos, and reports. Ideally, you want to be able to integrate graphics and text. You can always use the cut-and-paste method: leaving blank areas while you are printing text with the word processor or editor, printing graphics separately, and physically cutting and pasting them onto paper. This method is simple but tedious.

A cleaner approach is to instruct the computer where to place the graphics in the text. Using a two-pass method, you print the properly spaced text in one pass and then print the graphics in the second pass. If your printer has absolute position capability (the ability to back up and place the printhead at any location on the paper), these phases can be combined to merge graphics and text automatically by putting the paper through the printer twice.

Unfortunately, a simple screen dump program such as the Graphics command in DOS 2.00 is inadequate for this task. It doesn't provide the ability to locate and manipulate the image on paper. To provide this control, a utility that provides the option of saving your screen images on disk, such as *Press'N'Plot*, is often used (see Figure 3). At a later time another program can be used to put the graphics on paper with a variety of options. Useful options include image rotation, scaling, clipping, and color and pattern modification.

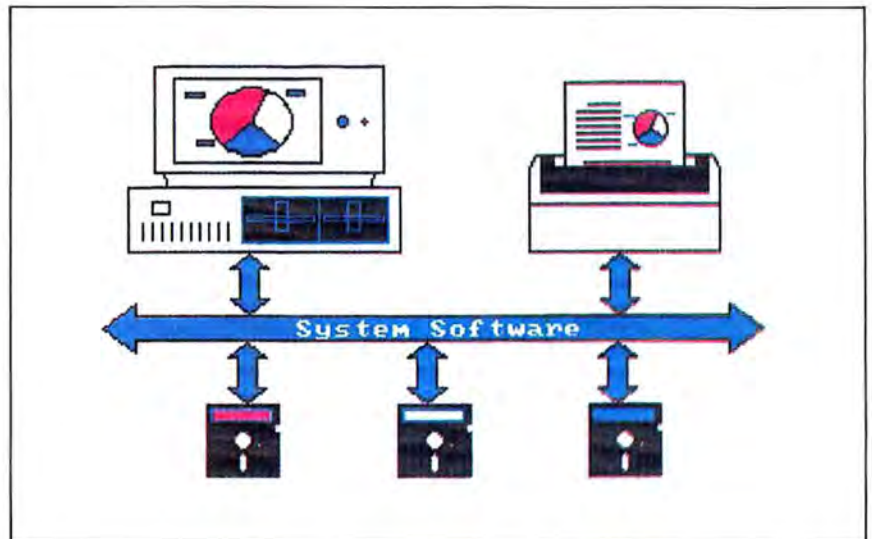


Figure 2: Integrated system

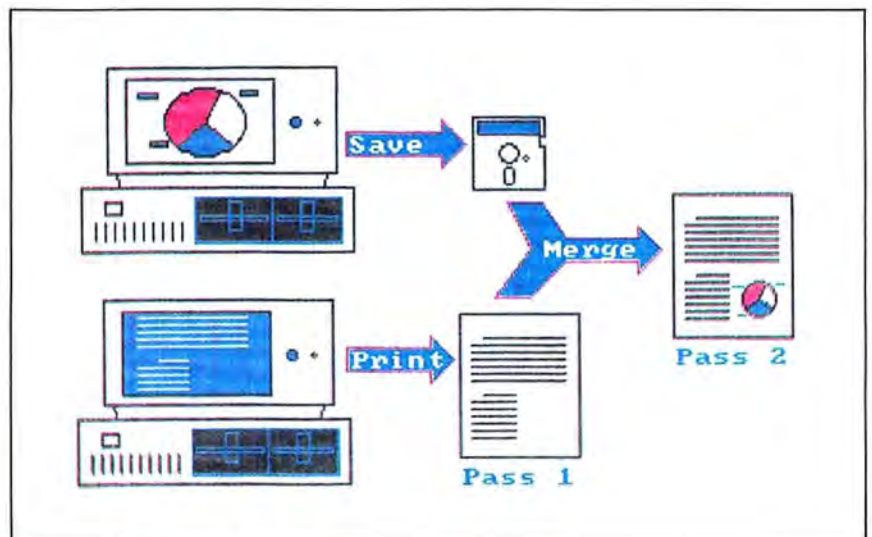


Figure 3: Two-pass method

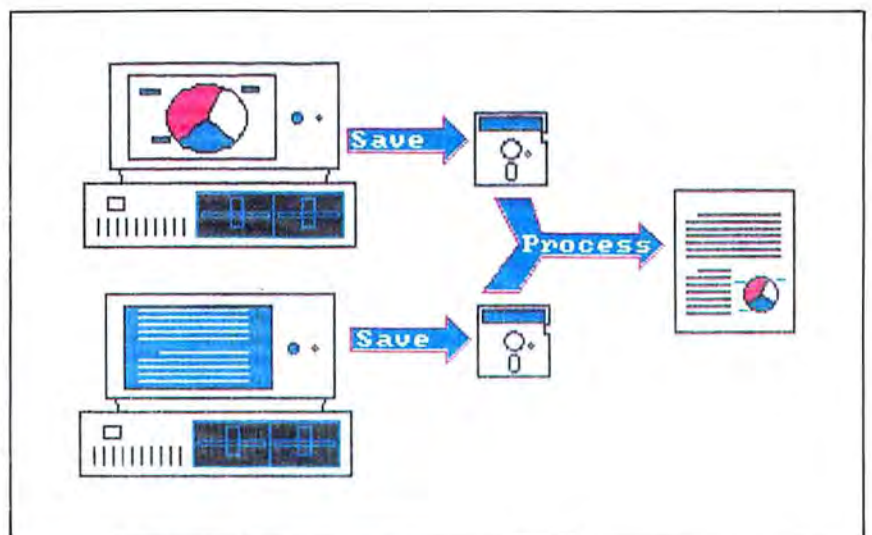


Figure 4: Text/graphics processor



Another method is taking images saved on disk and merging them into your text through a text processor (see Figure 4). This method involves embedding formatting commands into the text with an editor and later processing that text through another program that integrates graphics images into the text. Unfortunately, this method is difficult to implement on printers that do not provide the capability to reverse feed paper. (A complex printing method called colinear mixing will do this, but it requires sophisticated programming.)

The solution is to mix graphics and text right on the screen (see Figure 5). Unfortunately, the limited resolution available with standard monitors and graphics boards for the PC makes this method somewhat impractical. A typical 85-dots-per-inch printer provides an effective resolution of about 640 by 850 dots, whereas the IBM color monitor provides 320 by 200 dots in color graphics mode. The standard hardware currently available is barely adequate for displaying graphics alone. Greatly increased screen resolution is required for properly displaying graphics and text simultaneously.

Printing poses practical considerations. Printing in text mode is usually much faster than in graphics mode. Converting text to graphics and then printing the merged graphics is exceedingly slow.

### Color Graphics Letter

Despite the limitations of currently available printers and software, text and graphics can be mixed satisfactorily. In the example in Figure 6 the two-pass method was used to produce a color letter complete with graphics on an P-Series printer (formerly known as IDS Prism). The letter is addressed to a rival softball team's coach asking to arrange the next game.

The IBM *Personal Editor* was used to prepare the letter normally except that two main points are expressed graphically: the location of the next

## Color Text

Changing text colors for most color printers entails sending special character sequences when the change is desired. Typically, these printer commands are not easy to remember. One way to make remembering them easier is to assign printer control sequences to keys on the keyboard. When you wish to change the text color, for example, you simply hit a key, and the printer command is embedded in your text.

There are several ways to assign printer control sequences to keys. If your text editor supports key definitions, as is the case with the IBM *Personal Editor*, you simply assign the definitions. If your edi-

tor or word processor doesn't allow key definitions, there is systems software that will accomplish the task. DOS 2.00 provides that capability as a standard feature (read section 13 of the DOS 2.00 manual).

The set of printer control definitions that follows is for the P-Series printer used to print the letter in Figure 6. The first four function keys were assigned to the four ribbon colors. They are given in both the IBM *Personal Editor* and DOS 2.00 key redefinition format. (Note: in both cases the Esc character is the ASCII decimal 27 and not the characters 'Esc'.)

Color	Personal Editor	DOS 2.00
Yellow	def f1 = 'EscQ,1\$'	Esc[0;84;Esc;"Q,1\$";p
Magenta	def f2 = 'EscQ,2\$'	Esc[0;85;Esc;"Q,2\$";p
Cyan	def f3 = 'EscQ,3\$'	Esc[0;86;Esc;"Q,3\$";p

game and the team's dominance in the series. Once the text is complete, the next step is blocking out space for the two graphs. A map is used for the game location and a pie chart for the team's dominance.

The pie chart can be relatively small on the paper. Putting 320- by 200-dot medium-resolution graphics on a 85-dots-per-inch printer yields graphics measuring 3.76 by 2.35 inches. This will take up half the paper width and about 14 lines on a 6-lines-per-inch printer (or a little more than one-quarter of the screen as you view it with the editor). You reserve the space by resetting the margins and using the editor's reformat function to form a column of text that leaves enough space for the graph.

The map should be larger. Taking every screen dot and expanding it to four dots on the printer will yield a map 8 inches wide and about 28 lines long (nearly 5 inches). This will fit nicely at the bottom of the page.

When the text spacing is complete, you can spice up your letter with color. Put the proper printer control codes where you want the colors changed (see "Color Text"). The text will be complete, and you can print it out to see how it looks.

The next step is generating the graphics. For the pie chart use the Piechart BASIC program supplied on the DOS disk. Having modified the operating system with some print screen software (in this case *Press'N'Plot*), you enter the Piechart program and your data (7 wins to



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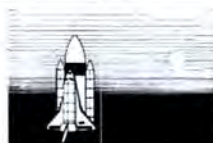
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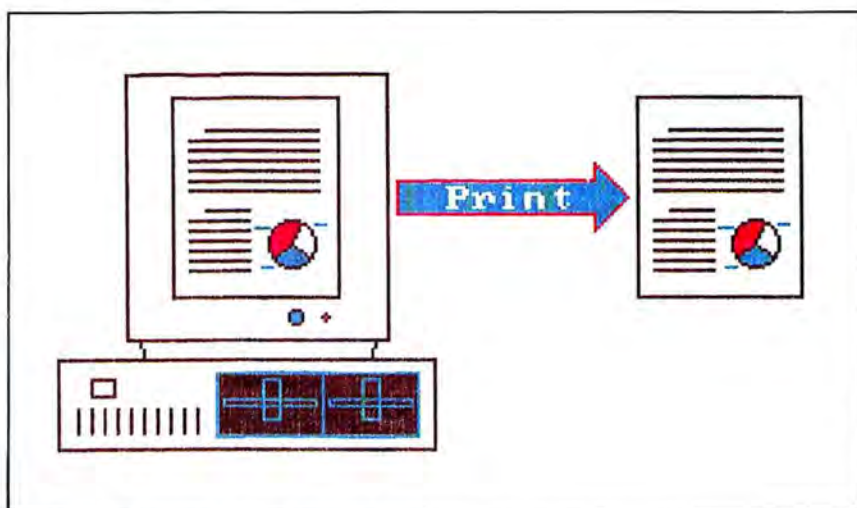


Figure 5: Integrated word/graphics

their 1). With the pie chart displayed  
save the picture on disk by pressing  
the <PrtSc> key and selecting the  
Save option.

To generate the map you'll need a  
two-dimensional graphics editor (I  
used *PC-crayon*). The map display is  
then saved on disk. Now your pic-  
tures are ready for placement in the  
text.

The pie chart presents two prob-  
lems, however. You don't want the  
words 'Another Chart? (Y or N)' in  
your letter, and the yellow used on  
the screen shows up poorly on paper.  
The color problem can be solved by  
changing colors for printing; a utility  
for this purpose is part of the  
*Press'N'Plot* program. The color  
choices are shown in Figure 7. Each  
box on the screen represents a screen  
color, and the four smaller boxes  
within that color represent the four  
bands on the ribbon (yellow, magenta,  
cyan, and black). The high-  
lighted numbers within those small  
boxes are the ribbon colors to be  
mixed. For example, for the color  
green the colors 1 (yellow) and 3  
(cyan) are mixed to form green on  
paper. You can make yellow on the  
screen appear purple on the printer  
by moving to the yellow box and  
mixing 2 (magenta) and 3 (cyan).

Then recall the pie chart from the  
disk. You can remove the words 'An-  
other Chart? (Y or N)' by "clipping"  
off the bottom of the picture using  
*Press'N'Plot*. Next indicate that you  
want the smaller-sized plot, and spec-  
ify the top and left margins where the  
plot is to be located. In the P-Series  
printer the paper then backs up to  
the desired location, and the pie  
chart appears on the paper with the  
colors modified, minus the unwanted  
words.

The map is placed on the paper in  
a similar manner, except that the im-  
age is not clipped and the size is ex-  
panded. When the plot is done, the  
letter is complete and ready for mail-  
ing.

### Look Before Buying

When you are selecting a dot matrix  
printer for mixed graphics and text  
applications, you should consider sev-  
eral points. The most obvious is  
whether it supports a graphics mode.  
Also, if you don't want to have to cut  
and paste or feed a page through the  
printer twice, absolute positioning or  
reverse line feed capability is very  
important.

Color can certainly add zest to  
your output. A number of low-cost  
color printers are currently on the  
market. If you can't find the right  
software and don't want to spend an



Dear Lefty,

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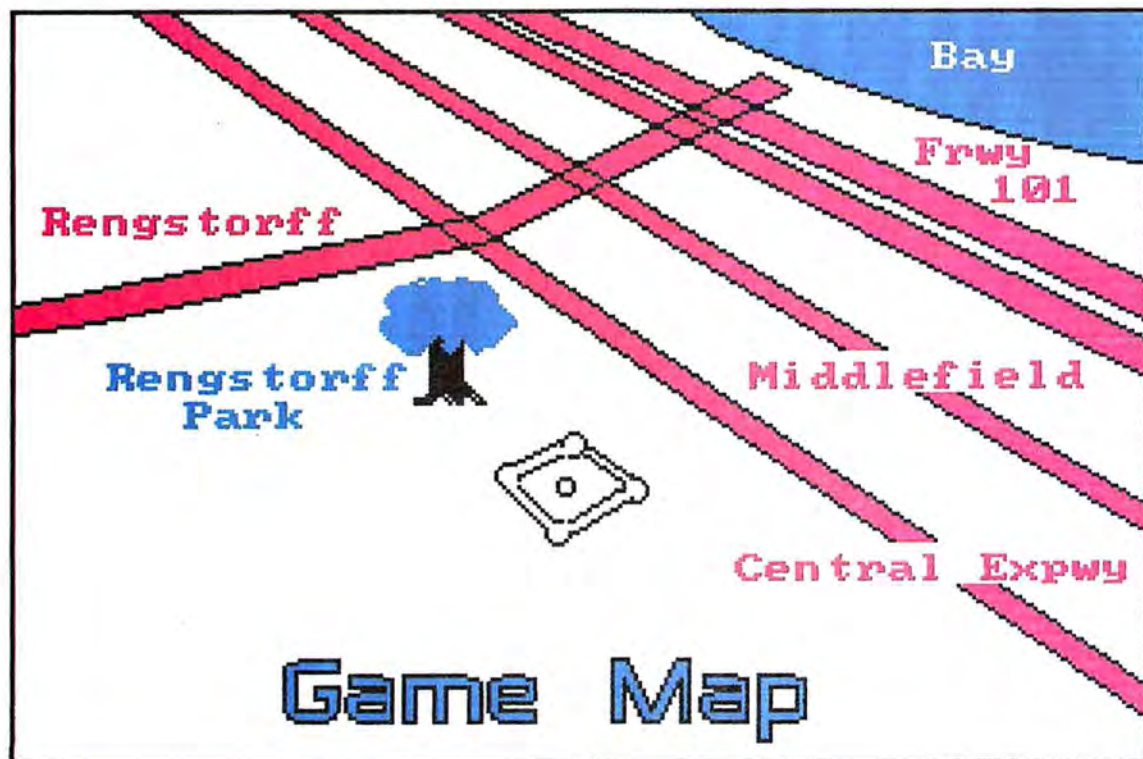


Figure 6: Letter with text and graphics



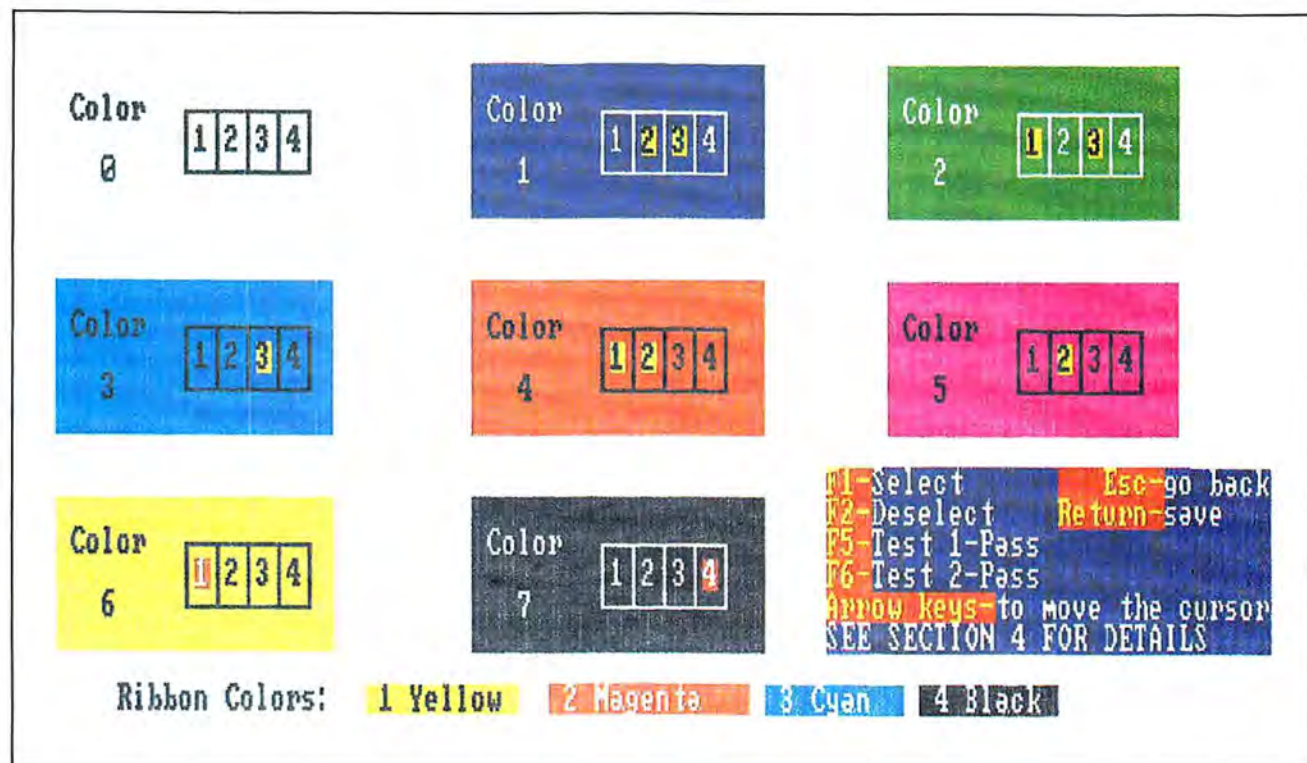


Figure 7: Press'N'Plot color to ribbon table

inordinate amount of time writing it, however, all those fancy printer features will be worthless.

Ask yourself these questions about the system software to support your printer: Does it support all the modes of the color board (40- and 80-character text, medium- and high-resolution graphics)? Can it save images on disk? What sort of manipulations does it support (clipping, scaling, and rotation)? How easily does it modify colors? What control does the printer offer over positioning the plot on paper?

#### Your Move

Low-cost hardware and software for embedding graphics in text exist today, and most dot matrix printers can reproduce them. Having the proper system software will enable you to use many sources of graphics with your word processing software. The components are ready for you to plug together.

In the future the quality of output and ease of use for mixing text and graphics will improve. Higher density dot matrix and ink jet printheads along with higher resolution displays will provide better hard copy. Competition among vendors will encourage friendlier software. Eventually, improvements in both hardware and software will enable you to merge graphics and text quite easily.

In today's growing sea of information the chances of getting your message across are decreasing. The cost of using graphics to make memos and letters more readable and more noticeable is small when you think that you may not get your message across at all. The next move is yours. The PC is waiting. ●

*Mark Skiba is the director of software engineering for the American Programmers Guild. He is involved in developing systems software for printers and other peripherals.*

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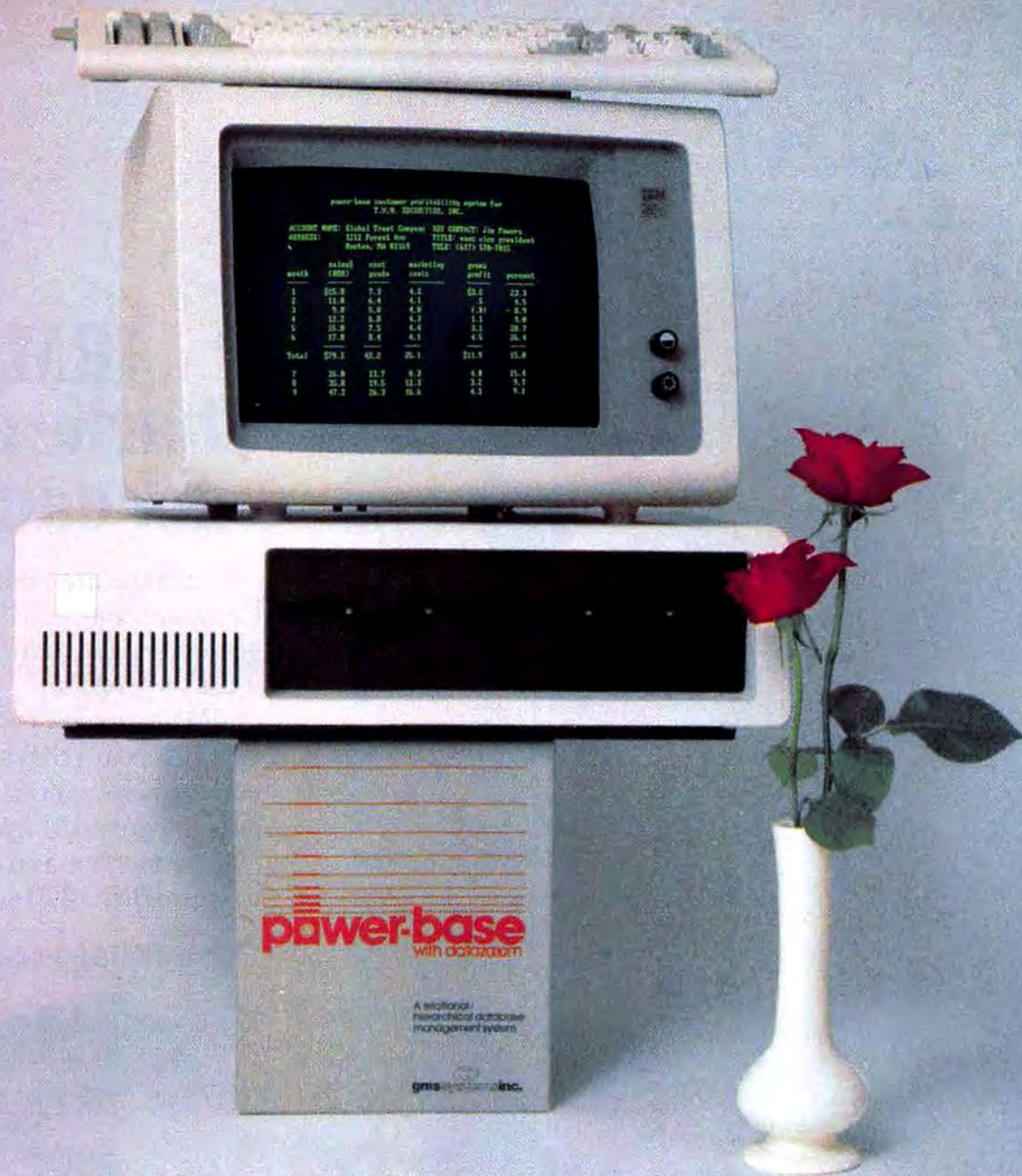
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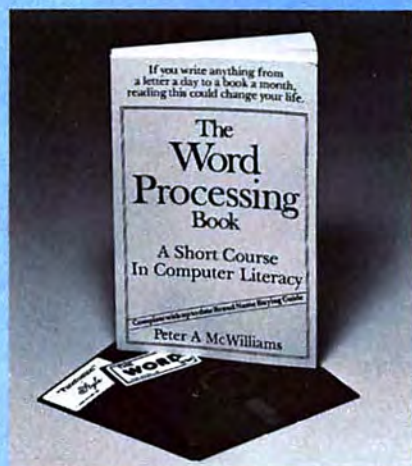
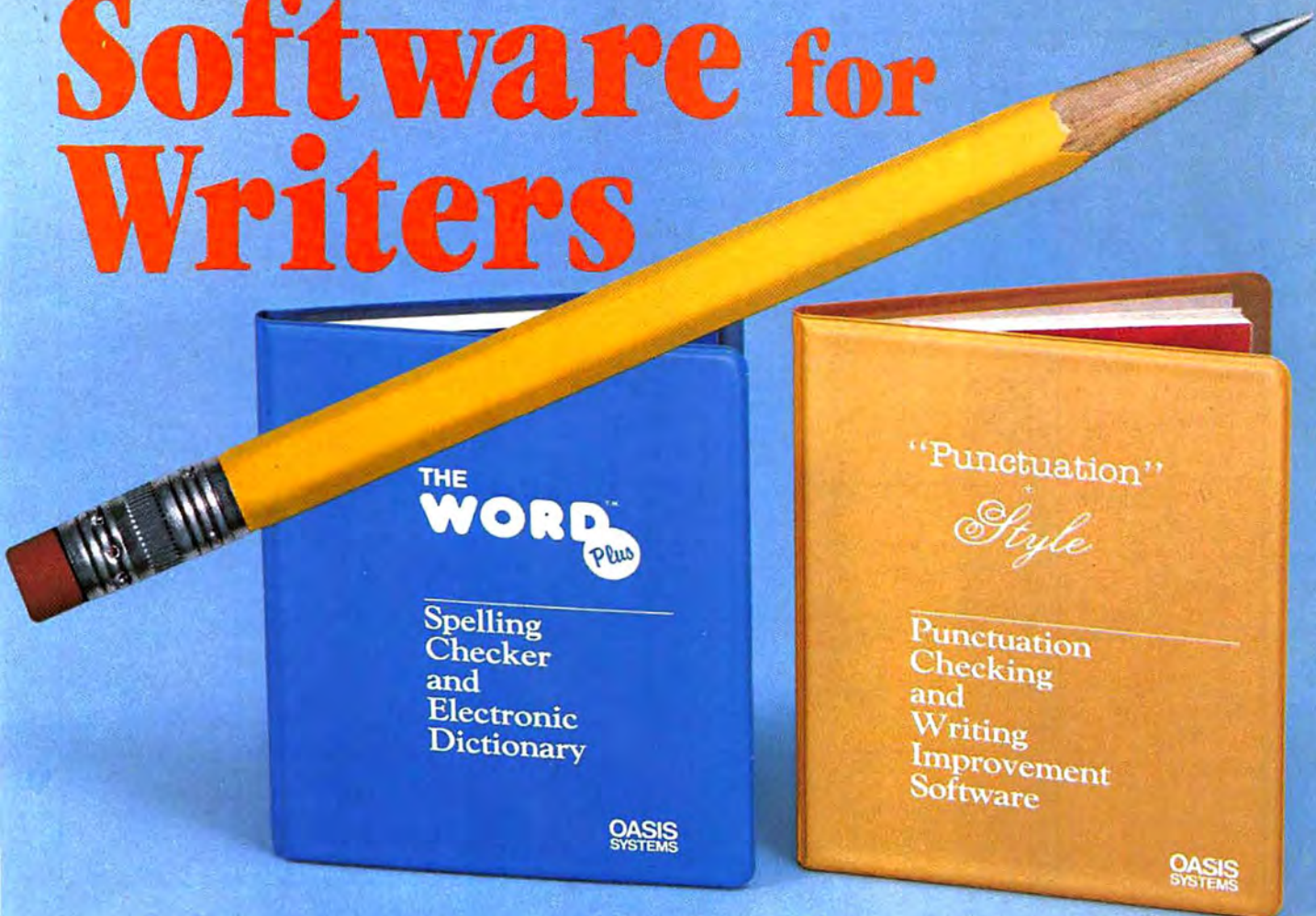
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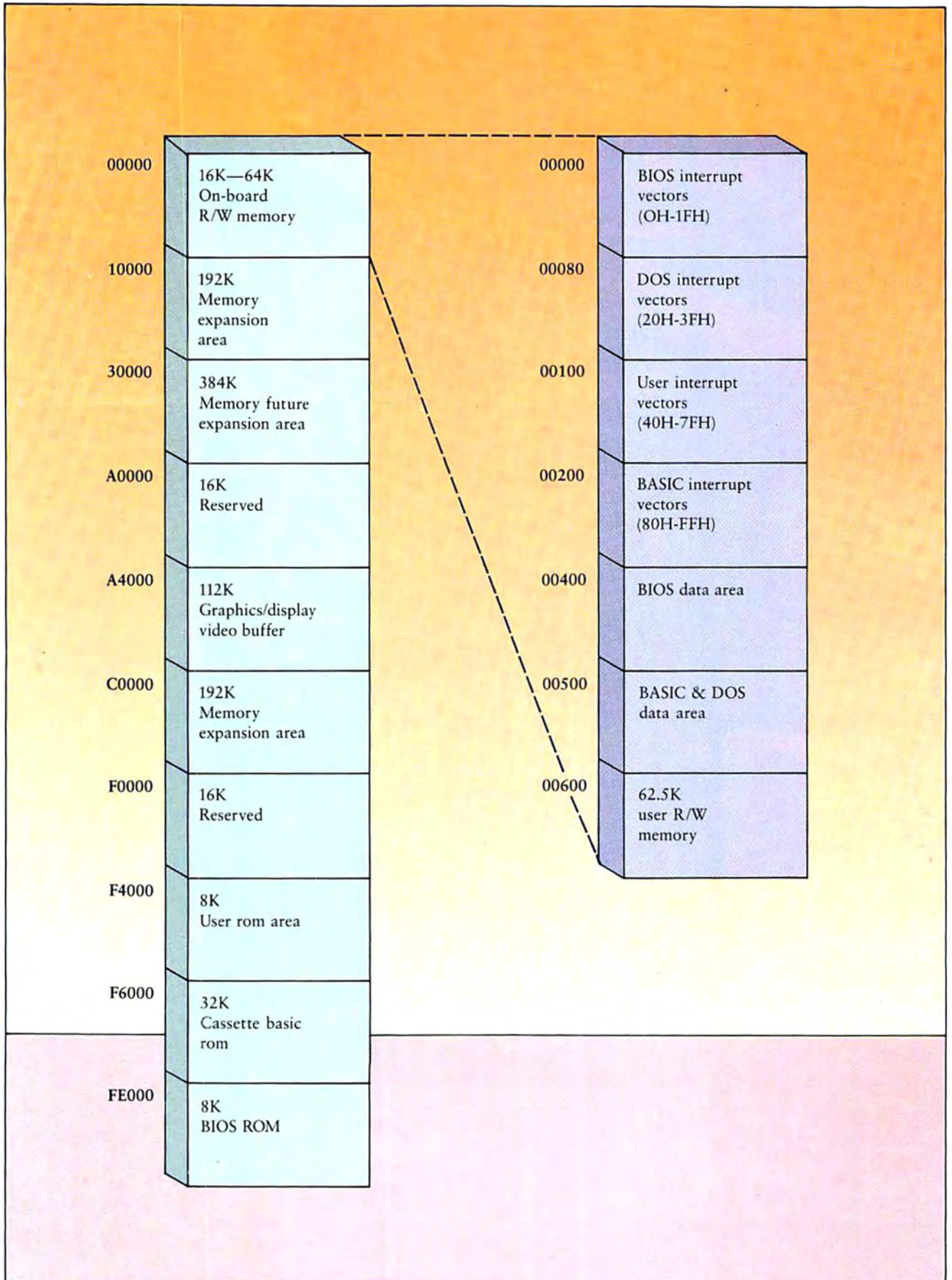


Figure 1: System memory map



# Mining the System Resources

*A look at the PC's memory and built-in operating system*

Leo J. Scanlon

Assembly language is a machine-oriented language rather than a people-oriented language like BASIC or Pascal. People-oriented languages use symbols and command statements that programmers can read easily, but assembly language uses mnemonics, which represent the simplest instructions a microcomputer can perform. Programs written in assembly language require less memory and run faster than those written in high-level languages like BASIC and Pascal.

To make the most of this compact storage and speed, an assembly language programmer must have a greater knowledge of the system's resources than a BASIC programmer. A programmer who is writing a complex program, such as a spreadsheet or word processor, needs to understand where programs and data can be stored in memory and where system information such as video and disk data are located. Likewise, the programmer must understand how the computer works. Interrupts, which temporarily stop the processor from executing its program to perform particular activities such as reading keystrokes as they are entered on the keyboard, must be fully comprehended.

*The following excerpt is from the book IBM PC Assembly Language: A Guide for Programmers (Robert J. Brady Co., Bowie, Maryland, 1983). The previous excerpt from Scanlon's book described the IBM Small Assembler and the Macro Assembler. This month we look at some of the PC's built-in resources—its basic I/O system. Chapter 6, part of which is excerpted here, gives a brief description of the PC's system memory and then discusses interrupt service routines within the BIOS.*

Figure 1 shows how the 8088's 1-megabyte address space is allocated in the IBM Personal Computer.

As you can see, the lowest-numbered 64K locations, C0000 through 0FFFF, hold the interrupt vector tables, the BIOS data area, and the read/write memory on the system board. The next 192K bytes are available for add-on memory boards, which lets you expand the read/write memory to 256K bytes. The 384K bytes starting at location 30000 accept additional read/write add-on boards in a future version of the PC.

Following the future expansion area is a block of 16K locations that IBM reserves for future use. (There is another reserved 16K block at location F0000.) Location A4000 is the

start of a 112K block of memory where the PC stores graphics and display data.

The 192K bytes starting at location C0000 currently provide ROM memory expansion, but may accept read/write memory in a future version of the PC. The 8K bytes starting at lo-

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The BIOS interrupts give you a way to access the powerful built-in features of the PC.

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cation F4000 are available for a user-provided program ROM chip, which you can plug into a spare socket on the system board. Finally, the highest-numbered 40K locations, F6000 through FFFFF, hold the Casette BASIC Interpreter and BIOS ROM chips.

If you have the IBM *Small Assembler*, the *Macro Assembler*, or some other relocating assembler, you needn't worry where your programs and data are located in memory. However, you must understand the



## ● Hands On

interrupt assignments in the system, so you can use the established interrupts and add others of your own.

Types 0 through 1FH, 20H through 3FH, and 80H through FFH are used by BIOS, DOS, and BASIC respectively. This leaves 64 interrupts (Types 40H through 7FH) available for your use.

The BIOS interrupts give you a way to access the powerful built-in features of the PC. Table 1 summarizes the BIOS interrupt vector assignments. As you can see, BIOS initializes most of these vectors. DOS initializes the rest.

In Table 1, the BIOS interrupts fall into five groups:

1. 8088 interrupt vectors (Types 0H through 7H)
2. 8259 interrupt vectors (Types 8H through 0FH)
3. BIOS entry points (Types 10H through 1AH)
4. User-supplied routines (Types 1BH and 1CH)
5. BIOS parameters (Types 1DH, 1EH, and 1FH)

In this section we will describe each interrupt group and emphasize the interrupts you can use in your programs.

### 8088 Interrupt Vectors

The first five of these interrupts, Types 0 through 4, are required in every 8088- or 8086-based system. The only other initialized interrupt in this group, Type 5, is an interrupt that transmits the screen display to a printer.

*Type 0, Divide by Zero:* This interrupt activates if a divide instruction (DIV or IDIV) produces a quotient that is too large to be contained in the result register (AL or AH). The routine this interrupt initiates—which starts at location 0060:0097—aborts your program by simulating a Ctrl-Break. It then displays the message 'Divide Overflow' and returns control to DOS.

*Type 1, Single-Step:* This interrupt lets you run programs one instruction at a time, so you can debug them. DOS makes this vector point to location 0060:00A4, which contains an Interrupt Return (IRET) instruction. Thus, a Type 1 interrupt simply jumps to the IRET instruction, then returns to the instruction that follows INT 1.

Does this mean you can't single-step through a program? Not at all. It just means you can't use the Type 1 interrupt to single-step. You can single-step with the DEBUG program's

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The Type 5 interrupt does exactly what the PrtSc key does, but does it under program control instead of from the keyboard.

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Trace (T) command, which executes one or more instructions, starting at the current CS:IP address or at a specified address.

*Type 2, Non-Maskable Interrupt:* For every interrupt but this one, you can force the processor to ignore interrupt requests. To do this you set the Interrupt Enable Flag (IF) to 0 with a CLI instruction. The Type 2 interrupt is non-maskable; it cannot be "locked out" or disabled. For this reason the Type 2 interrupt should be activated by some time-critical event, such as imminent loss of power.

In the PC, memory expansion options use the Non-Maskable Interrupt (NMI) to report storage errors. The service routine this interrupt calls, NMI\_INT (starting address F000:E2C3), displays the error message Parity Check 1 or Parity Check 2. Then it locks out interrupts with a CLI instruction and halts the processor with HLT.

*Type 3, Breakpoint:* This interrupt lets you execute a program until the 8088 encounters a specified "stop" address, or *breakpoint*. As with the Type 1 (Single-Step) interrupt, DOS makes the Type 3 interrupt vector point to an IRET instruction at location 0060:00A4. The Type 3 interrupt is unimplemented because you can get breakpoints as an option with DEBUG's Go (G) command.

*Type 4, Overflow:* This interrupt performs an operation when the 8088 executes an Interrupt If Overflow (INTO) instruction. As with interrupt Types 1 and 3, DOS makes the Type 4 interrupt vector point to an IRET instruction at location 0060:00A4. DOS doesn't provide an interrupt service routine here because IBM can't anticipate what you wish to do in case of overflow. They leave this decision up to you.

*Type 5, Print Screen:* The final interrupt in this group, Type 5, is a BIOS feature. The service routine this interrupt calls, PRINT\_SCREEN (F000:FF54), saves the current cursor position, transmits the information on the screen to the printer, then restores the cursor. Hence, the Type 5 interrupt does exactly what the PrtSc key does, but does it under program control instead of from the keyboard.

Memory address 50:0 holds the status of the PRINT\_SCREEN routine, as follows:

- If the print operation is successful, location 50:0 contains 0.
- While the print operation is in progress, location 50:0 contains 1.
- If an error occurs during printing, location 50:0 contains 0FFH.

### 8259 Interrupt Vectors

The 8259 is an *interrupt controller chip* on the system board. This chip accepts interrupt request signals (that is, maskable interrupts) from any of eight different devices in the system. Upon receiving an interrupt request,



Interrupt Number	Name	Initialized to	Initialized by
0	Divide by Zero	0060:0097	DOS
1	Single Step	0060:00A4	DOS
2 8088	Nonmaskable	NMI_INT (F000:E2C3)	BIOS
3 Interrupt	Breakpoint	0060:00A4	DOS
4 Vectors	Overflow	0060:00A4	DOS
5	Print Screen	PRINT_SCREEN (F000:FF54)	BIOS
6	Unused	—	—
7	Unused	—	—
8	8253 System Timer	TIMER_INT (F000:FEA5)	BIOS
9	Keyboard	KB_INT (F000:E987)	BIOS
A 8259	Unused	—	—
B Interrupt	Unused	—	—
C Vectors	Unused (Reserved)	—	—
D	Unused	—	—
E	Diskette	DISK_INT (F000:EF57)	BIOS
F	Unused (Reserved)	—	—
10	Video I/O	VIDEO_IO (F000:F065)	BIOS
11	Equipment Check	EQUIPMENT (F000:F84D)	BIOS
12	Memory Size	MEMORY_SIZE_DETERMINE (F000:F841)	BIOS
13	Diskette I/O	DISKETTE_IO (F000:EC59)	BIOS
14 BIOS	Communications I/O	RS232_IO (F000:E739)	BIOS
15 Entry	Cassette I/O	CASSETTE_IO (F000:F859)	BIOS
16 Points	Keyboard I/O	KEYBOARD_IO (F000:E82E)	BIOS
17	Printer I/O	PRINTER_IO (F000:EFD2)	BIOS
18 BIOS	Cassette BASIC	(F600:0000)	BIOS
19 Entry	Power-on Reset	BOOT_STRAP (F000:E6F2)	BIOS
1A Points	Time of Day	TIME_OF_DAY (F000:FE6E)	BIOS
1B User-Supplied	Keyboard Break	0060:0090	DOS
1C Routines	Timer Tick	DUMMY_RETURN (F000:FF53)	BIOS
1D	Video Initialization	VIDEO_PARMS (F000:F0A4)	BIOS
1E BIOS	Diskette Parameters	DISK_BASE (F000:EFC7)	BIOS
1F Parameters	Unused (Reserved)	—	—

**Table 1: BIOS interrupt vectors**

the 8259 passes the request signal and a device identifier code to the 8088.

Presently, only three devices are attached to the 8259: the 8253 system timer, the keyboard, and the 5¼-inch disk drives. Hence, only three of the eight possible interrupt types are in use. IBM reserves two other interrupt types for future versions of the PC.

**Type 8, 8253 System Timer:** The 8253 is a chip on the system board that maintains a count of the system clock. You can use the chip to calculate the elapsed time between two

events or to generate time delays. The 8253 automatically issues a Type 8 interrupt every 0.0549254 seconds. This means it interrupts the 8088 about 18.2 times per second.

The service routine the Type 8 interrupt calls, `TIMER_INT` (F000:FEA5), keeps track of the 8253's interrupts while interrupts are enabled (that is, while `IF=1`), so you can use this count to keep track of the time of day. The time count is a 32-bit value in two 16-bit memory locations, `TIMER_LOW`

(0040:006C) and `TIMER_HIGH` (0040:006E). The `TIMER_INT` routine also initiates a Type 1C interrupt at every "timer tick."

BIOS makes the Type 1C interrupt vector point to an `IRET` instruction, so you have to change the vector if you want the interrupt to do something useful. We'll discuss some possibilities for the Type 1C interrupt under User-Supplied Routines below. We'll also show you how to set and read the time count when we discuss the Type 1A (Time of Day) interrupt under BIOS Entry Points.



(AH)	Operation	Additional Input Registers	Result Registers*
<b>CRT Interface Routines</b>			
0	Set Video Mode	(AL) = 0 40 × 25 B/W, Alpha (Default) = 1 40 × 25 Color, Alpha = 2 80 × 25 B/W, Alpha = 3 80 × 25 Color, Alpha = 4 320 × 200 Color, Graphics = 5 320 × 200 B/W, Graphics = 6 640 × 200 B/W, Graphics	None
1	Set Cursor Lines	CH Bits 0-4 = Start Line for Cursor CH Bits 5-7 = 0 CL Bits 0-4 = End Line for Cursor CL Bits 5-7 = 0	None
2	Set Cursor Position	(DH,DL) = Row, Column (0,0) Is Upper Left (BH) = Page Number (0 for Graphics Mode)	None
3	Read Cursor Position	(BH) = Page Number (0 for Graphics Mode)	(DH,DL) = Row, Column of Cursor (CH,CL) = Current Cursor Mode
4	Read Light Pen Position	None	(AH) = 0 Light Pen Switch Not Down or Not Triggered (AH) = 1 Valid Light Pen Values in Registers (DH,DL) = Row, Column (CH) = Raster Line (0-199) (BX) = Pixel Column (0-319,639)
5	Select Active Display Page (Alpha Modes)	(AL) = New Page Value (0-7 for Modes 0 and 1; 0-3 for Modes 2 and 3)	None
6	Scroll Active Page Up	(AL) = Number of Lines. Input Lines Blanked at Bottom of Window. (AL) = 0 Blanks Entire Window. (CH,CL) = Row, Column of Upper Left Corner of Scroll (DH,DL) = Row, Column of Lower Right Corner of Scroll (BH) = Attribute to Be Used on Blank Line	None
7	Scroll Active Page Down	(AL) = Number of Lines. Input Lines Blanked at Top of Window. (AL) = 0 Blanks Entire Window. (CH,CL) = Row, Column of Upper Left Corner of Scroll (DH,DL) = Row, Column of Lower Right Corner of Scroll (BH) = Attribute to Be Used on Blank Line	None

(continues)

Table 2: Video I/O operations with Type 10 interrupt



**Type 9, Keyboard:** BIOS activates this interrupt whenever you press a key. For all practical purposes, you should consider the Type 9 interrupt as a system interrupt. We'll discuss a more useful keyboard interrupt, Type 16, later in this section, under BIOS Entry Points.

**Type E, Diskette:** BIOS uses this interrupt to communicate with attached disk drives. As with Type 9, you should consider Type E as a system interrupt. We'll discuss a more useful disk interrupt, Type 13, under BIOS Entry Points.

### BIOS Entry Points

Most of these interrupts perform input and output functions; they let you transfer information to or from the peripherals in the system. Other interrupts in this group let you determine the system configuration and the amount of read/write memory installed, and initialize and read the time of day.

**Type 10, Video I/O:** This interrupt performs any of 16 different I/O operations with the video display, based on a value of AH. The service routine it calls, VIDEO\_IO (F000:F065), begins by loading the starting address of the video buffer (a block of memory that holds display characters) into the Extra Segment (ES) register.

If your PC has a Color/Graphics Adapter, the video buffer is 16K bytes long and starts at location B8000. If your PC has a Monochrome Display/Printer Adapter, the video buffer is 4K bytes long and starts at location B0000.

With ES properly initialized, VIDEO\_IO performs the specified I/O operation. Table 2 summarizes these operations and shows you which registers are involved.

The 16 video I/O operations are divided into five groups:

- **CRT Interface Routines** let you set the video mode and the line limits for the cursor, set and read the cur-



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(AH)	Operation	Additional Input Registers	Result Registers*
<b>CRT Interface Routines</b>			
8	Read Attribute/ Character at Current Cursor Position	(BH) = Display Page (Alpha Modes)	(AL) = Character Read (AH) = Attribute of Character Read (Alpha Modes)
9	Write Attribute/ Character at Current Cursor Position	(BH) = Display Page (Alpha Modes) (BL) = Attribute of Character (Alpha) = Color of Character (Graphics) (CX) = Count of Characters to Write (AL) = Character to Write	None
10	Write Character Only at Current Cursor Position	(BH) = Display Page (Alpha Modes) (CX) = Count of Characters to Write (AL) = Character to Write	None
<b>Graphics Interface</b>			
11	Set Color Palette (320 × 200 Graphics)	(BH) = ID of Palette Color (0-127) (BL) = Color Value to Be Used with That Color ID	None
12	Write Dot	(DX) = Row Number (CS) = Column Number (AL) = Color Value If Bit 7 of AL = 1, the Color Value Is Exclusive-ORed with the Current Contents of the Dot	None
13	Read Dot	(DX) = Row Number (CS) = Column Number	(AL) = Dot Read
<b>ASCII Teletype Routine for Output</b>			
14	Write Character to Screen, Then Advance Cursor	(AL) = Character to Write (BL) = Foreground Color (Graphics) (BH) = Display Page (Alpha)	None
15	Read Current Video State	None	(AL) = Current Mode—See (AH) = 0 for Explanation (AH) = Number of Character Columns on Screen (BH) = Current Active Display Page
*Note: Besides the registers listed here, these routines preserve CS, SS, DS, ES, BX, CX, and DX. All other registers should be considered destroyed.			

Table 2 (continued)

sor position, read the light pen position, and manipulate the active display page.

○ *Character-Handling Routines* transfer characters to and from the display screen.

○ *Graphics Interface Routines* let you transfer graphics dots to and from the screen, and change the colors.

○ The *ASCII Teletype Routine* provides a Teletype-like interface to the video card. It writes a character to the display, then automatically advances the cursor.

○ The *Read Video State Routine* reports the current mode, screen width, and display page.

*Type 11, Equipment Check:* The Type 11 interrupt determines what options are attached to the system, and returns that information in AX. As Figure 2 shows, the interrupt ser-



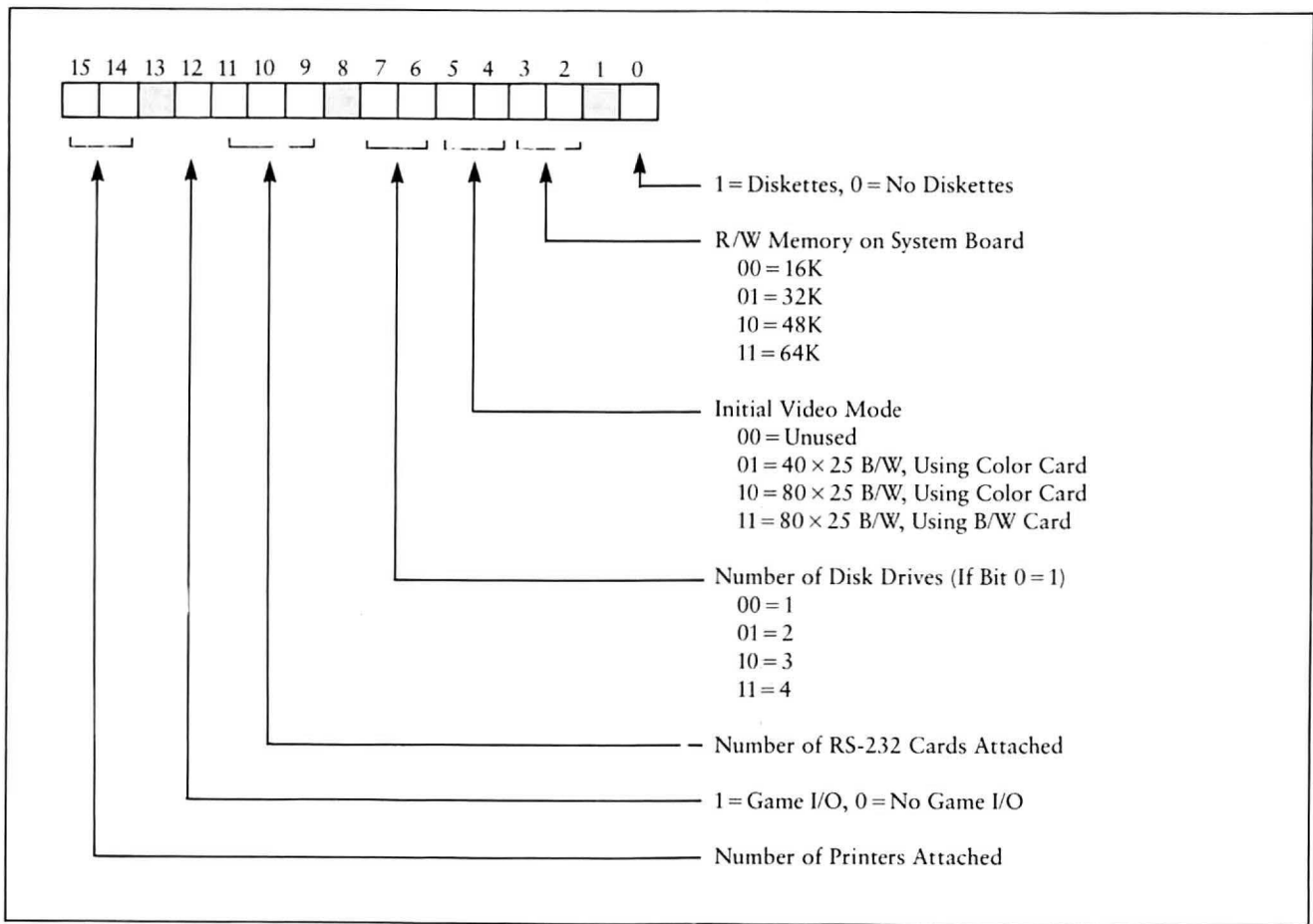


Figure 2: Equipment status returned in AX by interrupt 11

vice routine, EQUIPMENT (F000:F84D), determines the amount of memory on the system board, the video mode, the number of disk drives, how many communication (RS-232) cards and printers are installed, and whether anything is connected to the game I/O port.

This information is irrelevant if you are writing software for your own system because you already know what equipment you have. However, this feature is invaluable if you develop general software that can run on anyone's system. Using the contents of AX, you can customize your software to run differently on various systems. To do this, you might use the contents of AX to call one of several system-specific procedures.

**Type 12, Memory Size:** The Type 12 interrupt determines how many 1K blocks of read/write memory are installed on the system board, and returns this count in AX. Since this interrupt only inventories the system board, and no add-on memory, it is probably useless for most applications.

**Type 13, Diskette I/O:** The DOS commands let you operate on files in the system. The Type 13 interrupt gives you a greater degree of control over disk information in that it lets you operate on individual tracks or sectors in the system.

As Table 3 shows, the Type 13 interrupt service routine, DISKETTE\_IO (F000:EC59),

provides six different operations, based on a value that has been passed to the routine in AH. The read, write, and verify routines each return a status byte in AL (see Figure 3).

To format a track (AH=5) you need to set up a table of address information in the extra segment. This table must contain 32 bytes; 4 bytes for each of the 8 sectors on the track. The bytes are:  
Track number (0-39)  
Head number (0-1)  
Sector number (1-8)  
Number of bytes per sector (0 = 128, 1 = 256, 2 = 512, 3 = 1024)

Clearly, these operations are not for the faint-hearted. Before attempting them, you'd better know what you're doing! For guidance, consult the *IBM Personal Computer Technical Reference* manual.



(AH)	Operation	Additional Input Registers	Result Registers*
0	Reset Diskette System	None	None
1	Read Diskette Status	None	(AL) = Diskette Status (See Figure 3)
2	Read Sectors into Memory	(DL) = Drive Number (0-3) (DH) = Head Number (0-1) (CH) = Track Number (0-39) (CL) = Sector Number (1-8) (AL) = Number of Sectors (1-8) (ES:BX) = Address of Buffer	(AL) = Number of Sectors Read CF Bit = 0—Successful Operation (AH) = 0 CF Bit = 1 – Failed Operation (AH) = Status (see Figure 3)
3	Write Sectors from Memory	Same As Read Operation	Same As Read Operation
4	Verify Sectors	Same As Read Operation, Except (ES:BX) Is Not Required	Same As Read Operation
5	Format a Track	(DL) = Drive Number (0-3) (DH) = Head Number (0-1) (CH) = Track Number (ES:BX) = Sector Information	Same As Read Operation, Except AL Is Not Preserved

\*Note: These routines preserve DS, BX, CX, DX, DI, SI, and BP

Table 3: Diskette I/O operations with Type 13 interrupt

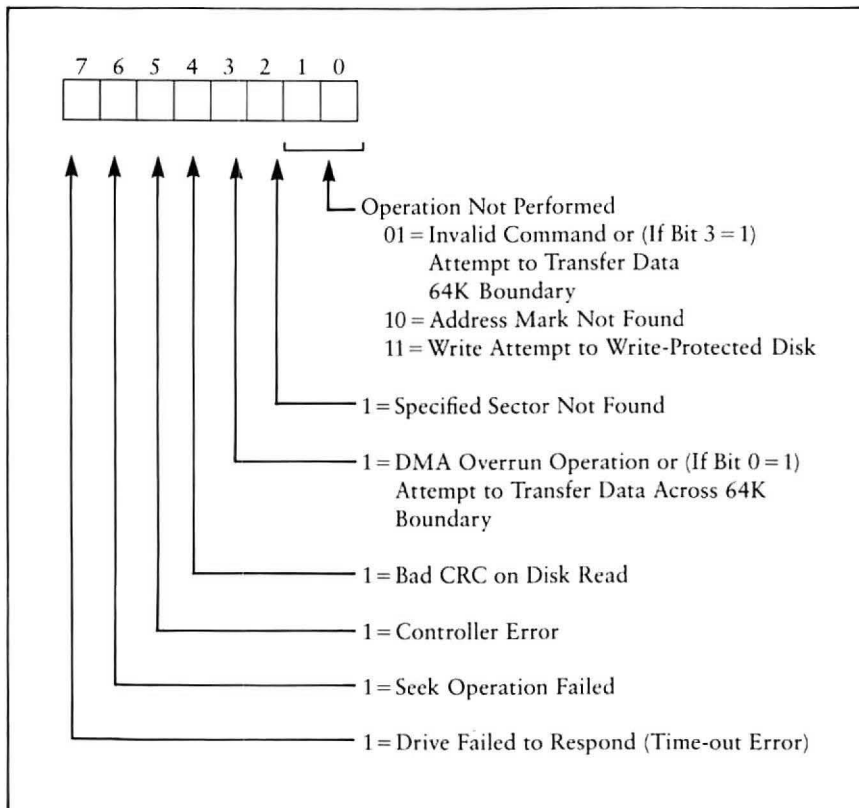


Figure 3: Diskette I/O status byte

**Type 14, Communications I/O:** This interrupt lets you transmit and receive information through the PC's communication port. For more information, see the description of the Asynchronous Communications Adapter in Chapter 2 of the *Technical Reference* manual.

**Type 15, Cassette I/O:** The commands provided in BASIC let you operate on cassette files in the system. The Type 15 interrupt gives you a greater degree of flexibility in that it lets you operate on 256-byte blocks of cassette information.

As Table 4 shows, the Type 15 interrupt service routine, CASSETTE\_IO (F000:F859), provides operations to turn the cassette motor on or off and to transfer one or more blocks to or from cassette, as selected by a value in AH.

Each block on cassette is comprised of the following fields:

1. An inter-block gap, called a leader, consisting of 256 bytes of all ones.

2. A synchronization bit (0) to identify the end of the leader.



(AH)	Operation	Additional Input Registers	Result Registers
0	Turn Cassette Motor On	None	None
1	Turn Cassette Motor Off	None	None
2	Read One or More 256-byte Blocks from Cassette	(CS) = Number of Bytes to Read (ES:BX) = Pointer to Data Buffer	(DX) = Number of Bytes Read (ES:BX) = Pointer to Last Byte Read + 1 CF Bit = 0 – Successful Operation (AH) = 0 CF Bit = 1 – Error Occurred (AH) = 1 CRC Error = 2 Data Transitions Were Lost = 3 Data Not Found
3	Write One or More 256-byte Blocks to Cassette	(CS) = Number of Bytes to Write (ES:BX) = Pointer to Data Buffer	(CS) = 0 (ES:BX) = Pointer to Last Byte Written + 1

Table 4: Cassette I/O operations with Type 15 interrupt

3. A synchronization byte with the value 16H.

4. The 256-byte data block.

5. Two Cyclic Redundancy Check (CRC) bytes.

6. A *trailer*, 4 bytes of all ones.

The CRC bytes help ensure the validity of the data during a read operation. Briefly, as the computer writes a block of data to cassette, each data bit passes through a CRC register, which accumulates the bit values using a polynomial equation. After the 256th bit has been written to cassette, the CRC register contains a 16-bit value that reflects the contents of that particular block. These 16 bits are written onto cassette, as 2 bytes, immediately after the data block.

Subsequently, when the block is read, the disk controller calculates another CRC value based on the incoming bit values. At the end of the block, this value is compared with the 2-byte CRC value read from cassette. If the 2 CRCs disagree, the cassette read program flags the operation as erroneous.

The *read block routine* turns on the cassette motor, waits until it

comes up to speed, then searches for the leader. After sensing at least 64 all-ones bytes, the routine looks for the “sync” byte. If it doesn’t find the sync byte, the routine resumes searching for a leader. (This sentence cries for a bad joke, but I resisted the temptation.) Otherwise, it reads the data block 1 bit at a time and assembles these bits into bytes. Each time the routine has accumulated a complete byte, it stores the byte into the data buffer pointed to by ES:BX, then increments BX by 1.

After reading all blocks, the routine reads the CRC bytes and compares this value to the generated CRC value. If the two do not match, the routine sets CF, loads 1 into AH, turns off the cassette motor, and exits.

The *write block routine* turns on the cassette motor and waits for it to come up to speed, then writes a 256-byte leader of all ones to the cassette. It follows this with a sync bit (0), a sync byte (16H), and the first data block. After this block, the routine writes a 2-byte CRC value.

This sequence repeats until the byte count in CX has been satisfied. If the data in the last block is less than 256 bytes, the routine “pads”

the last block with blanks. With the operation completed, the routine turns off the cassette motor, then exits. Unlike the read routine, the write routine does not generate an error report.

*Type 16, Keyboard I/O:* If your application is typical, you will probably use this interrupt more than any other. However, because of the wide range of possibilities it suggests and the versatility that IBM built into this keyboard I/O system, we will postpone discussing this topic until next month.

*Type 17, Printer I/O:* This interrupt lets you communicate with any of three printers in the system. With the three operations provided by the Type 17 interrupt service routine, PRINTER\_IO (F000:EFD2), you can print a character, initialize the printer port, or read the printer status. These operations are summarized in Table 5. All three return a status byte in AH (see Figure 4), but affect no other registers.

*Type 18, Cassette BASIC:* This interrupt calls up Cassette BASIC, which is installed in ROM in the PC.

*Type 19, Power-On Reset:* This interrupt forces the computer to re-



(AH)	Operation	Additional Input Registers	Result Registers
0	Print a Character	(AL) = Character to Be Printed (DX) = Printer to Be Used (0-2)	(AH) = Status of Operation (See Figure 4)
1	Initialize Printer	(DX) = Printer to Be Used (0-2)	Same as Print Routine
2	Read Printer Status	(DX) = Printer to Be Used (0-2)	Same as Print Routine

Table 5: Printer I/O operations with Type 17 interrupt

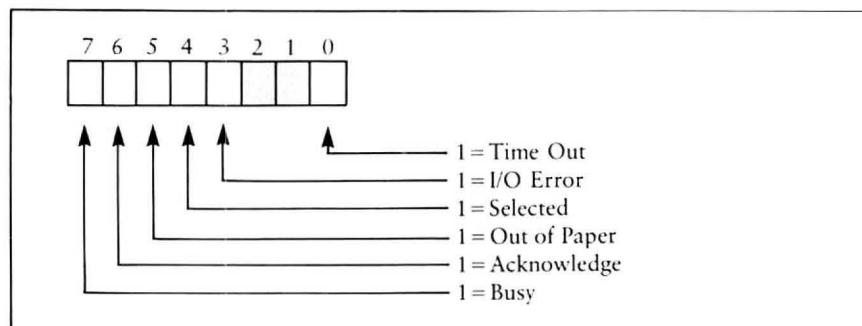


Figure 4: Printer I/O status byte

initialize from disk, if a disk drive is installed in the system. If the system does not have a disk drive, or if there is some error in either the drive or the floppy disk controller card, the computer enters Cassette BASIC via the Type 18 interrupt.

**Type 1A, Time of Day:** Recall that the Type 8 interrupt maintains a count of the system clock via interrupts from an internal 8253 System Timer. These interrupts occur at a rate of about 18.2 per second.

The Type 1A interrupt allows you to set this “time of day” count (a 32-bit unsigned number) or read its current value, so that you can use this facility to time events in your own programs. For instance, if you set the time count to 0, run a program, then read the time count, the resulting count value tells you how long the 8088 took to execute the program.

As usual, the value in AH selects the interrupt options. To set the time count, load 1 into AH and load the high and low 16 bits of the count into CX and DX respectively. To read the time count, load 0 into AH. The high

and low 16 bits of the count are returned in CX and DX respectively. Further, the contents of AL tell you whether 24 hours have passed since you last read the timer. If 24 hours have not passed, AL is zero; otherwise, AL is nonzero. Both options enable interrupts by setting the Interrupt Enable flag (IF) to 1.

The sequence shown in Example 1 calculates the execution time of a procedure called MY\_PROC.

The execution time of MY\_PROC is returned as a 32-bit value in CX and DX. To convert this value to a time in seconds, multiply it by 0.0549254 or divide it by 18.2.

Because the time count locations `TIMER_LOW` (0040:006C) and `TIMER_HIGH` (0040:006E) continually change, their contents—particularly those of `TIMER_LOW`—can be interpreted as a *pseudo random number*. Since the count locations are incremented, rather than changed randomly, they don’t provide a true random number. But because the time value is incremented 18.2

times per second, it is “random” enough for most applications.

Being 16 bits long, `TIMER_LOW` can hold values between 0 and 65,535. To generate a random number between 0 and 51, as you might want to do in a card game program, you could read `TIMER_LOW` and divide it by 52. This division yields a remainder between 0 and 51.

Example 2 shows the procedure `RAND_51`, which returns a value between 0 and 51 in AH. Note that we strip off the high 6 bits of `TIMER_LOW` to prevent the division from overflowing.

## User-Supplied Routines

Unlike the preceding interrupt types in this section, these two interrupts—Type 1B (Keyboard Break) and Type 1C (Timer Tick)—are called by other interrupt routines, rather than by your programs.

**Type 1B, Keyboard Break:** This interrupt is invoked whenever you press Ctrl-Break on the keyboard. BIOS initializes the Type 1B interrupt to point to an IRET instruction, but DOS reinitializes it to point to the same service routine as the Type 23 (Ctrl-Break Exit Address) interrupt.

**Type 1C, Timer Tick:** This interrupt is invoked by `TIMER_INT`, the routine that services the Type 8 (8253 System Timer) interrupt. Thus, like the Type 8 interrupt, the Type 1C interrupt executes about 18.2 times per second while interrupts are enabled.

The Type 1C interrupt lets you give the 8088 some additional task to do with each “tick” of the 8253. BIOS



```

STI                      ;Enable interrupts
SUB      CX,CX           ;Set time to zero
SUB      DX,DX
MOV      AH,1
INT      1AH
CALL     MY_PROC         ;Execute the procedure
MOV      AH,0           ;Read the execution time
INT      1AH

```

Example 1: Calculate the execution time of a procedure called MY\_PROC

This procedure uses TIMER\_LOW from the Type 1A interrupt to generate a pseudo-random number between 0 and 51. The number is returned in AH. No other registers are affected.

```

RAND_51 PROC
PUSH     CX              ;Save registers affected by INT 1AH
PUSH     DX
PUSH     AX
STI                      ;Enable interrupts
MOV      AH,0           ;Read the timer
INT      1AH
MOV      AX,DX          ;Move low count into AX
AND      AX,3FFH        ;and strip off high 6 bits
MOV      DL,52          ;Divide low count by 52
DIV      DL
POP      DX              ;Restore AL
MOV      AL,DL
POP      DX              ;Restore DX and CX,
POP      CX
RET                      ; then exit
RAND_51 ENDP

```

Example 2: Generate a random number between 0 and 51

makes the Type 1C interrupt vector point to an IRET instruction at location DUMMY\_RETURN (F000:FF53), so the Type 1C interrupt does nothing unless you change this pointer.

What can you do with the Type 1C interrupt? Well, you might have it display the value of the time count in decimal, thereby creating a time-of-day clock. Or you might have Type 1C's service routine examine the time count and do something when the time reaches a certain value. You can probably think of other possibilities for this useful interrupt. ●

*Leo J. Scanlon is a former technical publications manager for both Computer Automation and Rockwell International. He is the author of seven computer books.*

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# The Help Screen

*PC World offers answers and advice on every level.*

**Karl Koessel**

This month we tell how to swap parallel printers without unplugging the cables and how to BLOAD data into Compiled BASIC programs. We also have suggestions to give *WordStar* multiline footnotes and headers, as well as some advice to help you debug hand-copied programs.

## **Swapping Parallel Ports 1 and 2**

**Q.** *My IBM PC has two parallel ports: one is part of the Monochrome Display Adapter and one is on an AST Research multifunction card. I have a dot matrix printer connected to LPT1: (the parallel port on the monochrome adapter) and a letter quality printer connected to LPT2: (the parallel port on the AST card).*

*Some of the programs I have let me choose printers by specifying LPT1: or LPT2: but many simply direct all their printer output to LPT1:. To use my letter quality printer I must physically plug its cable into the LPT1: parallel port. There must be a better way.*

*I was told that DOS 1.10 would not support printer devices other than LPT1: so I bought DOS 2.00 on the assumption that I could use software to switch printers. I expect that the MODE command would do the job but I have not had any success.*

*Do you know how I can send output destined for LPT1: to LPT2:?*

*Neil Keever*

*San Jose, California*

**A.** Both DOS 1.10 and DOS 2.00 handle printer output to LPT1:, LPT2:, and LPT3: the same way. DOS 2.00 differs from DOS 1.0 in

that DOS 2.00 commands will recognize LPT2: and LPT3: as device names. For example, in DOS 2.00 the command `COPY A:YOURFILE LPT2:` will copy YOURFILE from drive A to printer 2, while DOS 1.10 will copy YOURFILE from drive A to the default drive and name the new file LPT2. But this difference between the two versions of DOS is not related to your problem, and either DOS may be used to implement the following solution.

DOS determines the hardware configuration of your PC during the

---

I could load all four  
screen images into high  
memory with just one  
disk access.

---

power-on self-test and stores this information in a small portion of memory (23 bytes) called the ROM BIOS data area. The data area begins at segment 40 hex, offset 0. The ninth and tenth bytes of this data area contain the address of the port to be used to output characters for LPT1:. The next two bytes contain the port address for LPT2:.

Exchanging the two port addresses will swap the printers, but each printer will be assigned the values for characters per line (cpl) and lines per inch (lpi) that were previously assigned to the other printer. If you use the MODE command to set the printers to different cpl or lpi values, you must reassign those values whenever the port addresses are exchanged.

SWAPADDS.BAS (Listing 1) is a BASIC program to swap the port address values LPT1: and LPT2:. Each time the program is run, LPT1: and LPT2: will be switched. If both printers are set for the same cpl and lpi values, this program is all you will need.

If the printers are set for different cpl and lpi values, use the batch files SWAPLPTS.BAT (Listing 2) and RSTRLPTS.BAT (Listing 3) to swap printers and to restore them to their original arrangement. These batch files set the MODE(s) for the printers and then run the program SWAPADDS.BAS.

The program and batch files are adapted from the AST Research ComboPlus user manual (Appendix C, *Switching Between LPT1 and LPT2*). Note that the SWAPADDS.BAS program is DOS version dependent and may not work with other computers or DOS versions later than 2.00.

## **BLOAD Backfires**

**Q.** *I am writing a program in BASIC that repeatedly displays several screens of text for full-screen data entry. The first version of the program would BLOAD each screen image directly into the monochrome display frame buffer. I quickly realized that with 192K of RAM I could load all four screen images into high memory with just one disk access and then move the appropriate blocks with a machine language subroutine. I have it all programmed and it runs correctly, uncompiled. The*



## The Help Screen

```
10 DEF SEG=&H40
20 A=PEEK(8):B=PEEK(9)
30 POKE 8,PEEK(10):POKE 9,PEEK(11)
40 POKE 10,A:POKE 11,B
50 SYSTEM
```

Listing 1: SWAPADD.SBAS

```
MODE LPT1:[parameters, if any, for SECOND printer]
MODE LPT2:[parameters, if any, for FIRST printer]
BASIC SWAPADD.S
```

Listing 2: SWAPLPTS.BAT

```
MODE LPT1:[parameters, if any, for FIRST printer]
MODE LPT2:[parameters, if any, for SECOND printer]
BASIC SWAPADD.S
```

Listing 3: RSTRLLPTS.BAT

*compiled version can load an image directly into the frame buffer, but a BLOAD to high memory hangs the system. The drive begins to buzz and keeps on buzzing. <Ctrl>-<Alt>-<Del> will not reset the system, and opening the drive door has no effect either. Why is my program running unpredictably when compiled?*

*Christopher Noe  
Chicago, Illinois*

A. Your uncompiled BASIC program is able to perform the BLOAD to high memory because that area of memory is not used by DOS, BASIC, or your program. But the compiled program resides in high memory, so the BLOAD is destroying the program's instructions and crashing DOS as well.

You must BLOAD the data into an unused area of memory. As you may know, each screenful of text on the monochrome display requires 4K of memory. Your program has four screens of data, so you must reserve 16K of memory. The easiest way to do this is to dimension an integer array for 8192 elements (2 bytes are reserved for each integer variable).

After the array has been dimensioned, assign a value to the first element so that the program can use the VARPTR statement to determine the array's memory address. You can then BLOAD the screen images into that area and use your machine language subroutine to move data from there to the screen.

### Headers and Footers

Q. The two programs I use most are 1-2-3 and WordStar. Both allow only one-line headers and footnotes, which is almost never enough for my reports. On long proposals I like to include the addressee, date, and page number on the top three lines of every page after the first.

Since 1-2-3 is primarily a spreadsheet and data base manager, I can understand its lacking these features. WordStar, however, has no such excuse. WordStar is a word processor, and it should allow multiline headers and footnotes.

Can you recommend a technique or a program to use with WordStar that will help me accomplish these objectives? I hope MicroPro reads this request, because I think it would be a great enhancement to an already terrific word processor.

*Morris W. Stemp  
New York, New York*

A. Digital Marketing Corporation sells a program called *Footnote* that numbers and formats footnotes in files created by WordStar or Select, another word processor. (See "Fancy Footwork" in this issue for a review of *Footnote*.) This should solve half your problem.

For the other half, the following technique will allow over 200 characters of header text to appear on any number of lines, but it requires some care to align the header correctly.

First, you must define one of the "User Patches." If you have WordStar version 3.3, you can use its WINSTALL program. Run WINSTALL and choose item D, Custom Installation of Printers, from the Installation Menu. Next, select item O, User-defined Functions, from



the Printer Installation Menu.

Change the values for User Function #4 to 0A 0D 00 00. For earlier versions of *WordStar* use the DEBUG program according to the instructions in "WordStar Made to Order" (PCW, Vol. 1, No. 2) to make this patch:

-F 78E L3 02 0A 0D

After the patch has been made, use the following steps to place multiline headers in any file.

At the top of the first page on which you want to include the header, type ^OX to release the margin, then type .HE followed by the text of the first line of the header. When the first line is complete, type ^PR to mark the start of the next line, then type 8 spaces and the text of the second line. Continue using ^PR and 8 spaces to separate each line until the header is complete, then press <Enter>.

Because of the User Patch, ^PR will cause *WordStar* to send a carriage return and linefeed to the printer. The 8 spaces are necessary to align subsequent lines of header with the default page offset. If you use a different page offset, you must use a different number of spaces. You can also add spaces to center a header.

The final step is to count the number of lines of the header, subtract that from the page length (usually 66 lines), and place a .PL command above the .HE command to account for the lines *WordStar* doesn't know about. For a three-line header the command would be .PL63.

Thanks to reader Bert N. Owens of Kansas City, Missouri, who contributed the suggestion from which this technique evolved.

### Debugging Hand-Copied Programs

*Q. Although I really love and enjoy almost every page of PC World, at times I don't. For example, in "Programming Sound in BASIC" (PCW, Vol. 1, No. 4), the PLAY statements on page 178 worked like a charm, so I eagerly entered the program lines for the Bach Minuet on page 183, only to suffer a huge disappointment. The only thing produced by running the program was the mes-*

### Program REMarks prove invaluable.

*sage 'Out of DATA in 110'. I tried every idea that my wife and I could imagine, but nothing made it work.*

*My frustration was greatly increased by an article entitled "Video Game Graphics" (PCW, Vol. 1, No. 5). The game, Block Buster, worked fine except that the ball never got erased. It was great fun to watch but was completely unplayable. Here again we tried every idea that came to mind, all to no avail. What will it take to correct this?*

*Jack L. Stirling  
San Diego, California*

A. I sympathize with your frustration, knowing how it feels to search long and laboriously through hand-entered program listings and ultimately find a letter O that should have been a zero. The following tips will help you enter programs without creating errors:

- Enter program listings character for character, including spaces.

- Hold back the urge to make changes until you have saved a working copy of the listing as printed.

- Watch out for easily confused characters such as 0 and O; 1, l, and I; \ and /; ' and ;; {, and [, etc.

If the program won't run, have a friend proof the hand-entered listing against the printed original.

Now let's look at another error to watch—one that is invisible in BASIC program listings.

Load BASIC and enter the following lines:

```
10 A=9 <Enter>
20 PRINT A <Ctrl>-<Enter>
30 END <Enter>
```

Press the <Enter> key to end line 10, the normal procedure used to end a BASIC program line. But to end line 20, hold down the <Ctrl> key before and while you strike the <Enter> key once. Then enter line 30, ending it by pressing the <Enter> key, as usual.

Pressing <Enter> sends a CHR\$(13) to BASIC, signaling that you are done with a line. Holding down <Ctrl> while you press <Enter> sends a CHR\$(10), the code for a linefeed. The screen appears the same, but a linefeed does not signal BASIC that the line is complete. BASIC considers characters entered after a linefeed part of the earlier line.

Although the program looks correct, when it is run you will see the message 'Syntax error in 20'. Notice that both lines 20 and 30 are listed after the error message. BASIC thinks line 30 is part of line 20. Trying to list line 30 reveals that it does not exist.

This "invisible" error was found by paying careful attention to the error



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## The Help Screen

message that was displayed when the program was run. The error message you received for the Bach Minuet program indicates that the program ran out of data when it tried in line 110 to READ a new value for a variable.

The READ statement in line 110 is within a FOR...NEXT loop. It may be that you had an incorrect value in line 100 that caused an extra READ to occur. Another possibility is that there was not enough information to READ because all or part of a DATA statement had been accidentally left out. It's also possible that the problem was a linefeed at the end of one of the DATA statements, as demonstrated above.

Finding an error is more difficult when the error does not generate an error message and stop the program. At these times, especially if the program is complex, program REMarks prove invaluable. The complete listing of Block Buster includes remarks before each line of program code. The REMarks in lines 242 to 249 and 252 lead me to believe that you had typed line 250 or 260 incorrectly.

If you cannot get a working copy of a program listing in the magazine, send me a disk or a printed listing of the program you have entered, along with a note describing the symptoms and error message(s) and line number(s), if any. Please include a self-addressed, stamped envelope when requesting this kind of specific help. ☉

---

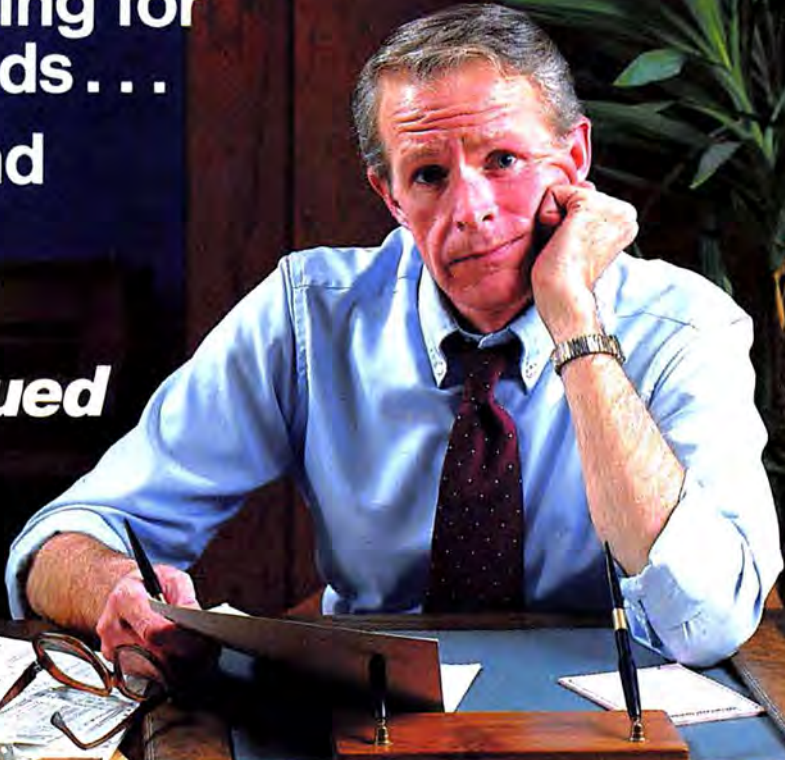
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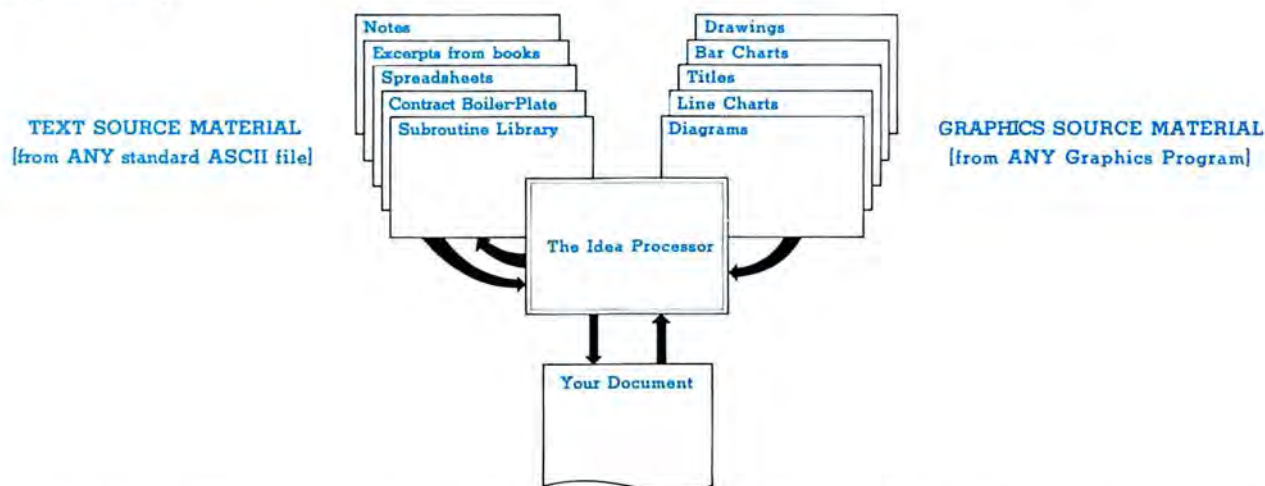
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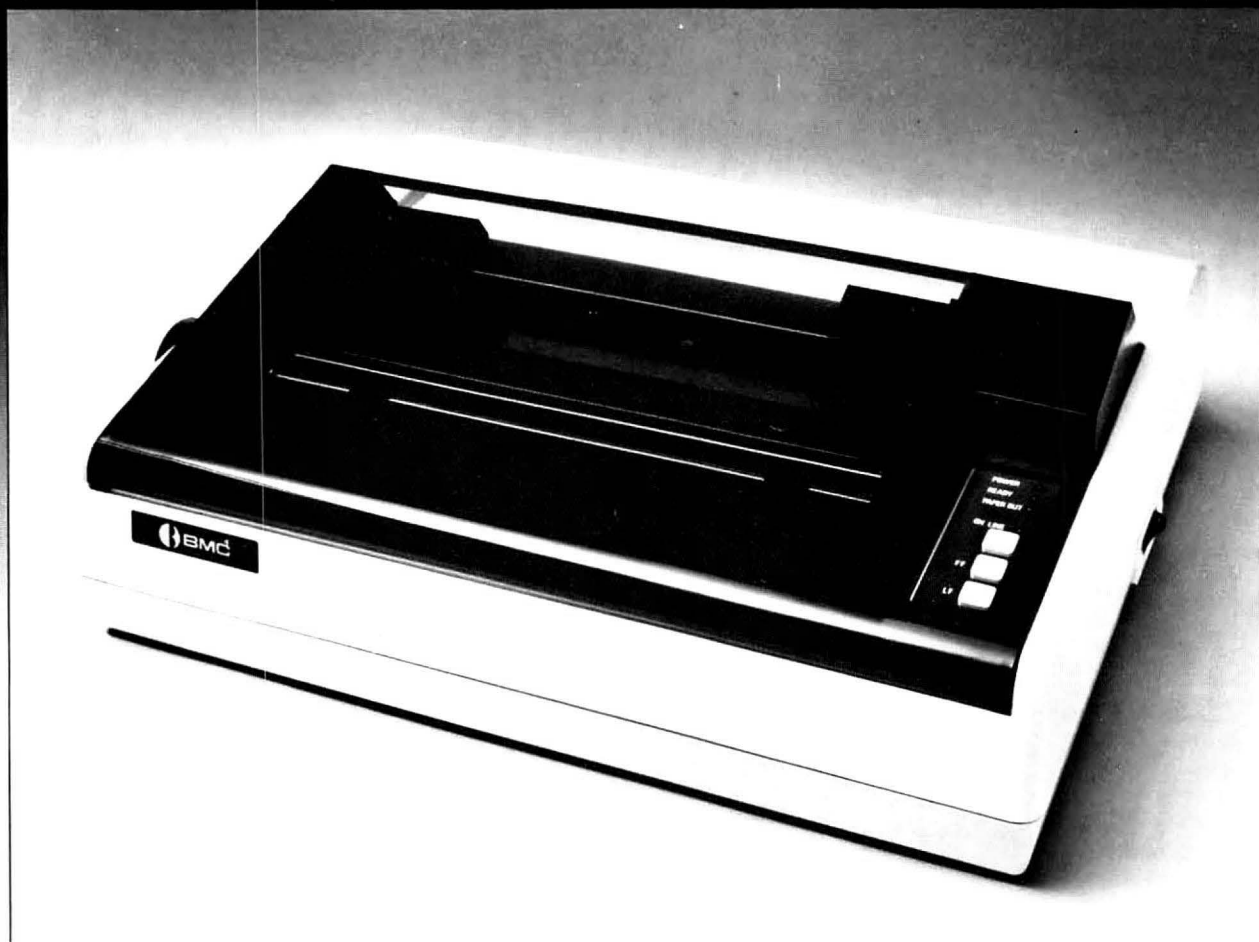
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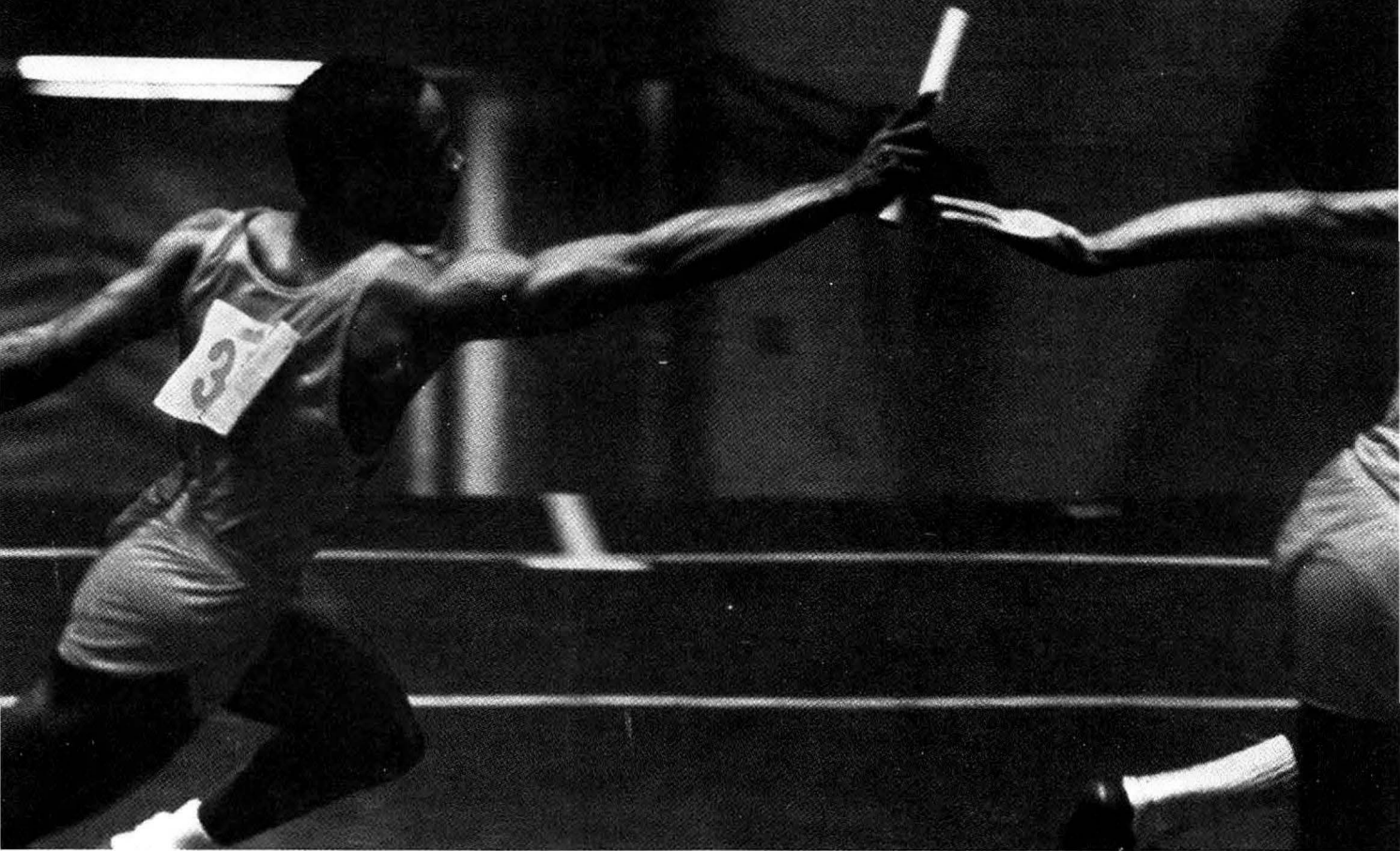
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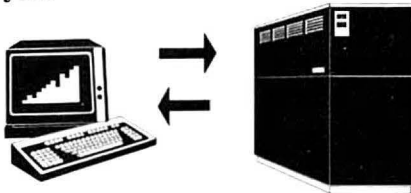
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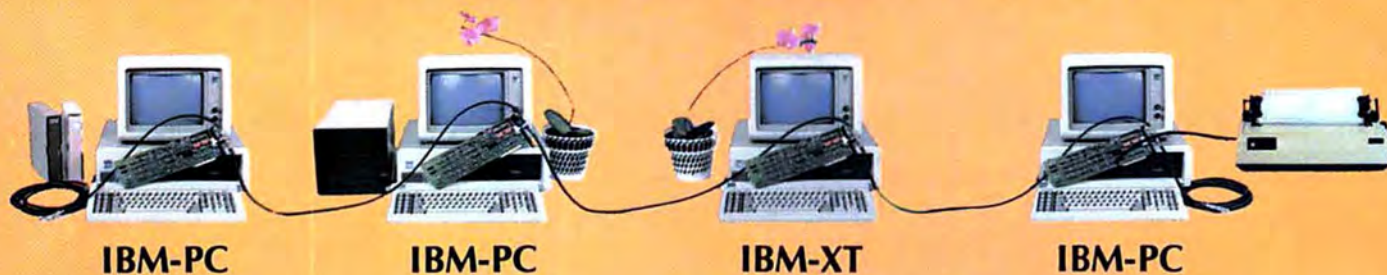
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1977	130	77	43	10	631
1978	126	75	46	7	613
1979	149	94	51	4	644
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# \*.\* Star-Dot-Star

*A global exchange of personal computer discoveries*

*Edited by Andrew Fluegelman*

*The star of this month's \*.\* shows how you can enter parameters to a Compiled BASIC program at the DOS command line level. This is a valuable technique for anyone developing compiled programs. In fact, it's too good a tip to waste any more time on introductions.*

## **BASIC Parms**

Listing "BASPARM.BAS" shows how a Compiled BASIC program can access PC-DOS command line parameters. Using this technique a compiled program can pick up the parameters on the DOS command and take action.

For example; if you type  
PROGA B:DATAFILE.TXT;NEW

as a command or in a batch file, this routine will place in the variable PARM\$ the string  
B:DATAFILE.TXT;NEW

You can then strip away any blanks and separate the individual parts of the parameter string as needed by the particular program.

In the example just listed, the program PROGA may have been written to open a file and to add data to it. The program expects to open the file as an append file unless the NEW part was specified on the command, in which case the file would be opened as an output file.

The comments in the listing "BASPARM.BAS" provide detailed documentation of what the routine does. You should note the warning

that the routine works in a compiled program only and that it should not be altered unless you are very careful not to cause any string variables to be generated.

The best way to use this routine is to place it at the beginning of the program.

*Willard Morris Sparks  
Marietta, Georgia*

*Editor's note: Experimenting with this technique reveals that the first character of PARM\$ will be a space. If you want to get a file spec from the command line, you should include code in your program to the effect of  
300 FIL\$=MID\$(PARM\$,2)  
otherwise you'll get a "bad file" error.*

```
10 ' BASPARM.BAS : 'Routine to determine parameters on DOS
20 '*****
30 ' Calling sequence from BASIC: (compiler only)
40 ' It is very important not to alter the sequence of these instructions
50 ' or insert any code without full knowledge of the interface structure
60 DEF SEG : 'Point data segment register to BASIC segment
70 DIM SUBR%(3) : 'Array to contain machine subroutine
80 DEF USR0=VARPTR(SUBR%(0)) : 'Get subroutine's segment offset
90 SUBR%(0)=&H5B59 : 'POP CX POP BX
100 SUBR%(1)=&H5153 : 'PUSH BX PUSH CX
110 SUBR%(2)=&HEB83 : 'SUB BX,10H
120 SUBR%(3)=&HCB10 : 'RETF
130 I%=0 : 'Dummy parameter to function call
140 PSP%=USR0(I%) : 'Get program segment prefix's segment
150 DEF SEG=PSP% : 'Set Base register at that segment
160 PARMLEN%=PEEK(&H80) : 'Get command parameter length
170 PARM$="" : 'Set up string to receive parameters
180 FOR I% = 1 TO PARMLEN% : 'Loop through parameter string
190 PARM$=PARM$+CHR$(PEEK(&H80+I%)) : ' & Concatenate characters
200 NEXT I% : 'together until end of string
210 DEF SEG : 'Return to normal data string
220 '*****
```

**BASPARM.BAS**



### Defined Functions

Functions defined with the DEF FN statement can be valuable aids in programming. They can reduce the size of a program, increase its clarity, and minimize the number of bugs it has. I have found the following functions useful in my own programming.

The first group of functions, shown in listing "FNMATH", performs some commonly required mathematical calculations. The second group, shown in listing "FNJUST", formats literal strings. If you need to left or right justify with blanks, use the BASIC statements LSET or RSET.

The third group, shown in listing "FNTIME", converts the calendar and clock variables into a more useful numeric format. The date format, YYMMDD, makes it possible to determine the precedence of dates by a simple numeric comparison, which is not possible with the American MMDDYY or the European DDM-

```
' left justify, right justify, and center using a special character
DEF FNLEFTJ$(X$,N,Y$)=LEFT$(X$+STRING$(N,Y$),N)
DEF FNRIGHTJ$(X$,N,Y$)=RIGHT$(STRING$(N,Y$)+X$,N)
DEF FNCENTER$(X$,N,Y$)=STRING$( (N-LEN(X$))\2,Y$)+X$+STRING$( (N-
LEN(X$)) \2,Y$)+STRING$( (N-LEN(X$))MOD 2,Y$)

PRINT FNCENTER$("CAT",20,"#")
#####CAT#####
```

### FNJUST

```
' date in YYMMDD form
DEF
FNDATE(D$)=10000*VAL(RIGHT$(D$,2))+100*VAL(LEFT$(D$,2))+VAL(MID$(D$,4,2))
' time in seconds
DEF FNCLOCK
(T$)=3600*VAL(LEFT$(T$,2))+60*VAL(MID$(T$,4,2))+VAL(RIGHT$(T$,2))

PRINT FNDATE(DATE$)<FNDATE("05/18/84")
-1
RANDOMIZE FNCLOCK(TIME$)
```

### FNTIME

```
DEF FNFLOOR(A)=INT(A)      ' greatest integer less than or equal to A
DEF FNCEIL(A)=-INT(-A)    ' least integer greater than or equal to A
DEF FNMAX(A,B)=B*ABS(A<B)+A*ABS(A>=B)  ' the bigger of A and B
DEF FNMIN(A,B)=B*ABS(A>B)+A*ABS(A<=B)  ' the smaller of A and B

PRINT FNCEIL(1.3)
2
PRINT FNMAX(10,15)
15
```

### FNMATH





MYX forms. The rapid change of the second counter makes the clock ideal for setting the random-number generator. Encoding in this way also makes it possible to use this function for benchmarking algorithms.

*Robert Metzger  
Rochester, New York*

### Keyboard Suppression

These two OUT statements turn the keyboard on and off. To turn it off type OUT 97,204 . To turn it on type OUT 97,76 . You must have the second OUT in memory before you execute the first; otherwise the system will hang.

*Marc-David Seidel  
Roslyn, New York*

### DOS Buffer

*If you're not already making use of the DOS command line buffer, you're in for a treat.*

I discovered this handy feature while drumming my fingers on the keyboard during an exasperating moment while trying to master the DOS syntax. Type

How about that! <ENTER>

When the A> prompt appears again, press <CursorRight> 15 times.

This buffer of the most recent keyboard DOS command is handy when you are using a similar command repeatedly, such as when you are examining the contents of several disks or learning by trial and error the arcane secrets of DOS syntax.

The buffer is revised each time you enter a new or edited DOS command. It holds 125 characters, the maximum length of a DOS command line.

*Steve Miles  
Minneapolis, Minnesota*

### Faster Searches

I would like to share a little trick with other WordStar users. When you request a time-consuming task like "Find & Replace Without Asking," a considerable amount of time is used to display the occurrences of the requested string. When such a display is unnecessary (because the GN option has been selected), you can save time by entering a new command just after starting the execution of the first one. The new command might be either another Find and Replace

---

Do you sometimes  
wish that you could  
toggle your printer into  
any mode directly from  
DOS?

---

(for instance, when you are formatting tables that have been output from a BASIC program) or a simple command like "Top of file" (^QR).

For the incredulous reader, the simple test of replacing all instances of the letter *e* by *ee* in this submission to \*. \* took 1 minute, 32 seconds when the display was allowed to change, but only 7 seconds without the display. When you are editing long texts in which a frequent word or group of words has been replaced by a special character (~ for instance) or formatting tables, this little trick can save a lot of time. Of course, the savings in time occurs for most other commands too.

*P. Jeanty  
New Haven, Connecticut*

### Did You Know That...?

There are many undocumented or little-known features of Microsoft BASIC that can be quite useful. Here is a sampler.

- You don't need to put a closing double quote around file names that are the only parameter of a command; LOAD "FILESPEC" is just as acceptable as LOAD "FILESPEC" .

- You can use square brackets to dimension and index arrays. This can make statements that have many parentheses easier to read; DIM A[20] OR A[1,2] works just fine.

- You don't need to put a comma, semicolon, blank, or concatenation symbol between items that constitute a parameter list for PRINT. For example, PRINT "STRING"STRINGS(10,40)AS is an acceptable entry.

- If you are using a color monitor, you can work in DOS in color by typing the following in BASICA: COLOR *n* : CLS : SYSTEM in which *n* is the number of the color you want.

- If you are using Boolean data and need all 16 bits that can be stored in a 2-byte integer, write your data in hexadecimal or octal. This avoids the necessity of computing the two's complement of your constant to turn on the high bit (two's complement notation is the way negative numbers are stored). For example, PRINT &H0F0F OR &H0F0F

- You don't need to put the number sign (#) in front of file numbers for file statements such as CLOSE, FIELD, GET, etc.; GET 1,10 is the same as GET #1,10.



○ You can't put a comment at the end of a DATA statement—DATA 10,20,30 'comment won't work. This flaw can be overcome by starting a new statement: DATA 10,20,30 :comment

Robert Metzger  
Rochester, New York

## DOS Printer Toggle

Are you frustrated when a particular program will not support a print style or size that you would like to use for output? Do you sometimes wish that you could toggle your printer into any mode directly from DOS? A simple solution is available.

Since a device name can be substituted for a file name, it is permissible to type COPY CON: LPT1:, which tells DOS to send input from the keyboard (CON:) directly to the printer. Realizing this, it is a simple step to key in the ASCII numbers of the characters needed to put the printer into any type style or size by using the <Alt> key in combination with the numeric keypad.

Here is an example that switches an Epson printer from normal pica into italics by sending the sequence <Esc> followed by 4. Note that <Esc> (ASCII 27) must have the value 128 added to it (27 + 128 = 155); otherwise DOS will react to the <Esc> character. The printer will recognize ASCII 155 as having the same meaning as ASCII 27.

COPY CON: LPT1:<ENTER>

<Alt>155 (on keypad)<Alt>4(on

keypad)<ENTER>

<F6><ENTER>

The screen will look like this:

COPY CON: LPT1:"

c^D

^Z

1 file(s) copied

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Ralph F. Keuler  
Seattle, Washington

#### Batch File Filer

After reading about the "Poor Person's Word Processor" (\*., PCW, Vol. 1, No. 3) I thought I would send you my "Poor Person's Note File." After using this batch file, which demonstrates some of the powerful capabilities of DOS 2.00, we may find a whole series of poor person's software pouring into the global exchange.

Recently, I had to keep a file of note cards that could be rapidly searched with one or more key words, or possibly a key phrase. Not wanting to pay \$200 or more for a note file program and not wanting to take a lot of time to develop my own, I turned to my new DOS 2.00 manual and found the FIND filter (say that ten times).

```
10 OPEN "YOUR1.FLE" AS #1 LEN = 242
20 FIELD #1,2 AS YR$, 1 AS SLASH$, 2 AS MON$,
   1 AS SPA$, 20 AS SOURCE$, 1 AS SPA2$, 20 AS
   AUTH1$, 1 AS SPA3$, 16 AS KEY1$, 1 AS SPA4$,
   15 AS KEY2$, 160 AS NOTE$, 2 AS LINEND$
30 INPUT "2-digit code";CODE%
40 IF CODE% = 99 THEN CLOSE: END
50 LINE INPUT "YEAR:";YEAR$
60 LINE INPUT "MONTH:";MONTH$
70 LINE INPUT "SOURCE:";MAG$
80 LINE INPUT "AUTHOR:";AUTHOR$
90 LINE INPUT "ADDITIONAL KEYWORD:";KEYWRD$
100 LINE INPUT "LOCATION (PAGES):";PAGE$
105 PRINT "NOTE:"
110 LINE INPUT INNOTE$
120 LSET YR$=YEAR$
130 LSET SLASH$ = "/"
140 LSET MON$ = MONTH$
150 LSET SPA$ = " "
160 LSET SOURCE$ = MAG$
170 LSET SPA2$ = " "
180 LSET AUTH1$ = AUTHOR$
190 LSET SPA3$ = " "
200 LSET KEY1$ = KEYWRD$
210 LSET SPA4$ = " "
220 LSET KEY2$ = PAGE$
230 LSET NOTE$ = INNOTE$
232 LSET LINEND$ = CHR$(13) + CHR$(10)
240 PUT #1, CODE%
250 CLS: GOTO 30
```

#### NOTEFILE.BAS

Aha! Here was a ready-made program that would search a text file for a particular word or phrase and display every line in the file in which the key word/phrase appeared. This is close to what I needed, but I also wanted to be able to have several key words present in a particular line before it was displayed. A little tinkering with the batch facility produced the solution, which has proven very useful. I call it LOOKFOR. To key it in use EDLIN or type in the listing reproduced in "LOOKFOR.BAT."

To search YOUR1.FLE and YOUR2.FLE for every line containing several key words enter, for example

LOOKFOR injury spinal ?

After some delay, every line in YOUR1.FLE and YOUR2.FLE that contains both words will be displayed. The batch file works by first searching YOUR files for the word *injury*, creating a temporary file of all



```

echo off

cls

find "%1" B:your1.file B:your2.file >templ.srh
:continue
shift
if not %1 == ? goto next1
more<templ.srh
goto endsrh
:next1
find "%1" templ.srh >temp2.srh
shift
if not %1 == ? goto next2
more<temp2.srh
goto endsrh
:next2
find "%1" temp2.srh >templ.srh
goto continue
:endsrh
if exist templ.srh del templ.srh
if exist temp2.srh del temp2.srh

```

#### LOOKFOR.BAT

the lines containing that word, and then searching the temporary file for all occurrences of the word *spinal*. This process would continue for as many key words as were requested in the LOOKFOR command. The question mark delimits the list of key words; if you forget to put it there, everything will still work, but the message 'syntax error' will briefly appear on the screen.

Imaginative key words can ensure that you find all note references that you are interested in. For example, if I used *injur* and *spin* instead of *injury* and *spinal*, I would have seen all references to spine or spinal injuries, or injured spines, etc.

When you are using more than two key words, there will be a fair amount of disk accessing. What I do is set up my emulated disk; copy LOOKFOR, FIND, and MORE to the emulated disk; and make the emulated disk the default drive. This causes the searches to be almost instantaneous.

An efficient note file can be set up using BASIC's random file mode. If you format 240 characters of information into each record you place into the file, the LOOKFOR command will display your notes in a neat format on either an 80- or 40-

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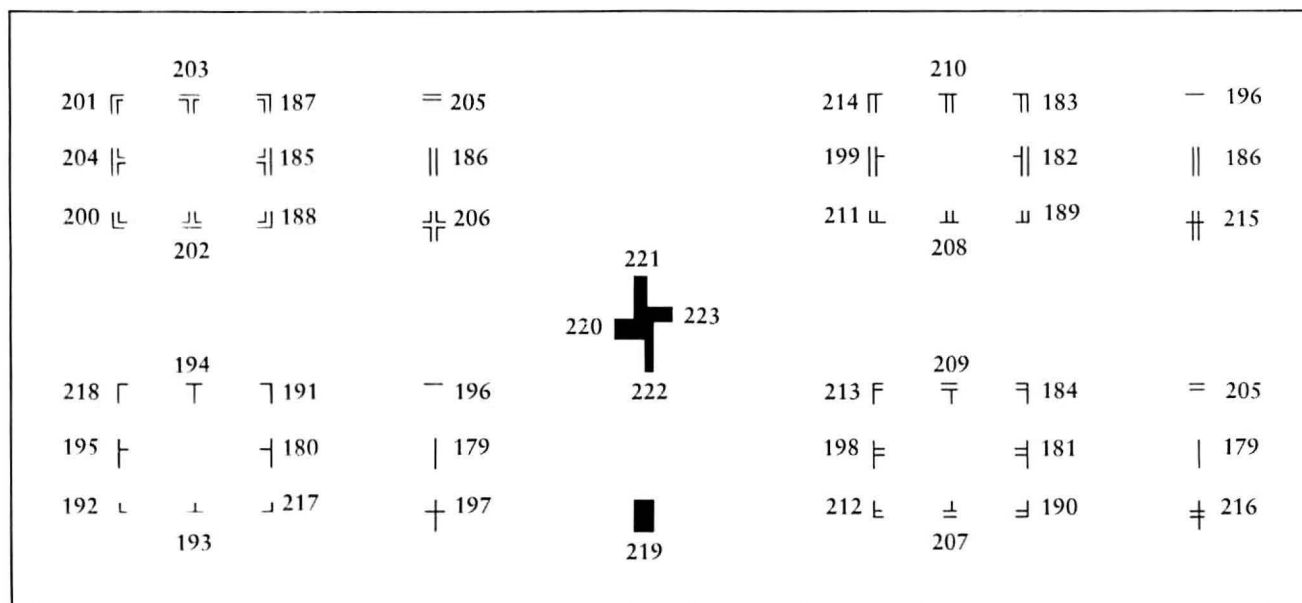
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column screen. The actual file will be set up with a record length of 242, the last 2 characters containing a carriage return and line feed so that the FIND filter will view the random file as a text format and treat each record as one line in the file. The listing "NOTEFILE.BAS" is a simple example of how such a file might be created.

Douglas D. Miller  
Tulsa, Oklahoma

*Rich Schinnell passed along a chart that finally makes sense of IBM's haphazard ASCII numbering of the PC's graphics characters (the chart is*

By accident I have discovered an interesting phenomenon that does not seem to be covered in IBM's manuals and that could be useful in keyboard entry functions.

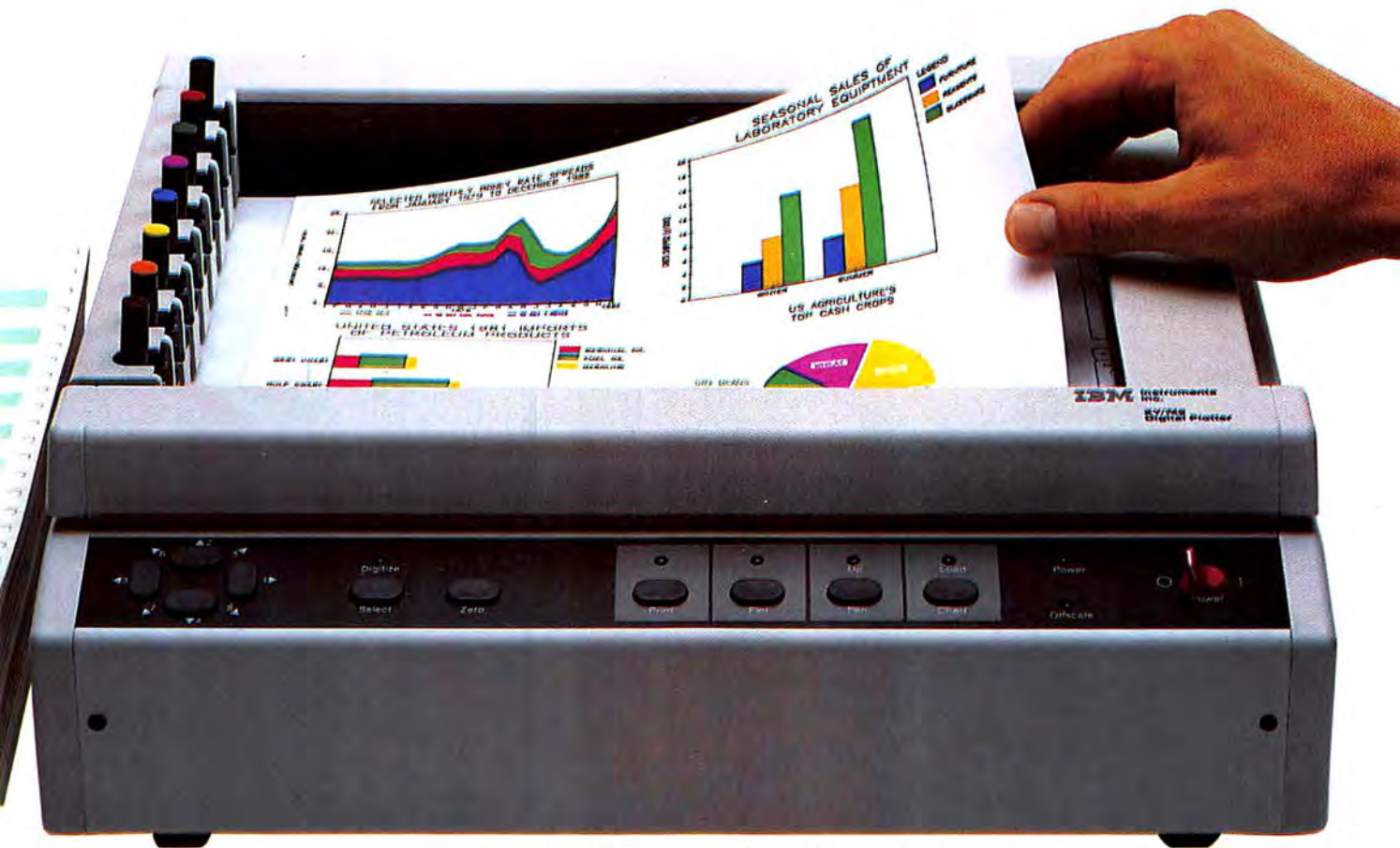
```
10 LINE INPUT AS: LINE INPUT BS: PRINT
   BS
```

If you press <ENTER> without actually keying in any data, you will find that the PRINT statement will display the character string that was entered in A\$—even though no characters were keyed into B\$.

Steven A. Green  
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# All work, and no play, makes Charlie dull.

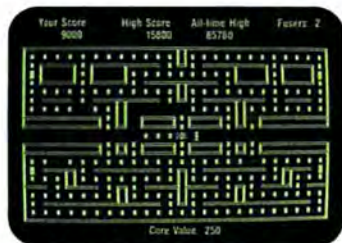
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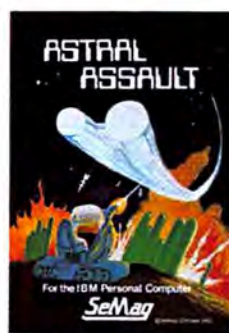
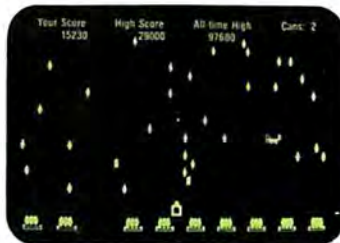


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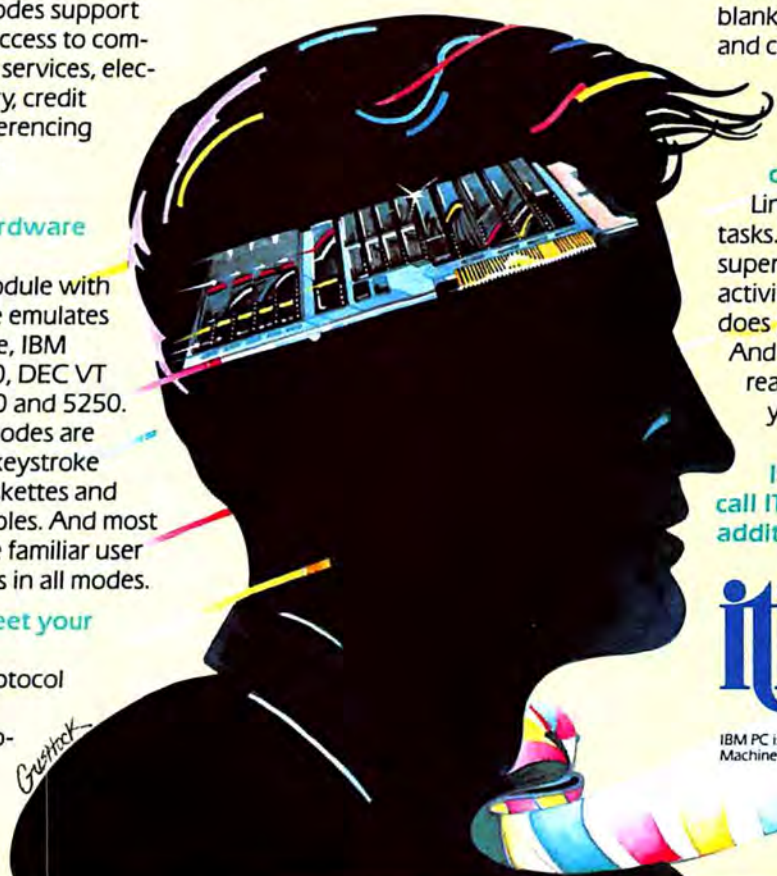
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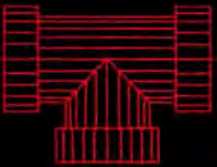
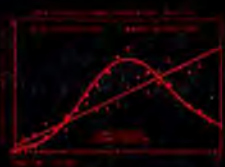



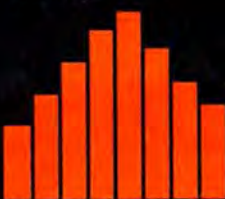
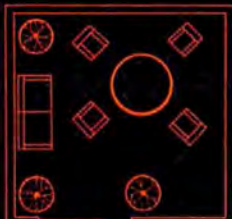


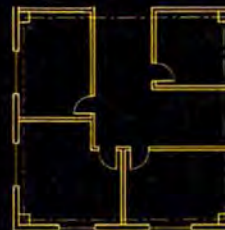
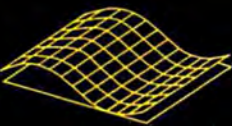

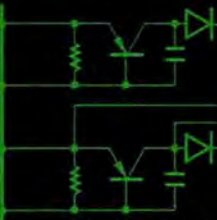
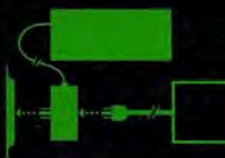

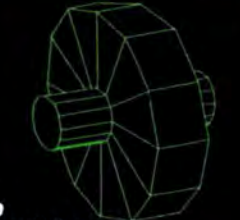



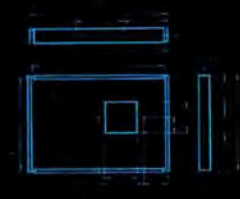
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# No More Pencils

Linda V. Williams

*Remember book reports and term papers? Hours of scribbling down words, crossing them out, and crumpling up papers in fury and frustration. At Jordan Middle School in Palo Alto, California, the attitude toward writing is changing, and not just for the literary hotshots. At lunchtime the school's computer center is full of kids using IBM PCs to write.*



Shelly Zulman and Debbie Bass at the keyboard.

The students at Jordan Middle School include boys and girls, members of the literary magazine and students who have severe learning problems, "good" students and kids that most teachers consider goof-offs. The one thing they have in common is their enthusiasm for writing on a computer. They're writing reports, letters, poems, and stories. They are even drawing pictures.

What does word processing do for these students? Pretty much the same things that it does for adults, but before students develop all sorts of bad habits and an antipathy for writing. Word processing makes writing easier and less frustrating than the usual pencil and pa-


per methods. It substitutes neatly printed sheets for pages of smudged and erased scrawl. It makes rewriting easy enough that students are willing to make revisions.

By eliminating the need to copy and recopy everything by hand, the computer frees students from the most time-consuming and least creative part of the writing process. Revising becomes a challenge instead of a punishment, and students can put energy into composing and polishing their work to produce better papers.

One student estimates that his marks are a full letter grade higher when he composes on the computer than when he types or writes by hand. Apparently his peers agree: 300 of Jordan's 900 students have taken the word processing course, and 800 have signed up for some computer instruction.

Mike Leonard, a graduate student from the Stanford University School of Education who developed Jordan's word processing course, observed that working on a computer changes students' perceptions of the writing process. "Some students come in to produce a ten-page story and go through seven revisions. They have the experience of really getting into writing, and they produce a wonderful final copy. That's something they simply wouldn't have done if they'd had to sit there with pen and paper."





Students at the other end of the academic spectrum, the nonwriters, benefit from word processing as dramatically as their more verbal peers. Leonard explains that "many of these kids have never had the experience of

turning in a piece of written material that looked good and felt good to them. They've never known what it feels like to become involved in writing in a positive way and to feel proud of the results."

These students begin by producing short papers, maybe only a paragraph or two, but those short papers look good to their creators and can form the beginning of longer pieces of writing. "We have kids who add a chapter to their one paragraph and have the beginning of a very nice story," Leonard notes. "There's a lot of creativity and a sense of 'Wow, I actually did something.'"

### A Tool for Learning Problems

Among the most confirmed of the nonwriters are those students who have learning problems that make writing particularly difficult. Special education teacher Marco Dondero has many such students in his classes. He explains, "These kids really hate the physical act of writing. It's very difficult for them to produce the thoughts and put them down on paper. It makes all the difference

for them to be able to write something once in a rough draft, put it up on the computer screen, correct it there, and get a finished product that looks really nice."

With the encouragement of Joan Targ, who directs the computer center at Jordan, Dondero brought a PC and printer into his special education classroom. His students have a variety of learning disabilities that are serious enough to require one or more periods a day of special help to enable them to function in their other classes. Dondero developed a program that would take six weeks; his goal was to help his students become better writers. At the end of the project he was convinced that the computer had indeed helped to achieve that goal, and he discovered benefits beyond those he initially envisioned.

His special education students not only wrote better, they felt better about themselves and their abilities. For the first time they were enthusiastic about writing. They wanted to write longer reports because their first three- and four-paragraph efforts looked too small when they were printed; they wanted to use the computer to write letters, book reports, and assignments for other classes. The novelty did not wear off. These kids wanted to use computers all the time.

Dondero asserts that the computer "has unprecedented power to change self-image and the ability to deal with a learning process that is extremely difficult." The issue of self-esteem is especially important for students who have learning disabilities. Many of them suffer from a poor self-image that can be an even more serious handicap than their learning problems. Being able to control a machine that has a reputation of being smarter than human beings boosts their self-confidence tremendously.



## A Nearly Optimal Environment

Jordan Middle School's computer center is a far cry from the three or four machines that most junior high schools are lucky to possess. It contains 22 computers (12 of them PCs loaned to the school by IBM), 14 printers, 2 Hewlett-Packard plotters, and a Votrax voice synthesizer. The computers are housed in two adjoining classrooms. The machines in one room are used for programming and those in the other for word processing and spreadsheets. Both rooms are full of kids from before classes begin until the last diehards are sent home at 6 p.m.

The rooms do not look or feel like classrooms. No teacher lectures groups of students. In fact, the adults in the room do very little formal teaching; they are there mainly to answer questions, offer explanations, and help students keep track of their schedules. The teaching is carried out primarily by the students themselves under a peer tutoring arrangement.

When a student selects an area to study, such as word processing, he or she is assigned a tutor—another student who has completed that course. The tutor helps the new student work through the material and answers questions that arise. Adults are available to help when the tutors need them, but anyone who has a problem is usually surrounded by a pack of young experts anxious to offer advice.

In the back of one of the rooms several desks form the office of Interactive Sciences, Inc. (ISI), a nonprofit organization devoted to studying the role of computers in education. ISI is the creation of Joan Targ, who originated the computer program at Jordan several years ago, and Jeff Levinsky, who began teaching advanced programming at Jordan while working at Hewlett-Packard.

The close relationship between the school's computer center and ISI creates a unique environment in which teaching is combined with hands-on research. Jordan's location in the heart of Silicon Valley enables the ISI staff to keep in touch with the most recent developments in the computer industry and gives them access to experts and a knowledgeable and talented pool of volunteers.

While Jordan's rich array of hardware is beyond the means of most schools, the lessons learned there can be applied in schools of more modest means. Having so many machines allows

the staff to explore what is possible in a nearly optimal environment. It also creates a setting in which educators can experiment with state-of-the-art equipment to discover potential applications for education.

Jordan's word processing course gives an example of how this process works and the benefits it has for other educators. Targ became interested in



Tristan Nathe and Jiaming Li in a joint effort

the applications of word processing to education several years ago. At that time, word processing was considered too costly for use in schools. Targ had the foresight to recognize that in computers today's extravagance is tomorrow's necessity.

She convinced several companies to lend the school the equipment it needed and enlisted the help of Mike Leonard, a graduate student in Interactive Educational Technology at the Stanford University School of Education, to develop the word processing curriculum. As a result of these efforts, Jordan has several years of experience with word processing and can serve as a resource to other schools just beginning to explore it.



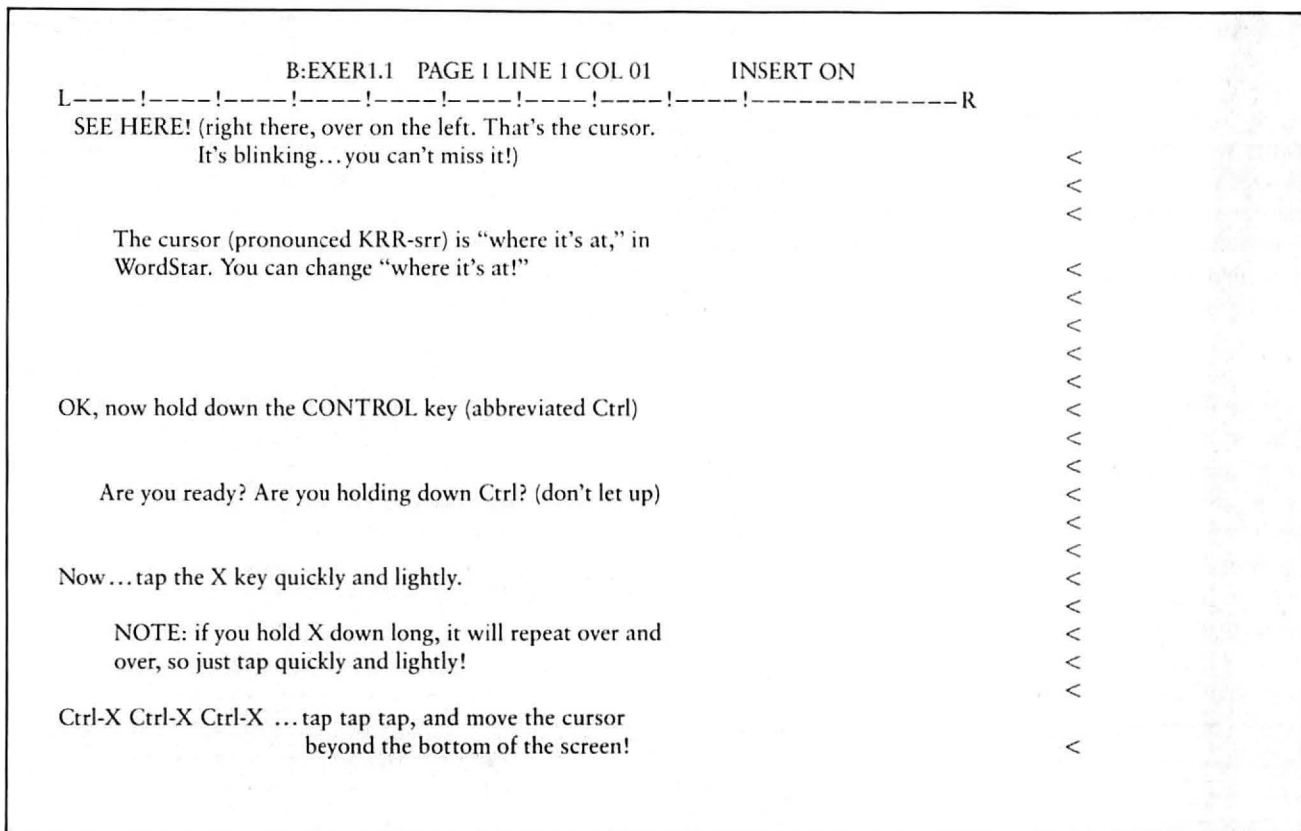


Figure 1: WordStar learning screen

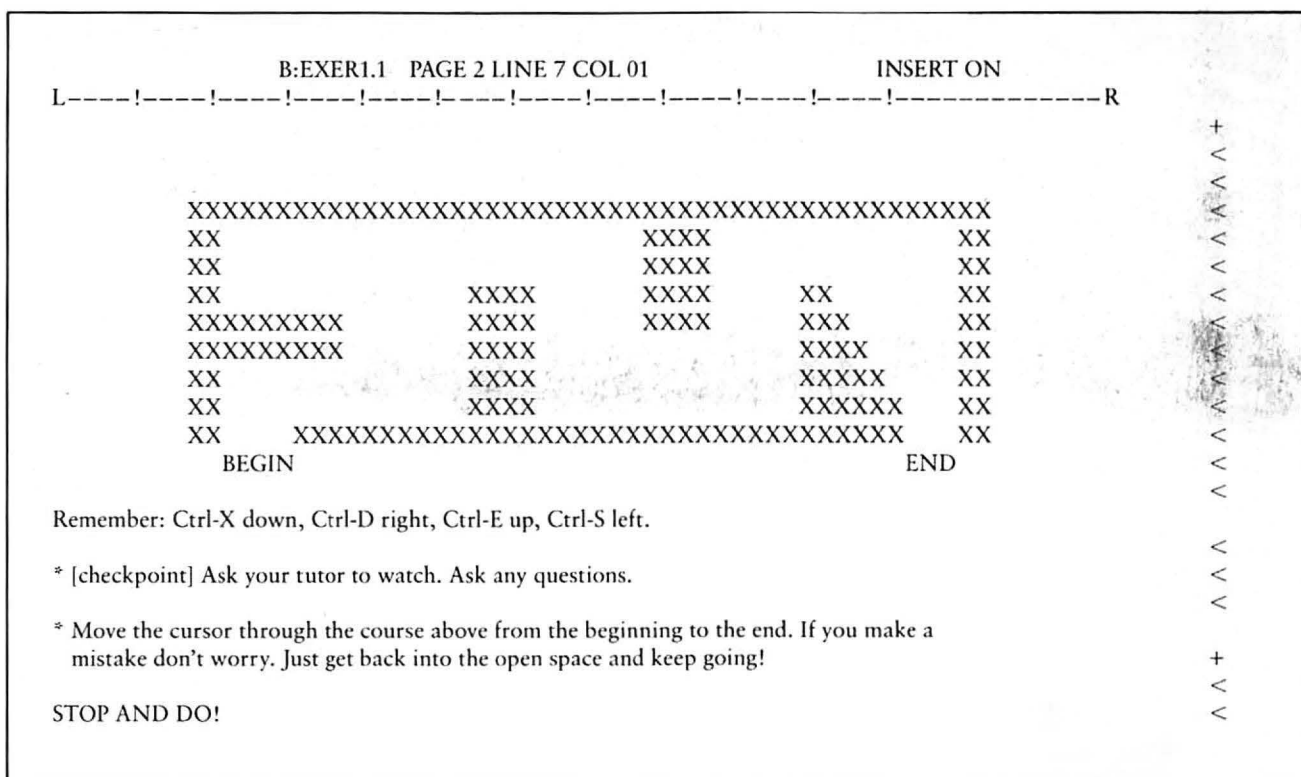


Figure 2: Maze for cursor movement



## Community

The PC has now been moved to another special education classroom, and Dondero admits that he's experiencing withdrawal symptoms. He had come to rely on the machine for a number of purposes beyond writing, and like many other computer users, he doesn't want to be without it. He has decided to try to solve the problem by applying for a grant to buy a computer for his classroom.

### Starring WordStar

Whether they're working on the great American novel or struggling to create a single paragraph, the students at Jordan all use the same word processing program—*WordStar* from MicroPro International. Anyone who has attempted the difficult task of mastering *WordStar* will be impressed that most students learn to use the program in about six hours of tutoring.

Although word processing programs are available for young people, Targ decided that if students could learn to program a computer, they could learn to use a standard word processing program. She wanted the students and the clerical and teaching staff to be able to use the same program. She points out that students finish the

word processing tutorial knowing how to use a program that is widely used in business. An additional benefit is that they are capable of tutoring their teachers, parents, fellow students, and members of the community.

*WordStar* is a mammoth program that has many advanced features that beginners don't need to know. Targ and her colleagues began designing the Jordan word processing course by determining what students did and didn't need to know. They decided that students must be able to start the machine, get the program going, open a file, type in text, save a file, print, go back into a file, and revise text. Then the course designers devised a series of lessons with exercises that taught students how to do those things. They also modified the *WordStar* systems disk so that the course lessons and exercises appear on the screen (see Figure 1).

The exercises are designed to appeal to adolescents and make the learning process enjoyable. For example, cursor control is practiced by challenging the learner to maneuver through a maze without bumping into walls (see Figure 2). Leonard reports that once students master the basic skills that enable them to write on the computer, they become hooked. They begin to use the computer for all their writing and are motivated to explore the more advanced features of *WordStar* as they need them.

### A Tool with Many Uses

Jordan Middle School's word processing course does more than simply teach students to use *WordStar*. It introduces them to the power of the computer as a tool for writing. By making the process of writing easier and more enjoyable, it encourages them to explore new possibilities. At Jordan the students aren't waiting for teachers to tell them what to do with the computers; they are enthusiastically figuring out uses of their own.

For example, last year the yearbook staff decided to use computers to prepare copy. This year they hit upon the idea of using the machines for a mailing campaign to solicit ads from local merchants, and they are busy exploring the power of form letters. The literary magazine staff is using computers to type copy and to produce an endless series of memos to the school's English teachers.

Given the power of the PC and the ingenuity of kids, who knows what they'll come up with next year? ●

---

*Linda Williams is an educational consultant and the author of Teaching for the Two-Sided Mind (Prentice-Hall, 1983), a book that explores the implications for education of recent brain research. She is currently writing a book on EasyWriter II.*

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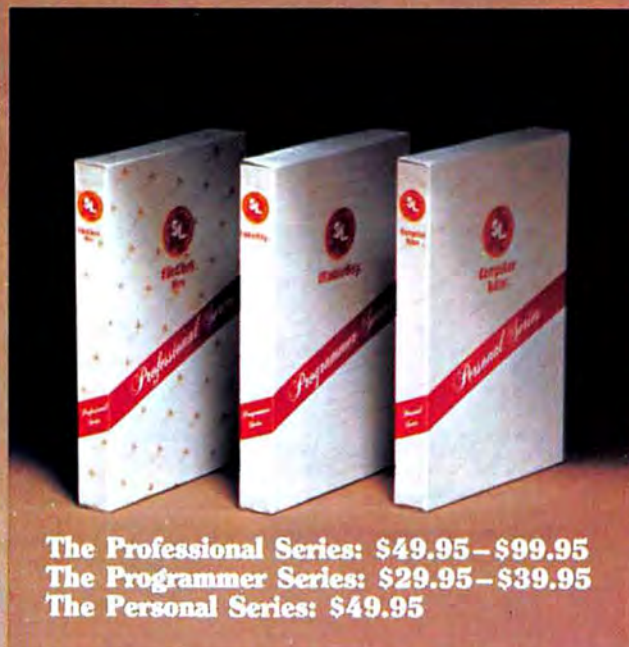
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# Small-Town PC

*Rural community governments use the PC to modernize office procedures.*

*Edwin T. Moore*

The IBM Personal Computer and compatibles are becoming prominent fixtures on the desktops of our civil servants. This phenomenon attests to the great potential that the PC has for improving our bureaucracies. Although most personal computer implementation is taking place in metropolitan areas, the governments of small towns could benefit as well. In fact, much of the nation is composed of small towns. In Vermont, for example, 93 percent of the state's 300 municipalities have populations of under 5000. The efficiency provided by use of the PC in small-town government could help reduce the need for so much bureaucracy at the more complex state and federal levels.

Although details vary from one community to another, there are many similarities among the kinds of work required of small-town governments. Most communities entrust their local governments with important tasks that require vast amounts of information processing and calculation, such as preparing budgets for community expenditures, keeping track of community finances, and maintaining a variety of extensive lists.

In many town offices bookkeeping and repetitive work are done by hand in much the same way they were done in the days of George Washington. This process tends to keep knowledge of vital information in the heads of the few people who actually produce it. Even elected officials, whose decisions should be based

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The PC is a logical candidate for use in small-town government offices.

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upon sound information, frequently do not have ready access to the facts they need. Local governments could benefit from having information more readily available for the conduct of their affairs. Better visibility of financial and other vital data for the responsible officials can lead to more efficient management.

Because of its widespread acceptance in the marketplace, its reasonable price, its remarkable computing power, and its relative ease of operation, the PC is a logical candidate for use in small-town government offices.

## Investing in the Future

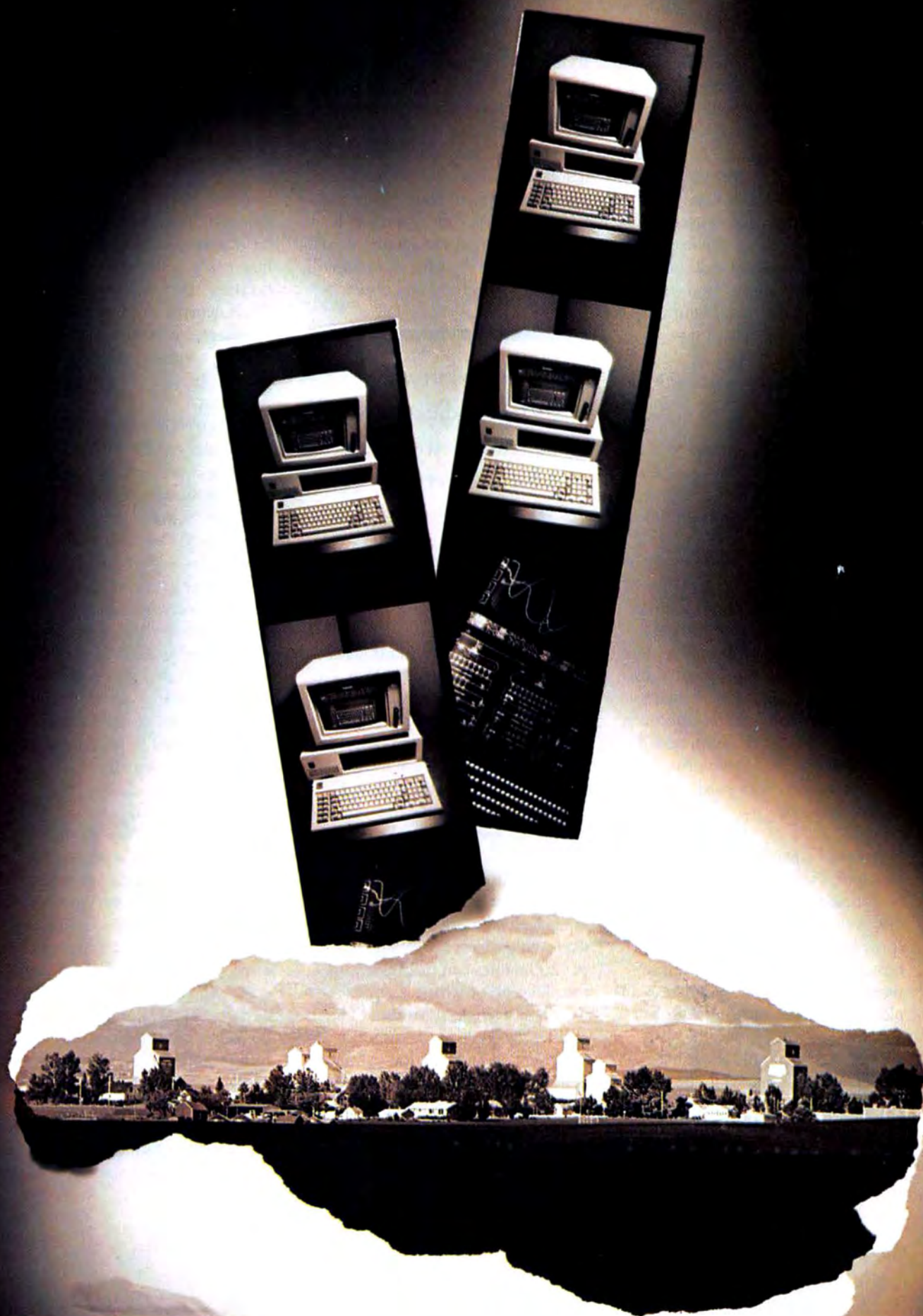
At a recent meeting, officers of small towns in Vermont expressed great interest in the PC. Many small towns are ready for the PC, and the PC is ready for them. Although most small-town officials and office personnel lack computer experience, many are interested in learning; most are aware that computers will soon become a part of their daily work.

Another advantage of the PC is that it offers more flexibility at less cost than other computers. No longer must a community spend more money than it can afford to computerize its operations and end up with more computing power than it needs.

The current rapid development in computer technology dictates that a provision be made to upgrade software and hardware continually. Towns that purchase PCs will be in better positions to upgrade than those that have made larger investments. Displaced hardware and software may be offered to schools and other organizations that have less sophisticated requirements.

The community where I live, Underhill, Vermont, has a population of 2172. The town office does not yet have a computer, but town officials







## ● Community

plan to purchase a PC within the near future. For the past year the town treasurer of Underhill has been bringing her checkbooks to my office each month to prepare monthly expense reports on my IBM PC and now on my XT. The XT with its 10-megabyte hard disk is an excellent choice for small-town applications. The built-in asynchronous communications board allows modem connection with other communities that have computers and with state-level computers as well.

Double-sided disk drives provide sufficient storage space for programs and data files for most needs of small communities. Using floppy disks is a convenient way of safekeeping backups of vital records. They require very little storage space in community vaults or safes.

Selecting a printer may require special consideration. For many towns letter quality printing is not necessary. Since most reports are printed relatively infrequently, high-speed output is not an essential feature. A wide printer may at first seem essential for multicolumn printouts; however, utilizing the compressed type option available with many 80-column printers may produce satisfactory reports.

### Software Considerations

Much of a small town's business can be handled with a few software programs that include word processing, spreadsheet, and data base applications. Starting with fundamental word processing and spreadsheet applications before tackling data base applications can produce results sooner and help build the novice's confidence and understanding. If the computer is viewed initially as a data base machine, the novice may get frustrated too easily.

Selecting programs is a matter of individual preference. We use *EasyWriter 1.1* and the extended version of *VisiCalc* with *StretchCalc* to produce reports for Underhill on my XT. Regardless of the program selected, sufficient software exists to handle almost all the routine work now done in local government offices. Given the right approach to each application, satisfactory results can be obtained with a minimum of additional programming effort.

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Sufficient software exists to handle almost all the routine work done in local government offices.

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One of the simplest tasks for the PC is maintaining lists, such as one for registered voters. Additions and deletions must be made before elections, and typing revised lists containing hundreds of names can be a chore for any small-town office. If the list consists of only the names of the voters, a word processor such as *EasyWriter* can handle the job easily. Simple insertions and deletions followed by reprinting eliminate retyping entire lists.

Larger lists can be made more manageable by breaking them down into smaller files. For example, a list of 1200 names can be divided into four files, all of which occupy less than half a single-sided disk. These smaller files reduce the response time for insertion and deletion commands and allow for growth in each file. A link command allows separate files to be printed to appear as one continuous list. For more complex searching and sorting operations, a data base management system may be used. Using embedded commands, a word

processor can effectively shape the printed copy. For example, reducing the space between lines allows more names to be printed on a page. Processing a checklist in this way will save hours of tedious work and provide files ready for the next revision.

### Expense Reports

All towns must keep track of expenditures in some way. They differ from businesses in that they are not required to file tax returns to the IRS. Their expense accounts are usually maintained on general ledger sheets that are compiled periodically to produce reports to town officers and taxpayers.

Using a PC with 256K and *VisiCalc*, I designed a worksheet that produces intermediate and final expense vs. budget reports. This format would be suitable for almost any small town. One area of the worksheet is devoted to the final report, while other areas are used for input data and intermediate results. User instructions for this application are very simple: a code sheet describes the cell (or cells) into which each type of expense is entered, and a set of instructions describes the sequence of steps needed to produce the report and necessary backup.

### Tax Management

For many small-town governments the most complex work involves local property taxes. It entails maintaining up-to-date lists of every property and every taxpayer in the community. This data is affected by every transfer of property, evaluation of a property's worth, tax bill sent, and tax dollar received. For all but the smallest towns, this task requires data base programming. Word processing is inadequate because of the inability of most word processors to handle numerical calculations, and spreadsheets are limited for this application because either the volume of data



soon exceeds the memory capacity of the PC, or they do not possess the programmability needed for the job.

Property values as determined by appraisers or listers are the basis for local town and school taxes in most communities. Towns must compile grand lists that include all property owners' names and addresses with descriptions of properties and appraised values. Annual preparation of revised grand lists is an important and time-consuming part of the work of local government offices. The computer can offer great assistance in this work. Towns in Vermont have the option of either preparing their own grand lists or utilizing the state computer to do much of the work. This year 40 Vermont towns, including Underhill, will have their grand list prepared by a central IBM 4341 located in Montpelier, the state capital. Communications with individual towns is done through the Office of Property Value and Review in Waterbury, which is in turn connected via a dedicated phone line to the mainframe in Montpelier. Next year the number is expected to grow to at least 60.

After property values have been established, the mainframe prepares the required reports, including grand lists and tax books for each town, tax bills for each property owner, notices of changes in appraisal, and mailing labels if desired. Having experience on the mainframe will help some towns understand what a small computer can do for them.

A centralized computer system, however, has some disadvantages:

- Loss of flexibility in designing a program.

- Required conformity to a more elaborate program than the community needs.

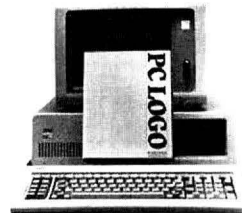
- Less control over the end product.

- Dependence upon the central computer to be up and running when output is needed. Delays occur when several towns need reports at the

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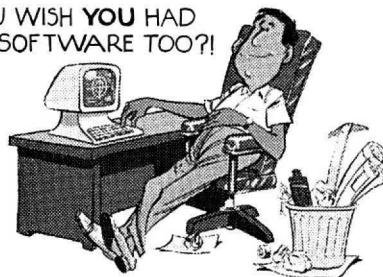
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## Community

same time, forcing some to wait for results of revisions and additions.

The disadvantages of the centralized system have caused some small towns to create their own grand lists using PCs. Those towns that already use the services of a centralized computer may also wish to own a PC with a modem connection to the central computer so that they can receive output from it more quickly.

After the grand list is prepared and tax bills are sent out, received tax dollars must be checked against each tax account by the local government offices. Although people pay taxes more often at certain times, it is customary to keep daily records of such receipts. Each payment must be identified and credited against its obligation to maintain current status for each account. Delinquent taxes must be determined and transferred from the current tax account to the tax collector. Although such an application might be handled by a spreadsheet for a very small town, a data base program is better suited to the task. With this approach one file can contain daily transactions and a second file the individual taxpayer accounts; command files then control the processing of transactions against the proper account.

### Training

More challenging than finding the right combination of software and hardware to do a given job in a local government is training personnel. Many small-town government employees have years of experience in their jobs but minimal computer experience. They may be concerned about the computer's effect on their control over information and job security. An important aspect of training is showing that the computer provides opportunities for better control of information than was previously possible and a chance to learn new skills that will improve the quality of an individual's contribution to the local government.



Different communities will take different approaches. In some, an opportunity will be created for a new person to join the office as a computer operator. Other communities will opt to train existing personnel. The town of Fairfax, Vermont (population 1805), for example, recently purchased an XT. After just a few hours of demonstration on how to use Lotus Development's 1-2-3, the town clerk and treasurer, who had had no prior computer experience, was able to produce an excellent 18-page change-of-appraisal report.

Some present personnel would rather not learn to use a computer but feel able to direct the work of those who do the computing. Patience is required in this area, as it sometimes takes a long time to show the benefits of the computer to "old-timers." In Vermont a statewide committee has recently been established to approach the challenge of promoting the use of microcomputers in small-town government offices. A major thrust of this committee's efforts is to address these questions about training personnel.

The work performed by small-town governments indicates many opportunities for practical PC applications. Although differences in the details of conducting business prevent a uniform approach for all small towns, programs can be tailored to the particular needs of each community. The modest cost of the PC will permit any town to own one and enable it to personalize its own applications. The result should be improvement in the accuracy, speed, and quality of work while each town maintains its individuality. ☺

*Edwin T. Moore is an engineer/builder living in Underhill, Vermont, and a consultant in the use of the IBM PC for small-business and community government applications.*



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Account Number: \_\_\_\_\_

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Name: \_\_\_\_\_ Apt. No. \_\_\_\_\_

Address: \_\_\_\_\_

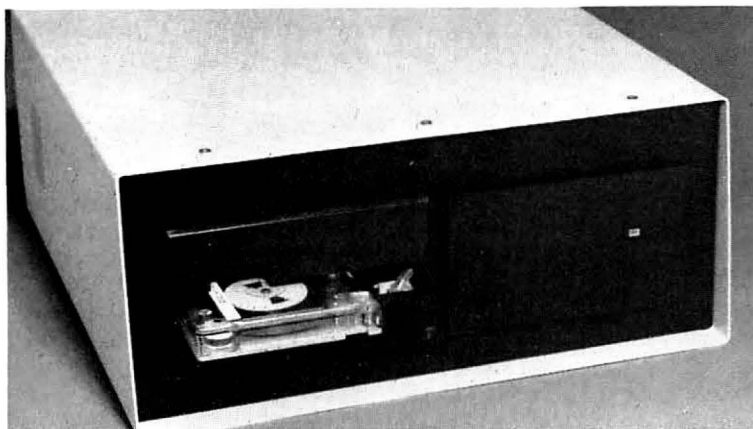
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Telephone (\_\_\_\_\_) \_\_\_\_\_

My computer(s) is/are: ☐ IBM PC ☐ Apple II ☐ TRS-80 ☐ Atari ☐ Commodore ☐ Other: \_\_\_\_\_

Signature: \_\_\_\_\_ (Signature required to validate membership)





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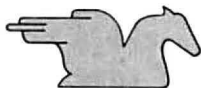
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**Accounts Receivable** 1. Daily Transactions Report 2. Invoices (with or without preprinted forms) 3. Statements (with or without pre-printed forms) 4. Summary Aging Report 5. Detailed Aging Report 6. Itemized Monthly Transactions 7. Detailed Customer Activity Report 8. Summary Customer Account Report

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**System Requirements:** Either CP/M\* or MS-DOS (PC-DOS) • Microsoft BASIC • 64K RAM • Two disk drives or hard disk • 132 column wide carriage printer, or an 8 1/2" x 11" printer with compressed print mode (an Epson MX-80 or similar printer).

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\*3Com Corp. in March Systems & Software, pg. 118  
\*\*3Com Corp. in March Systems & Software, pg. 119



# BBS Watch

## Bulletin board odds and ends

Gene Plantz

Most bulletin boards have two levels of caller interaction—novice and expert. Bulletin boards set at the novice level present complete menus with lots of information. This is the ideal level to choose when you first access a system because the information shows the bulletin board's restrictions and capabilities.

However, once you are familiar with the menus and the way the BBS presents data, you want to reduce the amount of help information given at every prompt. A bulletin board can take what seems like an eternity to display a large menu on your monitor (while your phone bill continues to climb). This is especially true when you use a slower communications speed such as 300 bps. The answer to this electronic lethargy is the expert mode.

### Expert Mode

When you select the expert level, explanatory information is kept to a minimum. On most systems the difference in the menu size is substantial—an average of five lines for novice mode versus one line for expert mode. I will show you the file transfer menus from my BBS so you can see the differences between the two levels. Figure 1 is an example of the novice display. The following line is the same menu for the expert display:

```
4-XFER COMMAND? (U,D,L,S,N,H,Q,?)
```

The expert level has other benefits. Some bulletin board systems allow you to enter multiple commands on one line and therefore bypass intermediate menus when in expert mode. This shortcut assumes that you are familiar enough with the system to know the questions it asks in order to carry out functions such as file

transfer. On my bulletin board, for example, you can enter your name, password, request for the file transfer system, the download command, the name of the file, and the transfer method in one command line when you first access the system. Such a command line looks like this:

```
JIM;SMITH;PASSWORD;F;D;TEST.BAS;A
```

---

## The answer to electronic lethargy is the expert mode.

---

The semicolons are command delimiters, which tell the bulletin board software that the caller is entering multiple commands on one line. Some systems save time by using "hot keys" that execute commands immediately after callers enter only the first letter of a menu command.

So to save both time and money, try the expert level the next time you call your favorite BBS. If you forget the proper command, simply type ? or H (for Help).

### User Group Bulletin Boards

As telecommunications becomes more popular, distribution of public domain software is shifting from the user group libraries to bulletin boards. Some user groups are even sponsoring their own bulletin boards. These boards usually reserve a portion of disk storage for club members. Bulletin boards are, of course,

perfect places for agenda and meeting time announcements. These systems also help groups attract new members who live too far away to attend meetings on a regular basis. The minutes of the meetings and programs are placed on the BBS, and members can call and download the information to their PCs. I spoke with one group president who is planning to put the group's newsletter on a BBS to provide a convenience for members and to reduce mailing costs for the group as a whole.

Newsletter editors say that contributors prefer sending stories to group bulletin boards, rather than mailing floppy disks or hand delivering hard copy.

### WATS You Thinking About?

When asked what it would cost to hook up an incoming Wide Area Telephone Service (WATS) line to my BBS, I didn't know the answer. So I called the local phone company office and asked the customer service representative. Assuming that my BBS would be busy 22 hours per day, the estimated cost is \$9450 per month!—quite a sum for a nonprofit enterprise. Sorry, but it looks like you callers will just have to keep making those long-distance calls. I don't think many of us SYSOPs can afford the \$113,400 per year for WATS.

### Subscription Bulletin Boards

I have described the average BBS as one run by an individual who donates time and equipment for the advancement of telecommunications. Sometimes the equipment is donated by a local computer store or software manufacturer, and the BBS has a file



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Transfer a File from This System	(DOWNLOAD)	D
Directory of Files to Transfer	(LIST)	L
Search for a String in the File List	(SCAN)	S
New Files Since Your Last Call	(NEW)	N
Information on These Features	(HELP)	H
Quit This Section—Return to MENU	(QUIT)	Q
ENTER YOUR FILE TRANSFER CHOICE		

Figure 1: Novice display

that advertises the business. The system is usually open, or free, to all callers. I feel strongly that this free exchange of information and programs benefits both callers and SYSOPs.

During the last year, however, some bulletin boards have begun to restrict system use to callers who pay

Try the expert level  
next time you call your  
favorite BBS.

annual subscription fees. Subscription proponents say that subscribers have a better chance of logging on to a BBS without the long wait for an open line. The fees also help pay for additional hardware such as hard disks or modems.

A caller usually signs up on most subscription systems by giving name, address, and phone number to the

SYSOP who verifies the information by telephone. The SYSOP then assigns a special logon identification number to the caller. The logon procedure minimizes trouble from pranksters who call bulletin boards to leave obscene messages or crash the system. While pranks are annoying, I don't think they outweigh the advantages of free communication. Subscription fees seem to defeat the spirit of free information exchange among computer owners.

I always get mixed reactions when I talk to people about the issue of free versus subscription bulletin boards. If you have strong feelings about this subject, please let me know. It may help future SYSOPs decide which type of system to run.

## Selecting a Communications Program

If you're in the market for a PC-compatible communications program and plan to download files from bulletin boards, you should buy a program that supports the Modem/Xmodem file transfer protocol. Most IBM PC bulletin boards that use *Hostcomm* software now support this protocol,

so it is important that your communications program takes advantage of this feature.

When shopping for a communications program, look for software that can:

- Receive ASCII files to disk.
- Send ASCII files from disk (with the option of injecting delays between characters or lines).
- Send and receive files with the Modem/Xmodem protocol.
- Change the parity to none and the number of data bits to 8 when the Modem/Xmodem protocol is used.

If a communications program performs all these functions and supports your modem speed, buy it. You will then be able to transfer most files found on any bulletin board system. ●

Send correspondence to BBS Watch, CompuServe 74055,412; Source STE908.

## IBM PC Bulletin Boards

Following is a partial listing of the IBM PC bulletin boards on-line in the United States and Canada. The list is updated as the author receives information about new bulletin boards.

203/289-6321  
East Hartford, Connecticut  
SYSOP: Scott Maentz  
6 p.m. to 9 a.m. Mon to Sat,  
all day Sun, download &  
upload, messages, 300/1200

(continues)



203/966-8869

New Canaan, Connecticut

SYSOP: Whit Wynat

24 hrs, download & upload,  
messages, 300/1200

213/371-8825

Culver City, California

SYSOP: Marc Schoenberg

24 hrs, download & upload,  
messages, 300/1200

213/390-3239

Source: TCG147

Santa Monica, California

SYSOP: Marc Schoenberg

24 hrs, download & upload,  
10M disk, 300/1200

213/649-1489

Culver City, California

SYSOP: George Peck

24 hrs, download & upload,  
messages

214/223-0983

Desoto, Texas

SYSOP: Mark Collard

24 hrs, download & upload,  
messages, 300

215/250-0173

Easton, Pennsylvania

SYSOP: Jerry Lotto

24 hrs, download & upload,  
300

301/251-6293

Gaithersburg, Maryland

SYSOP: Larry Jordan

24 hrs, communications info  
(Passwd = IBMPC)

301/460-0538

Bethesda, Maryland

SYSOP: Ramona Landberg

24 hrs, upload newsletter  
articles

301/937-4339

Beltsville, Maryland

Small People Software

SYSOP: Chet Rhodes

24 hrs, games, messages

301/949-8848

Rockville, Maryland

SYSOP: Rich Schinnell

24 hrs, download & upload  
(Passwd = IBMPC)

312/259-8086

Chicago, Illinois

SYSOP: Gene Plantz

(PCMODEM)

24 hrs, download & upload,  
messages, 300/1200

312/376-7598

Chicago, Illinois

SYSOP: Pete Coniceak

24 hrs, download & upload,  
messages, 300

319/332-7648

Quad Cities, Illinois

SYSOP: Jeff Machusak

24 hrs, download & upload,  
messages, 300/1200

319/363-3314

Cedar Rapids, Iowa

SYSOP: Ben Blackstock

24 hrs, download & upload,  
messages, 300

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|---------------|-----------|-----------|----------|
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| ■ named lines | ■ GETFILE | ■ SORT    |          |

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For immediate shipment of **KEDIT** send check/money order for \$85., shipping & handling included. CT residents add 7½% sales tax. For more information call 203/429-8402.

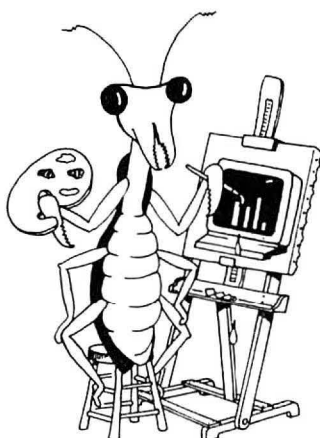


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415/861-5733

San Francisco, California

SYSOP: Harry Logan

Hours variable, download &  
upload, messages, 300/1200

416/499-7023

Toronto, Canada

SYSOP: Doug Peel

24 hrs, download & upload,  
messages, 300/1200

608/262-4939

Madison, Wisconsin

PC Users Group

SYSOP: Read Gilgen

5 p.m. to 8 a.m. weekdays,  
5 p.m. Fri to 8 a.m. Mon,  
download & upload,  
messages

617/353-9312

Boston Computer Society

SYSOP: Brian Hess

5:30 p.m. to 9 a.m. Mon to  
Fri, all day Sat & Sun,  
download & upload, mes-  
sages, 300

703/560-7803

Vienna, Virginia

ABBS with IBM PC

Conference

24 hrs, download & upload,  
messages

703/680-5220

Dale City, Virginia

Dale City Info Exchange

SYSOP: Tim Mullins

24 hrs, news, new product  
review—all PCs

(continues)

## WORRIED?

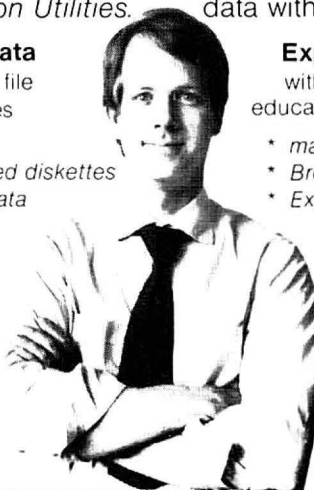
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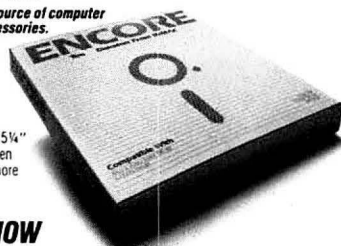
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## BBS Watch

703/978-0921

Fairfax, Virginia

SYSOP: Bruce Churchill

(Hostcomm)

24 hrs, software eval/purchase

(Passwd = IBMPC)

703/978-9592

Fairfax, Virginia

SYSOP: Don Withrow

(Hostcomm)

24 hrs, download & upload,

tips

(Passwd = IBMPC)

716/836-6964

Buffalo, New York

SYSOP: Bob Taylor

9 p.m. to 9 a.m. Tu, W, Th,

F; 6 p.m. Sa to 9 a.m. Tu;

download & upload, mes-

sages, 300

806/353-7484

Amarillo, Texas

SYSOP: Dorn Stickle

6 p.m. to 8 a.m. Mon to Sat,

all day Sun, download &

upload, messages, 300/1200

## BBS of the Month

This issue's BBS of the Month is the Desoto, Texas, bulletin board, 214/223-0983. The following is a practical file transfer list; the BBS list may change as the SYSOP adds or deletes items. The listing includes the file size in bytes.

ARCHIVE.BAS	2212	Disk archive
PSQUISH.BAS	4736	Compress BASIC programs
SD.COM	1536	Directory sort
PC-FILE.EXE	44160	PC-File version 8.9
PC-SORT.EXE	24704	Utility for PC-File
PRT40.CTL	128	Utility for PC-File
PRT80.CTL	128	Utility for PC-File
PRT.CTL	128	Utility for PC-File
PC-FILE.DOC	46848	Documentation for PC-File
WORLDMAP.BAS	8376	Graphics—Draws map of the world
BASXREF.HEX	12800	Compiled BASIC cross-referencer
BACKUP.HEX	27520	Backup for programs
FINANCEA.BAS	20864	Finance program
CHESS.HEX	42112	Chess program
747.BAS	33408	747 flight simulation program
STREK.HEX	43136	Star Trek game
MENU.BAS	2816	Menu program for BASIC
MONO80X.HEX	896	Switch to monochrome monitor
COLOR40.HEX	896	Switch to 40-column color
COLOR80.HEX	896	Switch to 80-column color



913/842-5749  
Lawrence, Kansas  
24 hrs, download & upload,  
messages

914/221-0774  
Hopewell Junction, New York  
SYSOP: John Giberson  
24 hrs, download & upload,  
messages, 300

919/847-4625  
Raleigh, North Carolina  
SYSOP: Randy Ray  
Download & upload, mes-  
sages, 300/1200  
(Passwd = IBMPC)

800/848-8199  
CompuServe  
24 hrs, download & upload,  
messages  
Subscribers only

IBMPRICE.BAS	6656	IBM PC price sheet
DESIGN.BAS	17280	Graphics program for IBM with color graphics boards
SETKEY.EXE	31872	Redefine keys
SETKEY.DOC	2432	Documentation for SETKEY.EXE
ASK.HEX	640	DOS 2.00 batch enhancement
ASK.DOC	1152	Documentation for ASK.COM
ASK.COM	256	Batch enhancement for DOS 2.00
TI.COM	640	Display continuous time on screen
UNWS.EXE	3200	Makes a DOC file ASCII for WordStar
PAC-GAL.EXE	39296	PacMan-type game
MAZE.EXE	16768	Draws mazes—finds the way
COM2ASM2.BAS	3009	Converts .COM files to assembler source code
COM2ASM2.DOC	2162	Documentation for COM2ASM2.BAS
DISKDEX.BAS	7598	Disk index program
DISKDEX.DOC	5794	Documentation for DISDEX.DOC
HIDEFILE.BAS	12745	Unerase files
HOST.BAS	14104	Makes your PC a host computer
MATH.BAS	7448	Children's math game
WORDGAME.BAS	15295	Hangman game [needs WORD1,2,&3]
WORD1	768	Needed for WORDGAME.BAS
WORD2	2560	Needed for WORDGAME.BAS
WORD3	1664	Needed for WORDGAME.BAS

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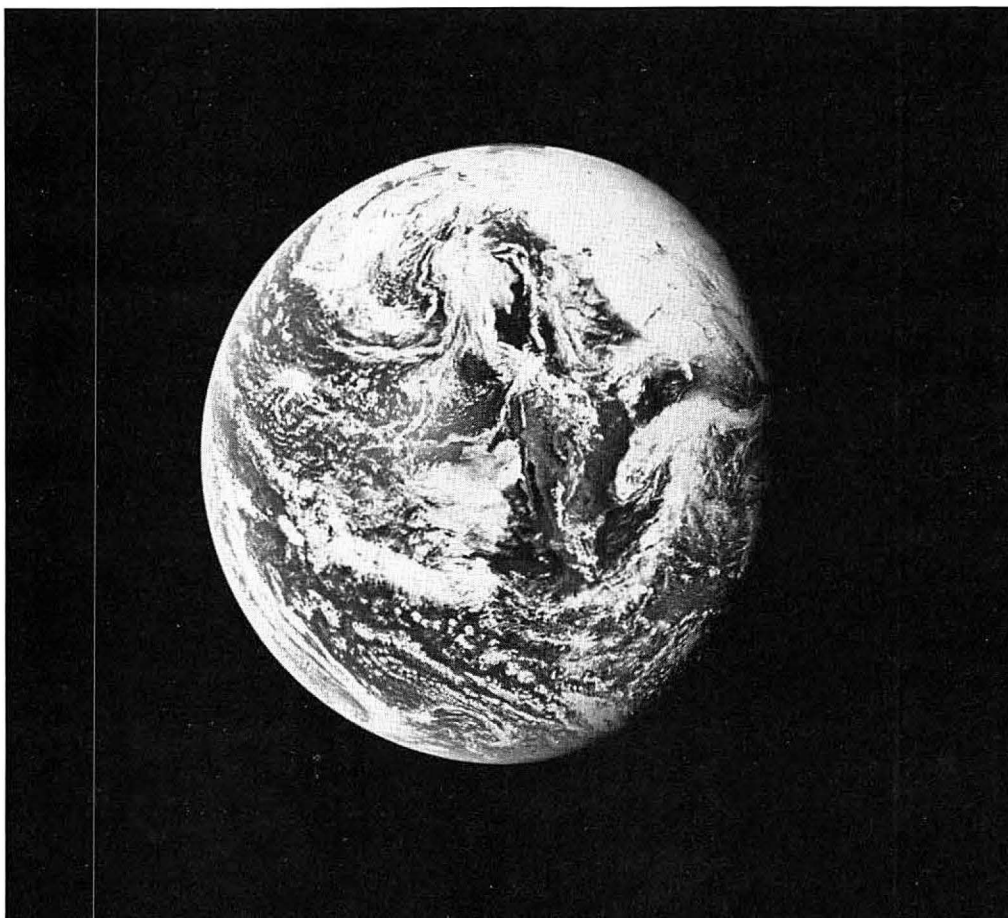
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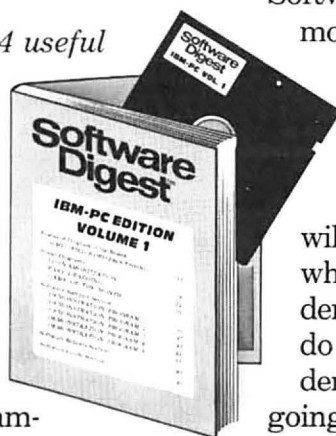
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- ☐ IBM-PC or XT  
☐ APPLE (Model \_\_\_\_\_) ☐ With CP/M Board  
☐ CP/M (Computer Name \_\_\_\_\_)  
☐ CP/M-86 (Computer Name \_\_\_\_\_)  
☐ MS-DOS (Computer Name \_\_\_\_\_)



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Rainbow Writer Color Text Formatter . . .	\$119.
Rainbow Writer Screen Grabber . . . . .	69.
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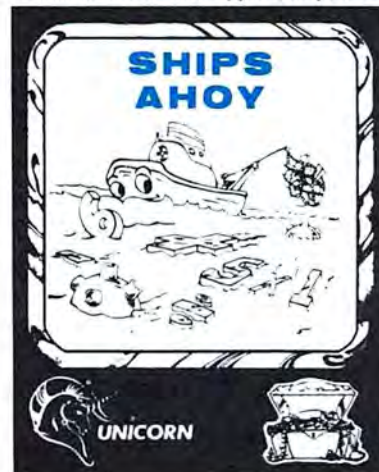


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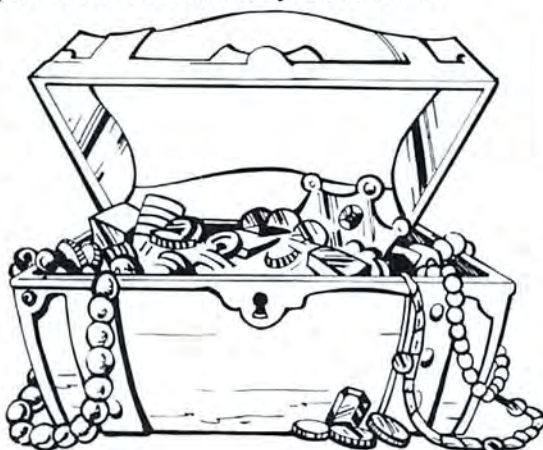
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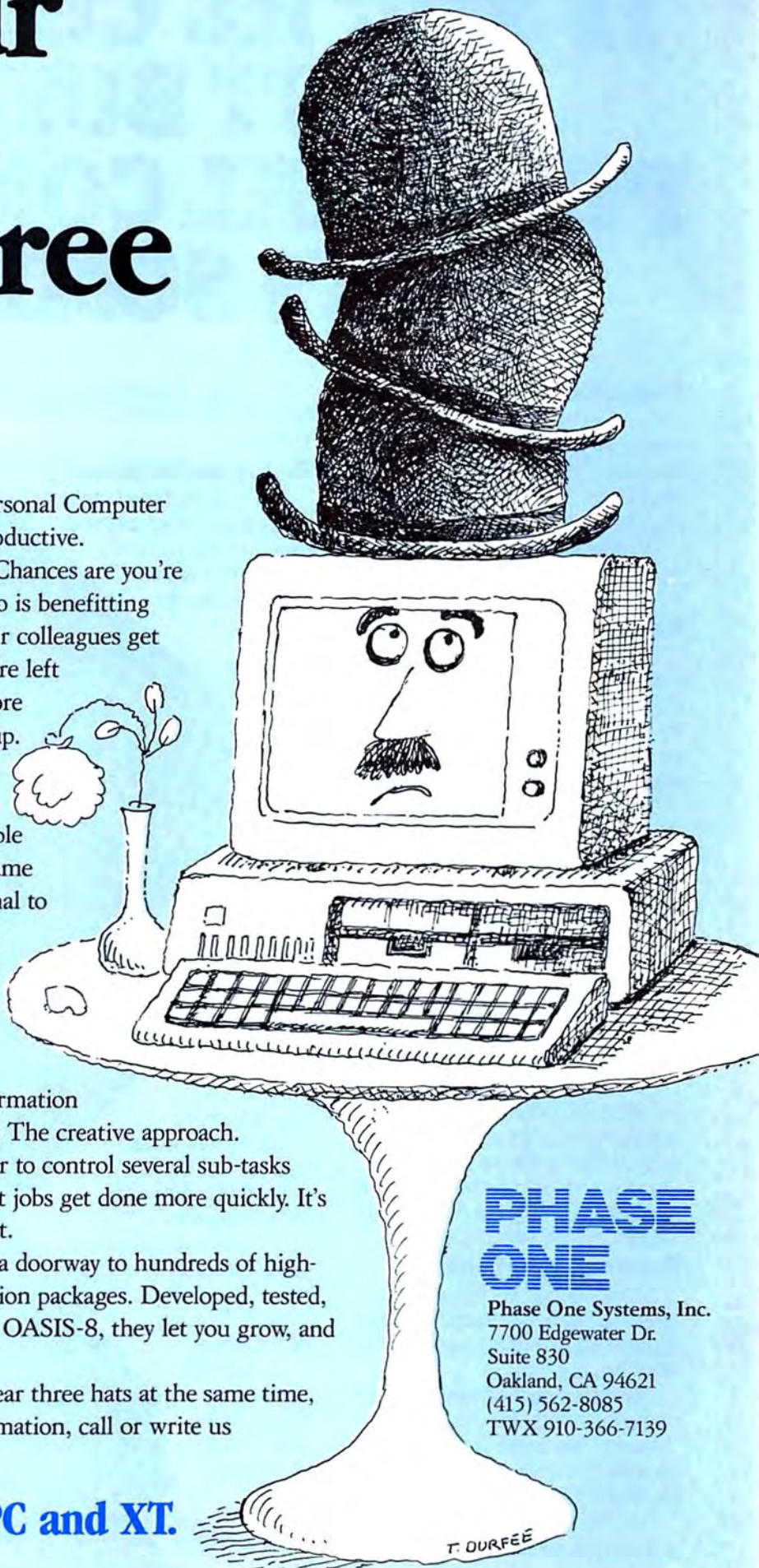
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## **Computers come in two parts.**

One part is the "hardware," the machinery itself. The other is the "software," which tells a computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything. And vice versa. You have to buy both.

## **Buy the software first.**

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

## **The simpler the better.**

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you want to do without getting in the way.

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# User Group Dispatch

*User group news from around the world*

*Edited by Anna Bunker*

The following information is reprinted from user group newsletters. *PC World* takes no responsibility for its accuracy. We suggest that you contact specific user groups for further details.

## More Public Domain Disks

*The following two items are reprinted from the NYPC Newsletter, May 1983, The New York IBM PC Users' Group.*

The New York Amateur Computer Club is distributing PC Blue, an ongoing software library for PC-DOS. The programs were extracted from the CPMUG or SIG/M libraries, and some require 8080 processor support. The library includes languages, applications packages, utilities, and games. All material is public domain and may be distributed without restriction. NYACC publishes a 215-page catalog of the first 26 volumes in the library. It includes table of contents, abstracts of the files, and all document files on the disks.

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## Vendor Relations and dBASE II

*The following item by David Browning, Capital PC's vendor relations manager, is reprinted from the Capital PC Monitor, June 1983.*

This month I'd like to recap the efforts some of our Capital PC members have made to persuade Ashton-

---

We decided to try to coordinate our efforts to get some attention from Ashton-Tate.

---

Tate to improve *dBASE II*, a product many of us have purchased and use. Working on this as a group for several months, we have gotten some positive results (see Table 1).

*dBASE II* had been available on 8-bit computers for some time and was adapted for use on the IBM PC last summer. An aggressive advertising and marketing campaign was undertaken to whet the appetites of the new owners in the PC market. At that time very little software and no professional data base programs were available for the IBM PC. Two to three months of advertising before the first delivery had caused a near panic among buyers. Rumors had it that 200 orders had been placed before the first copy was released.

At last it was out; version 2.3B was delivered. My company, among others, worked hard to get applications up and running for our customers. We found some bugs in the software but managed to work around them. A couple of months later we received the update, version 2.3D, which fixed some of the bugs and added a couple of desirable features. So far, so good. Then the weeks turned into months, and discussions at the Capital PC monthly meetings indicated that several people were still having problems with the package. We decided to try to coordinate our efforts to get some attention from Ashton-Tate, although some people thought the company was riding too high on current sales (rumors of well over \$1 million a month in sales of *dBASE II* alone) to be bothered with us. Some said that software manufacturers have traditionally perceived user groups as mere hobbyists who illegally copy software.

Rather than write negative letters complaining about poor support, we decided to consolidate and document as many errors as we could gather from our user reports. If we could demonstrate a bug with a test case, we would include it. If several members reported a similar problem but a test case could not be repeated, that was included also. If a member's problem was clearly a user error, we didn't include it, as the company is certainly not responsible for user ability. We included some problems that could have been either bugs or user errors and labeled them unknowns.

Each complaint was identified separately with supporting documentation and categorized as serious or moderate. A list of names and ad-



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# User Group Dispatch

addresses of contributing Capital PC members was attached, and a cover letter was written requesting that Ashton-Tate tell us its game plan for fixing the more serious errors.

At the time of cutoff (end of March), 22 members had responded. Most of them took the time to write up their problems and some even provided documented test cases. All indicated that they were legal owners and provided the version and serial number of their product. I am not sure how many owners of *dBASE II* are among the 1500 or so Capital PC members, but I know the number is more than 22. Another dozen have written me since the cutoff date, asking for copies of the documentation of the errors.

I think this type of involvement can benefit user group members. Special interest groups can coordinate efforts in their specific area and reach the product vendors via the vendor relations director.

Ashton-Tate responded with: "Mr. Cole convened a special task force to review our reported troubles. Two groups were formed to test the problems against their developmental version of release 2.4. One group tested against the IBM PC version running on a PC using PC-DOS. The other group tested against the CP/M 2.2 operating system running on an 8-bit, S-100 bus computer." (See Table 1 for a summary of the IBM PC Task Force responses.)

My thanks to Mr. Cole of Ashton-Tate for providing this rapid response. The programming tips will help. We hope that it does not take too much longer to finish testing version 2.4 so it can be released. We are looking forward to it.

Problem	Response
PACK loses records.	Fixed in V2.4. <i>dBASE 2.4</i> will PACK without index, then reindex.
PACKed file length doesn't pass to DOS.	DOS problem. Try using <i>dBASE COPY TO</i> command to strip the records marked as deleted vice PACKing.
Macro substitution within DO CASE doesn't always work.	Tested OK in V2.4.
SORT won't work for some files over 257 records long.	336-record data base on character field of 20 sorted OK under V2.4.
COPY and APPEND can lose <i>dBASE</i> data and mess up a disk.	Tried to repeat the test case under V2.4. Got proper error message. No disk or directory problems.
MODIFY COMMAND has several errors.	Fixed in V2.4. Still will truncate beyond column 79. (Note: use a text editor such as the <i>IBM Personal Editor</i> for program preparation—Dave.)
APPEND added blank records instead of correct data from second data base.	Still a legitimate problem under V2.4. Passed to author for correction.
Interruption of APPEND can put garbage records in data base and lose size sync with DOS.	ESC is an emergency device and should only be used as such. As much protection as possible is being built in (i.e., PACK will ignore it, and APPEND will handle it better). Use ESC in emergencies only.
Parts of files get mixed up with <i>dBASE</i> files.	Couldn't repeat the problem under V2.4.
SET INDEX TO only works with the primary file.	Fixed. Also fixed in the new V2.4 PACK command.
USE will not close a temporary index file so it can be deleted.	Fixed in V2.4.
CLEAR and RESET scramble data in multiple disk ops.	Fixed in V2.4 by changing the RESET command to 'RESET <drive>'.
(continues)	

Table 1: Summary of *dBASE II* errors and Ashton-Tate's responses







## User Group Directory

PC World publishes a User Group Directory every month. If your group is not in this list but would like to be, send the group's name, address, contact, and other information to *User Group Dispatch*, PC World, 555 De Haro St., San Francisco, CA 94107.

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Birmingham IBM PC User Group  
Fred Hilbers  
P.O. Box 19248  
Birmingham, AL 35219  
205/879-3716

### Arizona

Phoenix IBM-PC Users Group  
James S. Serbin  
P.O. Box 44218  
Phoenix, AZ 85064  
602/954-7519

Tucson IBM PC User Group  
Brian Wagner  
P.O. Box 1489  
Tucson, AZ 85702  
602/795-9437

### California

Diablo Valley PC  
Al Hunt  
1415 Oakland Blvd. #101  
Walnut Creek, CA 94596  
415/687-8037

Fresno IBM-PC Users Club  
R. Betancourt  
6750 N. Woodrow Ave.  
Fresno, CA 93710

(continues)

Problem	Response
LINKAGE command doesn't work.	Wasn't supposed to work with anything other than NEXT in V2.3D. Changed in V2.4.
INDEX must have all key fields of same type.	This is as designed. (Note: not well documented.) Works with numeric or character keys, but not mixed.
JOIN creates two fields with same name in output data base.	This problem can be avoided by naming the output fields with the FIELD phrase.
Location of last record is not consistent (GO TO <last rec no> then SKIP -1, etc.)	The SKIP command has been worked on in V2.4. Also new test for eof: "IF EOF..." vice # = 0 for index files and EOF for nonindexed files. New test is the same for both file types.
String field comparison is not consistent depending on order of comp.	User misunderstanding combined with deficient explanation in documentation.
Undocumented legal commands.	Manual for V2.4 includes pages for these. CHANGE SUMMARY is supposed to be with each manual, which now includes these.
'While <exp>' is not allowed in some commands, but not flagged as errors.	Extended error trapping has lower development priority than other tasks.
System date is not pulled in if dBASE is invoked with a parameter.	Fixed in V2.4.
DELIMITED WITH in APPEND FROM will only accept comma, contrary to manual.	Documentation error, but ability to use other delimiters is being incorporated in a future version.
(continues)	

Table 1 (continued)



## User Group Dispatch

Greater South Bay IBM-PC Users  
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Mike Immel  
P.O. Box 665  
Lomita, CA 90717  
213/325-7533

IBM PC Users Group of Santa Maria  
Ray Smyer  
575 Ferndale Dr.  
Santa Maria, CA 93455  
805/937-7490

IBM Users Group of California  
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Marin-Sonoma PC Users  
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Rancho California Computer Club  
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Redding Area PC Society  
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Redding, CA 96001  
916/243-4411

Sacramento IBM-PC Users Group  
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Citrus Heights, CA 95610  
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San Diego Computer Society  
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San Fernando IBM PC Users Club  
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Santa Barbara City College Com-  
puter Science Department  
Stu Swartz  
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805/966-2919

Silicon Valley Computer Society  
Elvin Bollet  
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School of Nursing n319y  
UCSF  
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Colorado Springs IBM PC Users  
Group  
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Boulder, CO 80303  
303/494-4062

Northern Colorado PC Users  
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Fort Collins, CO 80526  
303/223-8391

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West Hartford, CT 06107  
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IBM PC User Club of Stamford  
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New Canaan, CT 06840  
203/966-9378

Southeastern Connecticut IBM PC  
Users Group  
Pat Ryan  
78 Spring Glen Rd.  
Niantic, CT 06357  
203/739-4855



### Delaware

PC Professional Users Group  
P.O. Box 2350  
Wilmington, DE 19899

### District of Columbia

Capital PC  
Janet Withrow  
P.O. Box 3189  
Gaithersburg, MD 20878  
703/978-1530

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(CompuServe)  
Mike Todd  
4910 43rd St. NW  
Washington, DC 20016  
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CompuServe: Mike Todd,  
70001,1264; Wes Meier,  
70215,1017

### Florida

Manasota IBM PC User's Group  
Richard Reynolds  
1102 Mallorca Dr.  
Bradenton, FL 33529  
813/792-5400

### Miami PC User Group

Eddy Cue  
6925 S.W. 16 St.  
Miami, FL 33155  
305/262-1891, 305/940-1755

### Northern Florida Amateur Com-

puter Club  
Stephen D. LeBar  
10921 Kuralei Dr.  
Jacksonville, FL 32216

Problem	Response
'@...SAY...' will not go to alternate file.	Would require too much memory to implement.
<CursorLeft> control is inconsistent in BROWSE.	Working as designed—left one character in a field, then to first character of next left field when at left end of current field.
Semicolon in dBASE data will cause a carriage return and line-feed in REPORT and DISPLAY.	As designed. See page 113 of manual. (Note: manual is not too clear—Dave.)
In APPEND if no data is entered in field 24, incorrect skip to next record results.	Fixed in V2.4.
ENDIFn without required space before the n isn't trapped and doesn't work.	Not repeatable in V2.4.
CHR(7) no longer beeps the speaker in V2.3D.	Being fixed.
<Ctrl>-W to save programs causes file linkage/size errors.	Fixed in V2.4.
Last line left in printer buffer.	Problem with user's hardware. Use ? " " for last line to flush.
Too many EJECTS.	Not repeatable in V2.4.
SET FORMAT causes ejects.	Use a memory variable for line position instead of trying to keep track of line counter.
16-bit ZIP program promised?	Looking into it.
Saving programs with <Ctrl>-W.	Fixed in V2.4.

Table 1 (continued)

(continues)



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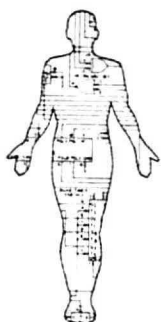
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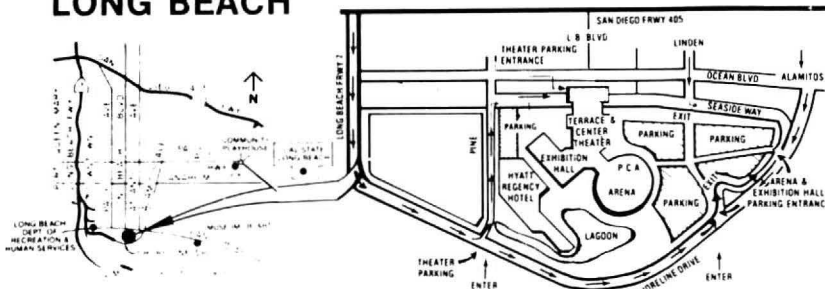
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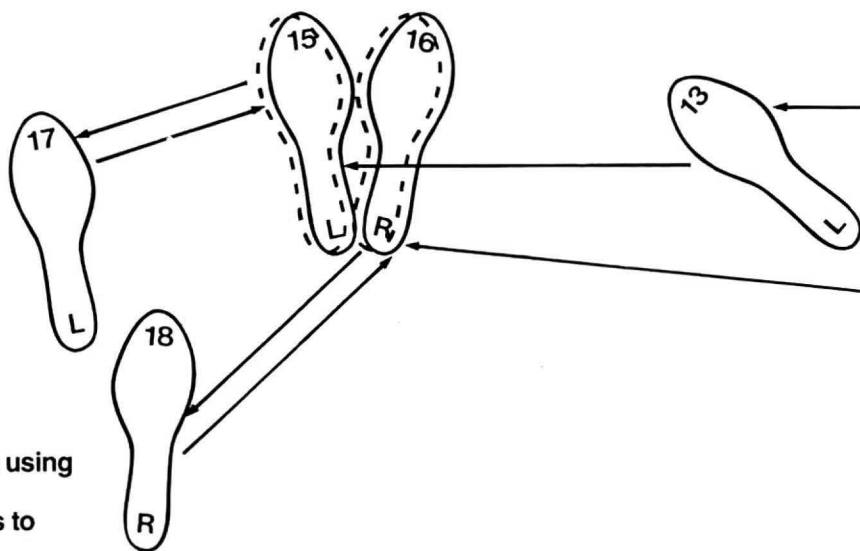
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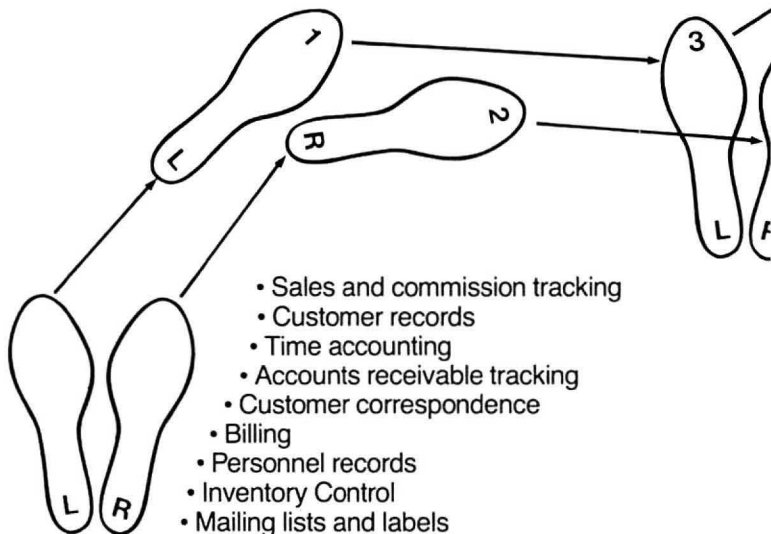
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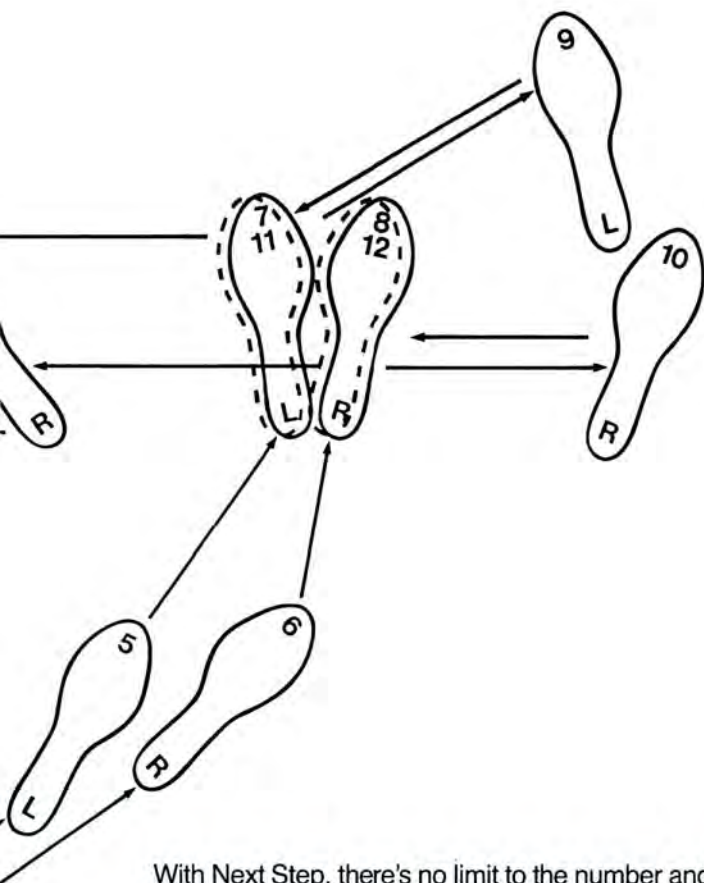
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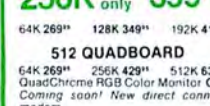
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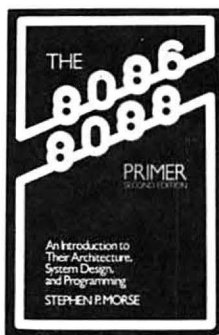
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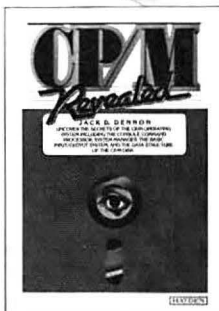
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# World Events

*A calendar of regional, national, and international events*

*Edited by Eric Brown*

*World Events* lists computer-related conferences, conventions, workshops, camps, symposiums, trade fairs, and shows. If you know of an upcoming event, we'd like to hear from you.

---

## October 10-13

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## October 13-15

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## October 20-23

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## October 24-26

ACM '83

Sheraton Centre Hotel  
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Association for Computing Machinery

ACM '83

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RAI Exhibition Centre  
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P.O. Box 3315  
Annapolis, MD 21403  
800/368-2066, 800/492-0192

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### November 1-3

INTECH '83  
McCormick Place  
Chicago  
Integrated Office Technology Conference and Exhibition. Aimed at managers of office systems and local and wide area networks. Seminars, workshops, and equipment demonstrations addressing networking technologies, data communications, and integrated information systems.

National Trade Productions, Inc.  
9418 Annapolis Rd.  
Lanham, MD 20706  
800/638-8510, 301/459-8383

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### November 1-3

Federal Office Automation Conference  
Washington Convention Center  
Washington, D.C.  
Aimed at federal office administrators interested in office automation. Conference includes a plenary session, seminars, workshops, technology briefings, and major addresses. There will also be an exposition of the latest office automation equipment.  
National Council for Education on Information Strategies  
P.O. Box N  
Wayland, MA 01778  
800/343-6944, 617/358-5356 in Massachusetts

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### November 3-6

Denver Computer Showcase Expo  
Currihan Hall  
Denver  
A regional exposition for business, professional, and corporate users of personal computers and word processing systems. Features hardware, software, peripherals, media, supplies, and services relating to mini and microcomputer environments.

Peter Young  
The Interface Group  
300 First Ave.  
Needham, MA 02194  
617/449-6600

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### November 5-6

4th Annual San Diego Computer Fair  
Scottish Rite Center  
San Diego  
Fair includes technical sessions, contests, commercial, and user group

displays. Speech on curing paraplegics with computerized electrical impulses.

San Diego Computer Society  
P.O. Box 81537  
San Diego, CA 92138  
619/565-8720

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### November 7-11

COMPSAC '83  
Palmer House Hotel  
Chicago  
Seventh International Computer Software and Applications Conference and Technical Show. Aimed at software programmers, designers, and managers. First two days are devoted to tutorials on applications software. Remainder of conference consists of seminars, speakers, papers, and panels on such issues as robotics, office automation, reliable software, tools and metrics, life cycle models, and human factors in software.

IEEE Computer Society  
1109 Spring St. #300  
Silver Spring, MD 20910  
301/589-8142

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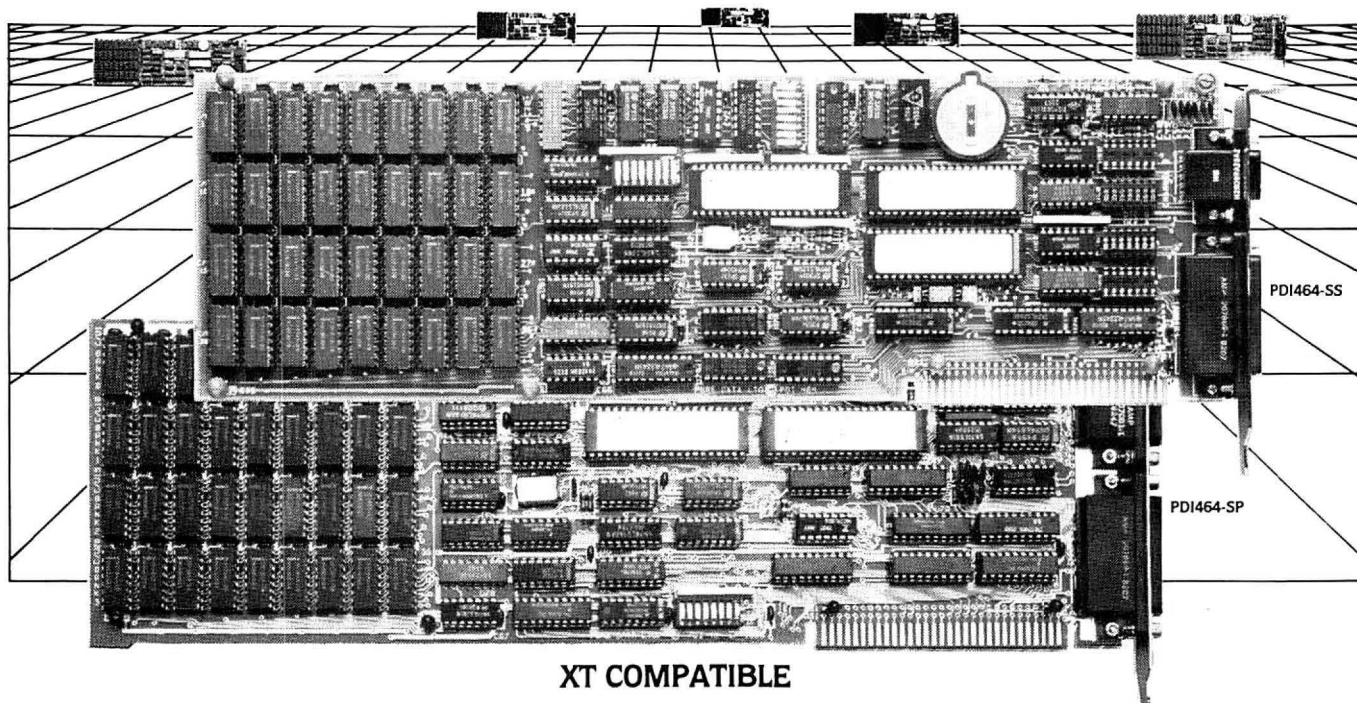
### November 8-10

Mini/Micro-West  
Brooks Hall & Civic Auditorium  
San Francisco  
Software computer and OEM show for computer end users. Held in conjunction with Wescon Convention Show.

Jeanie Oldendorph  
Electronic Conventions  
8110 Airport Blvd.  
Los Angeles, CA 90045  
800/421-6816, 213/772-2965,  
800/262-4208 in California

(continues)

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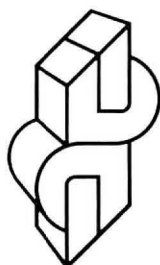
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- IBM-compatible serial channel with selectable address and 6-foot cable
- IBM-compatible parallel printer adaptor with selectable address
- Real Time Clock/Calendar with field-replaceable lithium battery backup
- p-Disk™ disk emulator for single/double-sided diskette emulation
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- Only occupies one expansion slot
- Fully-illustrated installation and operation manual

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- Print spoolers for parallel and serial channels with multiple copies
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- Fully-illustrated installation and operation manual



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Keysoft International, Computerland,  
Computer Innovations, Compugroup,  
ECOSEA Technologies and others.



## World Events

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### November 8-10

Wescon Convention Show  
Moscone Center  
San Francisco  
High-tech computer show for OEMs and test, design, and manufacturing engineers.  
Jeanie Oldendorph  
Electronic Conventions  
8110 Airport Blvd.  
Los Angeles, CA 90045  
800/421-6816, 213/772-2965,  
800/262-4208 in California

---

### November 10-13

Los Angeles Computer Showcase Expo  
Los Angeles Convention Center  
A regional exposition for business, professional, and corporate users of personal computers and word processing systems. Features hardware, software, peripherals, media, supplies, and services relating to mini and microcomputer environments.  
Peter Young  
The Interface Group  
300 First Ave.  
Needham, MA 02194  
617/449-6600

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### November 14-17

14th Annual Canadian Computer Show & Conference  
Toronto International Centre  
Toronto  
Largest computer show in Canada. 350 exhibitors and 37,000 attendees. General computer show with international exhibitors. Also a four-day conference on various

computer topics sponsored by the Canadian Information Processing Society.  
Industrial Trade Shows of Canada  
20 Butterick Rd.  
Toronto, Ontario  
M8W3Z8 Canada  
416/252-7791

---

### November 17-19

Fifth Annual Northeast Computer Show and Software Exhibition  
Hynes Auditorium  
Boston  
Largest annual East Coast end-user computer event. 500 exhibitors of microcomputers, accessories, peripherals, and software.  
Northeast Expositions  
822 Boylston St.  
Chestnut Hill, MA 02167  
800/841-7000, 617/739-2000 in Massachusetts

---

### November 17-20

Washington D.C. Computer Showcase Expo  
Washington D.C. Convention Center  
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The Interface Group  
300 First Ave.  
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### November 17-20

Chicago Computer Showcase Expo  
McCormick Place  
Chicago  
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### November 29-30

The Office Vanishes: Exportation of Work by Computer  
Waldorf-Astoria  
New York  
Business-oriented conference on exporting internal data processing to specialized outside knowledge-based systems.  
The Conference Board, Inc.  
P.O. Box 4026  
Church Street Station  
New York, NY 10249

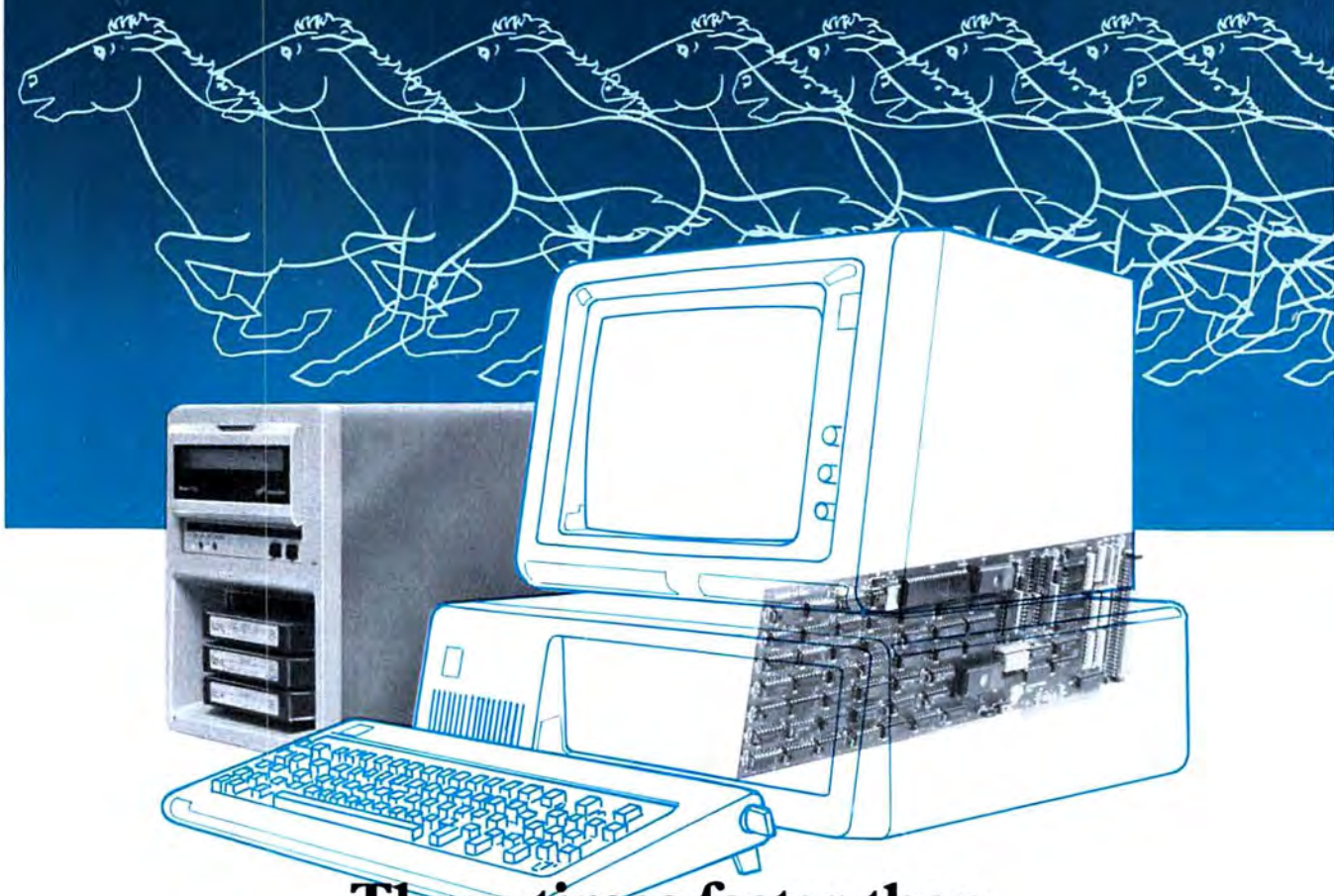
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### November 28-December 2

COMDEX/Fall  
Las Vegas Convention Center, Las Vegas Hilton, Sahara, Riviera, and other locations  
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*(continues)*

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## World Events

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### December 8-10

Business & Personal Computer  
Sales-Expo '83 & 1983 Houston  
Business Show  
Houston Civic Center  
Houston  
Two shows in one facility. Sales-Expo '83 is an exposition and sales marketplace for micro and minicomputer end users. The Business Show concentrates on business-oriented computer applications.  
Produx 2000, Inc.  
P.O. Box 2000  
Bala Cynwyd, PA 19004  
800/523-3882, 215/457-2300 in  
Pennsylvania

### December 8-11

3rd Annual Southeast Computer  
Show & Office Equipment  
Exposition  
Atlanta Civic Center  
Atlanta  
Computer trade show for micros, minis, software, and hardware. Emphasis on small-business systems. 200 exhibitors and 20,000 attendees expected.  
Computer Expositions, Inc.  
P.O. Box 3315  
Annapolis, MD 21403  
800/368-2066

### December 12-15

CHI '83 Conference on Human  
Factors in Computing Systems  
Park Plaza Hotel  
Boston  
Conference on system usability, human issues in software, hardware, and documentation design. Papers, sessions, tutorials on input/output modes, cognitive models of users, and other human factors issues.  
ACM SIGCHI (Association for Computing Machinery Special Interest Group on Computer & Human Interaction)  
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GTE Laboratories  
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Waltham, MA 02254  
617/466-4044

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MPI 320K D/S D/D Drives ..... Call  
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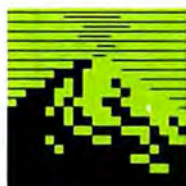
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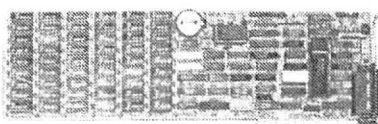
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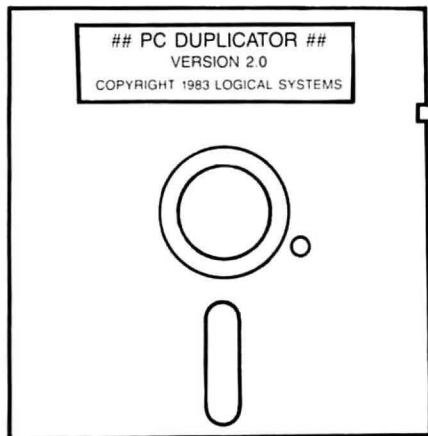
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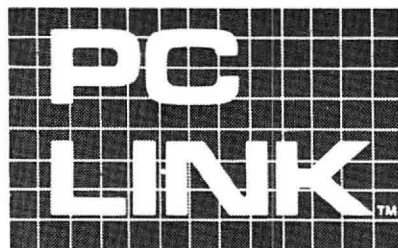
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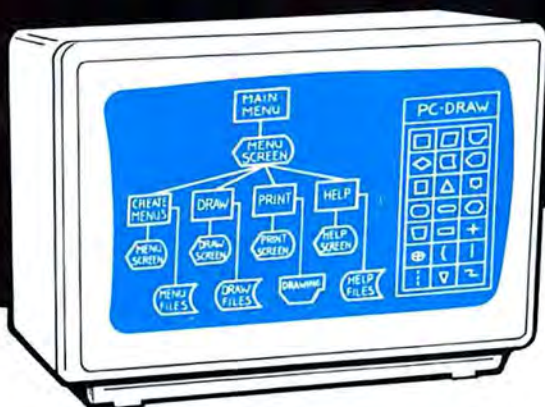
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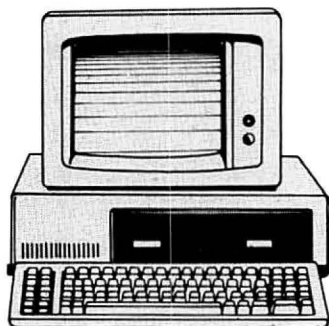
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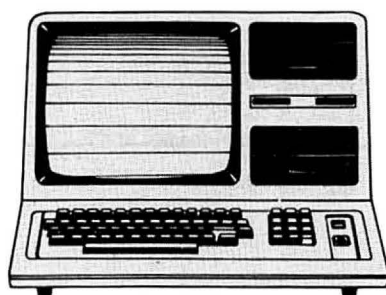
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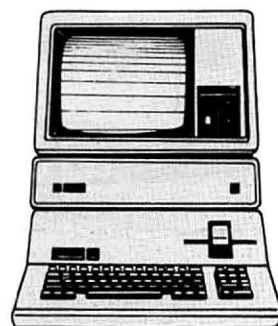
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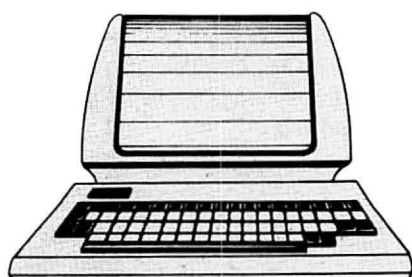
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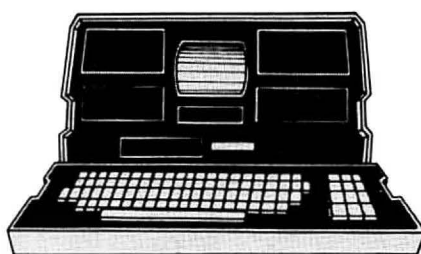
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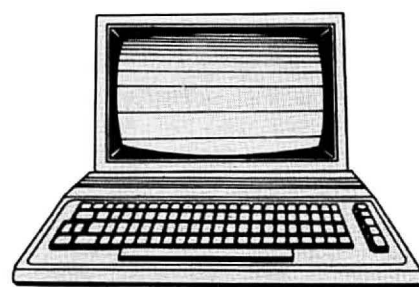
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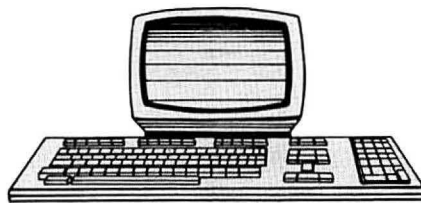
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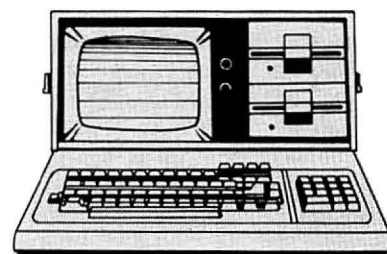
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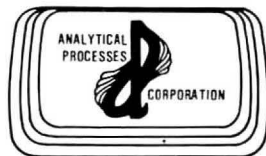
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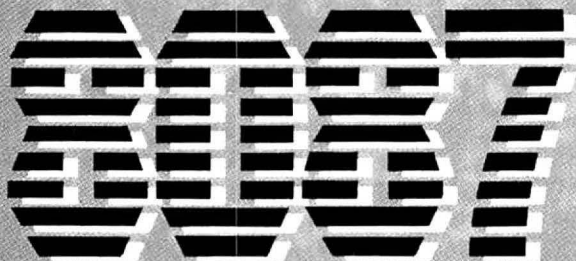
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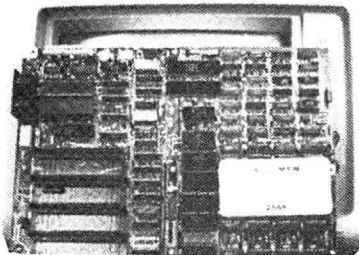
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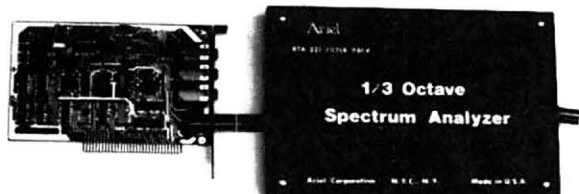
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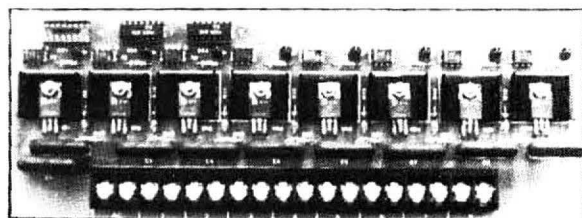
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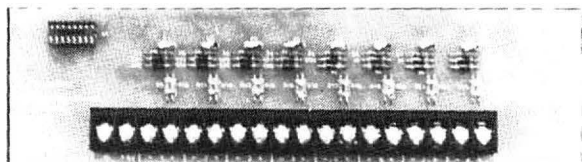
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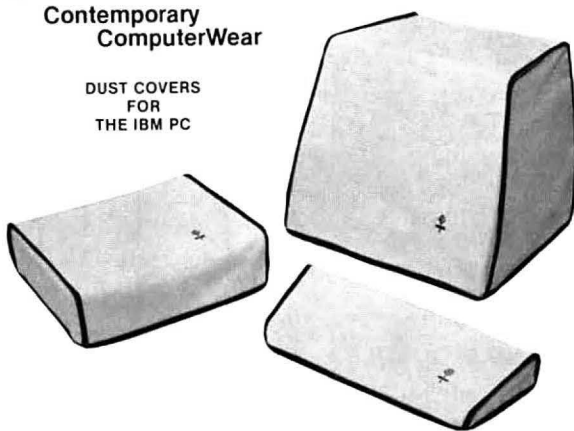
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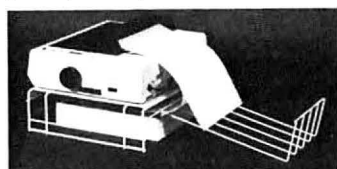
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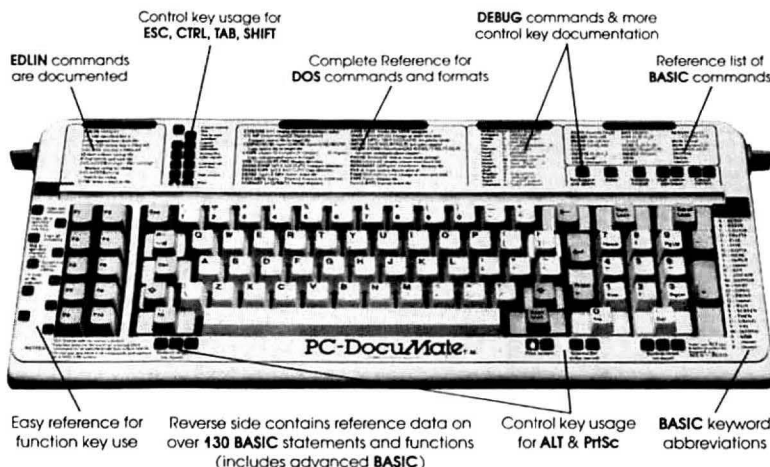
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Charter Membership \$10. *The PC Club Connection, P.O. Box 1720, Morgan Hill, CA 95037, 408/779-8913*

# Just Announced

*The wide world of PC products*

*Edited by Anna Bunker*

In the fast-paced personal computer marketplace *Just Announced* acts as an alert service to keep you abreast of the latest developments in IBM PC and compatible technology. Information for this department is provided by manufacturers; these write-ups are not reviews. Many of these descriptions will be followed up by reviews in this or future issues.

## Hardware

### Boards

#### SixPakPlus

A multifunction enhancement board that can be used with the 64K system board, the 256K system board, or the IBM PC XT. The SixPakPlus features six enhancements: up to 384K RAM, one RS-232C serial port, one parallel printer port, an optional game adapter port, a clock/calendar with battery backup, and the *SuperPak* disk. The disk includes two programs: *SuperDrive*, a disk emulator that retrieves and stores data and command files ten times faster than floppy disk drive access, and *SuperSpool*, a printer buffer. List price: Basic board with 64K RAM, serial port, parallel port, clock/calendar, *SuperPak* disk \$395; basic board, game adapter port \$445; each additional 64K \$100. AST Research Inc., 2372 Morse Ave., Irvine, CA 92714, 714/540-1333.

#### Color Graphics Board

A high-resolution graphics controller with on-board intelligence that is designed for the production of business graphics, CAD/CAM graphics, animation, and Videotex applications. It requires 64K, one disk drive, and a color monitor. The board includes an 8088 CPU and a VLSI graphics controller (NEC 7220). It features 1024 by 1024 resolution graphics, up to four memory planes, and an optional lookup table for a palette of 4096 colors. Sixteen colors can be displayed simultaneously.

A light pen interface is a standard feature; a mouse and an RS-232C serial port are optional. The board is available in several configurations of memory planes, interfaces, and lookup tables. List price: Basic board with 1024 by 1024 resolution and two memory planes \$995, third memory plane \$395, fourth memory plane \$295, lookup table option \$295, mouse interface option \$195, serial port option \$125. Frontier Technologies Corporation, P.O. Box 11238, Milwaukee, WI 53211, 414/964-8689.

#### Advanced Communication Board

A board that supports synchronous, asynchronous, bisynchronous, HDLC-SDLC, and CCITT-X.25 protocols for mainframe communications. It requires 64K and one disk drive. An RS-232C serial port is standard and a parallel printer port is available as an option. The board features packet switching, a procedure that transfers data in small, 128-byte blocks. Other features include an optional real-time clock/cal-

endar with battery backup and a switch-selectable device address. Frontier Technologies' communications program, COMPAC (described under Applications Software) supports all the board's features. List price: \$275, parallel printer port option \$40, real-time clock/calendar option \$40. Frontier Technologies Corporation, P.O. Box 11238, Milwaukee, WI 53211, 414/964-8689.

## Modems

#### Info-Mate 212A

A Bell-212A-type modem that fits under a desktop phone. The modem requires an RS-232C serial port. Info-Mate automatically adapts to the



**Info-Mate 212A, Cermetek Microelectronics**

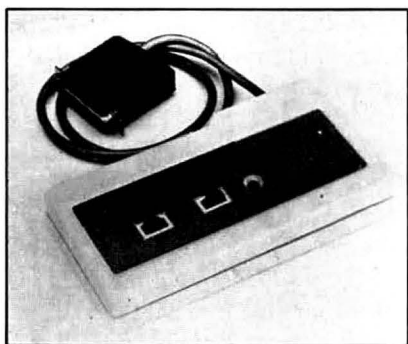
host's communications parameters with an automatic parity select. The modem features auto-dial, auto-answer, auto-speed select, and automatic or manual selection of pulse or tone dialing. Commands are on a single level, so users do not have to work through several menus to perform one function.



Up to 52, 32-digit telephone or logon numbers can be stored in the modem's memory. Dialing commands include dial last number, dial until answered, dial alternate number, and dial from memory. Info-Mate's voice recognition circuit is able to determine if a voice answers the call and displays that information on screen. List price: \$595. Cermetek Microelectronics, Inc., 1308 Borregas Ave., P.O. Box 3565, Sunnyvale, CA 94089, 408/734-8150, TWX 910-379-6931.

#### AM/FM Downloader

A receive-only modem designed to download computer data (ASCII text files or CPU-specific program files) from commercial radio stations. It requires an RS-232C serial port. The modem is compatible with Bell-103 (300 bps) signals and will operate at speeds of up to 4800 bps. A radio station's main audio channel may either be recorded on tape, which is played into the modem, or received directly into the modem. List price: \$69.88. Microperipheral Corporation, 2565 152nd Ave., Redmond, WA 98052, 206/881-7544.

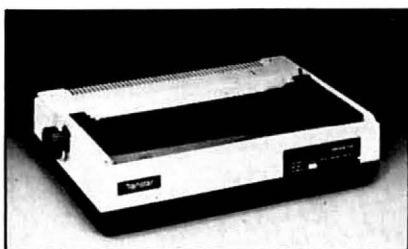


AM/FM Downloader,  
Microperipheral

## Printers

### Transtar Model 120

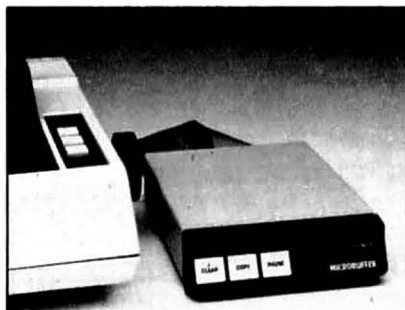
A letter quality printer that supports Diablo-routine word processing features such as boldface, underscore, superscript, and subscript. The printer requires a parallel printer port. The Model 120 features an automatic paper loading system that loads cut-sheet paper in four positions. It prints 14 cps at 10, 12, or 15 characters per inch. List price: \$599. Transtar, P.O. Box C-96975, Bellevue, WA 98009, 206/454-9250.



Transtar Model 120, Transtar

### Microbuffer

A stand-alone printer buffer that allows a set of data to be printed while another set is being processed. Microbuffer is available with either an RS-232C serial port or parallel printer port. The parallel version comes with a 6-foot cable, and the serial version requires Inmac cable #310-2. Microbuffer has 32K or 64K of memory expandable to 256K. It supports a variety of printers, including Epson, NEC, Diablo, and Okidata, and can be used with almost any computer/modem combination.



Microbuffer, Inmac

The controls on the front panel of the buffer are used to clear the buffer, halt the print, and allow data to pass around the buffer. A copy button allows up to 255 copies of the same document to be printed. List price: 32K \$320, 64K \$379. Inmac, Dept. 134, 2465 Augustine Dr., Santa Clara, CA 95051, 800/547-5444, 800/547-5447 in California.

## Miscellaneous

### 2100 Interactive State Analyzer

A real-time logic analysis peripheral device that plugs into the microprocessor's bus to give the software developer a real-time view of the software. It requires 128K, one disk drive, and Pascal. The ISA package includes supporting software and the Pascal run-time system.

The ISA gives the PC the ability to perform specific tests and measurement tasks on software being developed. It features 16-channel logic analysis capability used for debug-

## Just Announced

ging microprocessor hardware and designing software. List price: Basic 16-channel with ½K of storage memory for each channel \$2995, each additional 16-channel card \$895. Northwest Instrument Systems, Inc., P.O. Box 1309, Beaverton, OR 97075, 503/297-1434.



Interactive State Analyzer,  
Northwest Instrument Systems

## System Software

### Languages

#### MetaBASIC

A precompiler for the BASIC programming language. It requires 64K, one disk drive, and DOS 1.10. With MetaBASIC, modular BASIC programs can be developed that contain "real" subroutine calls (not GO-SUBs). Full argument passing is supported. Subroutines may be nested to any level. MetaBASIC also supports named global common, symbolic definition, data declaration, and record data type.

Remarks and spaces can be included in programs without sacrificing speed. MetaBASIC automatically compresses the program by suppressing remarks and unnecessary blanks

and by reassigning abbreviated names to all program variables. List price: \$59. Software 128, 363 Walden St., Concord, MA 01742, 617/369-6400.

## Operating Systems

#### DOSxfer

A program that transfers files from PC-DOS 1.0 or 1.10 to the p-System format. It requires 64K and two disk drives. DOS disks must be formatted for single-sided use due to limitations in the p-System. Files may be specified as .TEXT or .DATA in the p-System context. A .TEXT file may be directly transferred to the printer. The DOS directory may be displayed. The program is useful for converting the source code of DOS Pascal programs to UCSD Pascal programs. List price: \$27.95. Look-ahead Software, 1285 Easter Ln., Eagan, MN 55123, 612/454-3053.

## Applications Software

### Communications

#### COMPAC

A communications package that supports a variety of protocols: asynchronous, bisynchronous, synchronous, HDLC-SDLC, and CCITT X.25. It requires 64K, one disk drive, and Frontier Technologies' Advanced Communication Board. With COMPAC the IBM PC can communicate with mainframes and other IBM PCs. The program supports three character sets: ASCII, EBCDIC, and Transcode. COMPAC operates under PC-DOS or CP/M-86. All ten function keys are user-definable, with each function key definition up to 200

characters long. List price: async \$125, bisync \$695, HDLC-SDLC \$695, CCITT X.25 \$795. Frontier Technologies Corporation, P.O. Box 11238, Milwaukee, WI 53211, 414/964-8689.

#### X.25

A networking program that implements all three levels of the CCITT X.25 specification, a mainframe communications standard, with 1980 amendments. It requires 64K, one disk drive, Frontier Technologies' 128K memory board, and Frontier Technologies' Advanced Communication Board.

The program features full handshaking signals for modem communication and includes the industry standard RS-232C signals on a DB-25 connector. It allows full-duplex synchronous communications at a rate of up to 19,200 bps. X.25 is compatible with the LAPB link access procedure. It supports virtual call and permanent virtual call operation. List price: \$795. Frontier Technologies Corporation, P.O. Box 11238, Milwaukee, WI 53211, 414/964-8689.

#### PC-to-PC 4800 Baud

A communications package that allows synchronous, 4800 bps communication between IBM PCs. It requires 256K, two disk drives, a 4800 bps external modem, and Intelligent Technologies' communications package, *PC Express*. The software must be installed in both the transmitting and the receiving PCs. Users can upload and download files and send messages four times faster and at a quarter of the cost of conven-



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1984/448pp/paper/0-89303-530-0/\$18.95

### Inside the IBM PC: Access to Advanced Features and Programming—Peter Norton

Written on an intermediate level, this new guide explores the inner workings and advanced features of the IBM PC. Explains the full range and power of the IBM PC with an introduction to ROM and complete coverage of associated service routines. Covers the fundamentals of the 8088 microprocessor and PC-DOS with detailed explanations of PC-DOS services. Also shows how diskettes work with programming examples of decoding information. A diskette is available with more than 120 programs and/or subroutines including details of little-known IBM PC capabilities, a complete copy protection scheme, and access routines to gain access to every feature.

1983/320pp/paper/0-89303-556-4/\$19.95/

### IBM PC Assembly Language: A Guide for Programmers—Leo J. Scanlon

Introduces assembly language beginners to the fundamental principles of the 8088 microprocessor, number systems, and assemblers. Focuses on a real assembler—IBM's disk-based assembler and MACRO assembler—soon to become the *de facto* standard. This book first outlines the steps necessary to create and run assembly language programs and then describes the entire instruction set of the 8088. This guide also features many valuable application programs, summary tables, and illustrations.

1983/320pp/paper/0-89303-241-7/\$19.95

### 8087 Applications & Programming for the IBM PC and Other PC's—Richard Startz

Designed for anyone interested in the 8087, from beginner to pro, this book is the first clearly-stated comprehensive explanation of the number-crunching INTEL 8087 microprocessor. Begins with a non-technical introduction and evolves into a detailed technical treatment of the 8087 with independent sections geared to technical and non-technical readers. It contains a variety of numerical applications and "cookbook" programs and delivers thorough insight into the exciting potential of the microprocessor that is indispensable to PC owners intent on performing numerical applications.

1983/256pp/paper/0-89303-420-7/\$19.95

### Games, Graphics, and Sound for the IBM PC—

Dorothy Strickland, Dennis Rockwell, and Kevin Bowyer

This learn-by-doing manual teaches beginners how to program the IBM PC for graphics and sound to create video games. Contains instructions on how to program graphics and sound in BASIC, Pascal, and FORTRAN. There are explanations for integrating sounds and pictures to animate games and more than 70 useful working examples. Also includes a step-by-step running example of how to design a simple, but complete video game.

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## Just Announced

tional 1200 bps communications. Data integrity is maintained. List price: \$350. Intelligent Technologies International Corporation, 151 University Ave., Palo Alto, CA 94301, 415/328-2411.

### Educational

#### DOS 2.0 Tutorial

A program that explains DOS 2.00 commands. It requires 64K and one disk drive. The program illustrates the DOS 2.00 hierarchy file structure with sound and moving ASCII graphics. Command definitions are randomly accessible. The program includes an error checker. List price: \$49.95. Sophco, Inc., 663 W. Aspen Way, Louisville, CO 80027, 303/665-5782.

### Entertainment

#### Master Miner

An arcade-style adventure game that requires 64K, one disk drive, and a color graphics board. Players mine gems in an asteroid belt while protecting themselves from alien claim jumpers. The keyboard is user-configurable and a joystick is optional. The game includes several skill levels. One or two people can play. High scores are saved to disk. List price: \$39.95. Funtastic, Inc., 5-12 Wilde Ave., Drexel Hill, PA 19026, 215/622-5716.

#### The Witness

A prose mystery game that reflects the classic whodunits of the 1930s. The game requires 64K and one disk drive. The player is either a witness to the murder or the chief police detective with 12 hours to untangle and solve the mystery. Important clues



The Witness, Infocom

are found in pieces of physical evidence included with the game: a copy of a page from *The Register*, a California newspaper dated February 1, 1938, the same month that the crime occurs in the game; the manual, in the form of the *Nat'l Detective Gazette*, a 1930s detective magazine; a suicide note from one of the characters; a Western Union telegram to the player; and a matchbook from a nearby restaurant. List price: \$49.95. Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138, 617/492-1031.

#### Codebreaker

A game that tests the player's logic against the computer's. It requires 64K, one disk drive, and a color graphics board. The object of the game is to break a secret code. There are four skill levels and three ways to play on each level. The ability of the computer to break the secret code increases with each level. On the lowest level children and inexperienced adults can beat the computer. List price: \$39.95. Sylvan Glen Software, P.O. Box 31053, Des Peres, MI 63131.

### Financial

#### Personal Finance Utility

An integrated set of programs that organize personal finances. It requires 64K and one double-sided or two single-sided disk drives. The programs included are: net worth, personal inventory, accounts payable and receivable, an appointment book, and a checking account system that handles multiple accounts. A set of utilities can handle amortization and depreciation schedules and calculate interest. Hard copy reports can be produced. List price: \$79.95. First Release Software, Inc., 5814 Jester, Garland, TX 75042, 214/495-1323.

#### Business Finance Utility

An integrated set of programs that organizes small-business finances. It requires 48K, one double-sided or two single-sided disk drives, and an 80-column printer. The programs included are: accounts receivable with invoicing, accounts payable with check writing, single-entry general ledger, a mailing list compatible with most mail-merge word processors, an appointment calendar, and a banking system that handles several accounts. The program can calculate amortization and depreciation schedules, determine interest, and perform break-even analysis and quick ratios. List price: \$1295. First Release Software, Inc., 5814 Jester, Garland, TX 75042, 214/495-1323.

(continues)



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CDC 9409 320K Disk Drive .....	525.00	<b>259.95</b>
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Diskettes - 3M, Dysan, Others .....		<b>SCALLS</b>

## Software

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Continental UltraFile .....	195.00	<b>124.95</b>
Home Accountant Plus .....	150.00	<b>84.95</b>
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## Software Continued

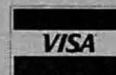
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Software Arts TK! Solver .....	299.00	<b>229.95</b>
TK! SolverPacks .....	100.00	<b>84.95</b>
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PFS: Report .....	125.00	<b>89.95</b>
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### Graphics

#### Fontastic

A printing enhancer that prints any DOS ASCII file, including word processing documents, in 20 fonts. It requires 128K and one disk drive. The fonts include Roman, Gothic, calligraphy, darkbold, and lightbold. Any character can be rotated 90 degrees. *Fontastic* features a full-screen font creation utility that can modify the given standard fonts or create new fonts, which can be added to the font library. *Fontastic* supports the following printers: the Epson series with Grafrax, IBM, C. Itoh, and Okidata. List price: \$125. IHS Systems, 4718 Meridian Ave. #211, San Jose, CA 95118, 408/265-5503.

#### Softplot/BGL

A graphics programming tool that includes a plotter emulator. It requires 128K and one disk drive. A color graphics board and a color monitor are required for display. The program is designed to create technical, educational, and custom business graphics applications. It includes two modules: BGL and *Emuplot*. BGL is a device-independent graphics language written in a standard subset of BASIC. It features two-dimensional viewing with windows, image rotation, three-dimensional plotting, and automatic text justification. It provides functions comparable to CORE and GKS base levels and supports device features such as color and dashed lines. The scale of the plotting grid is determined by the user.

*Emuplot* is a plotter emulator for dot matrix printers that produces high-resolution hard-copy graphics. The dot matrix printer performs plotter functions by reading standard

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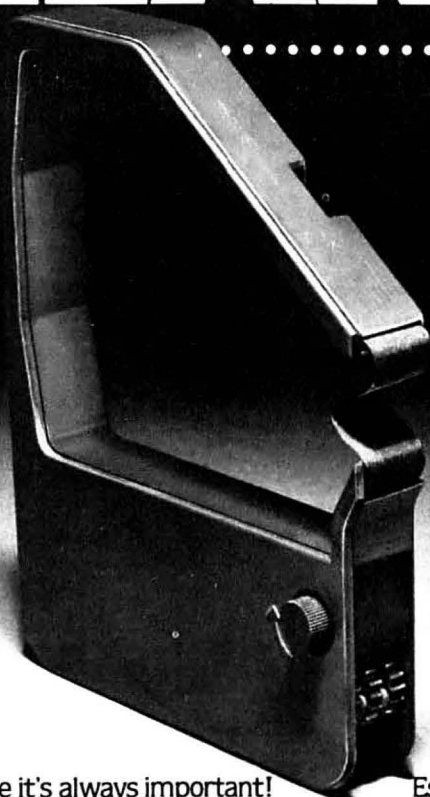
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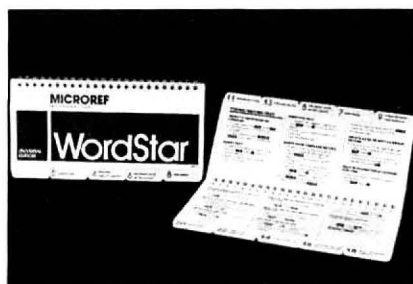
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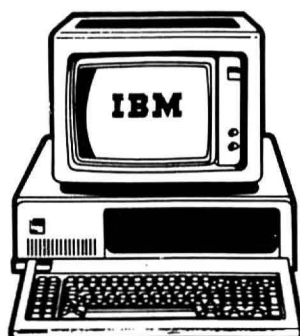
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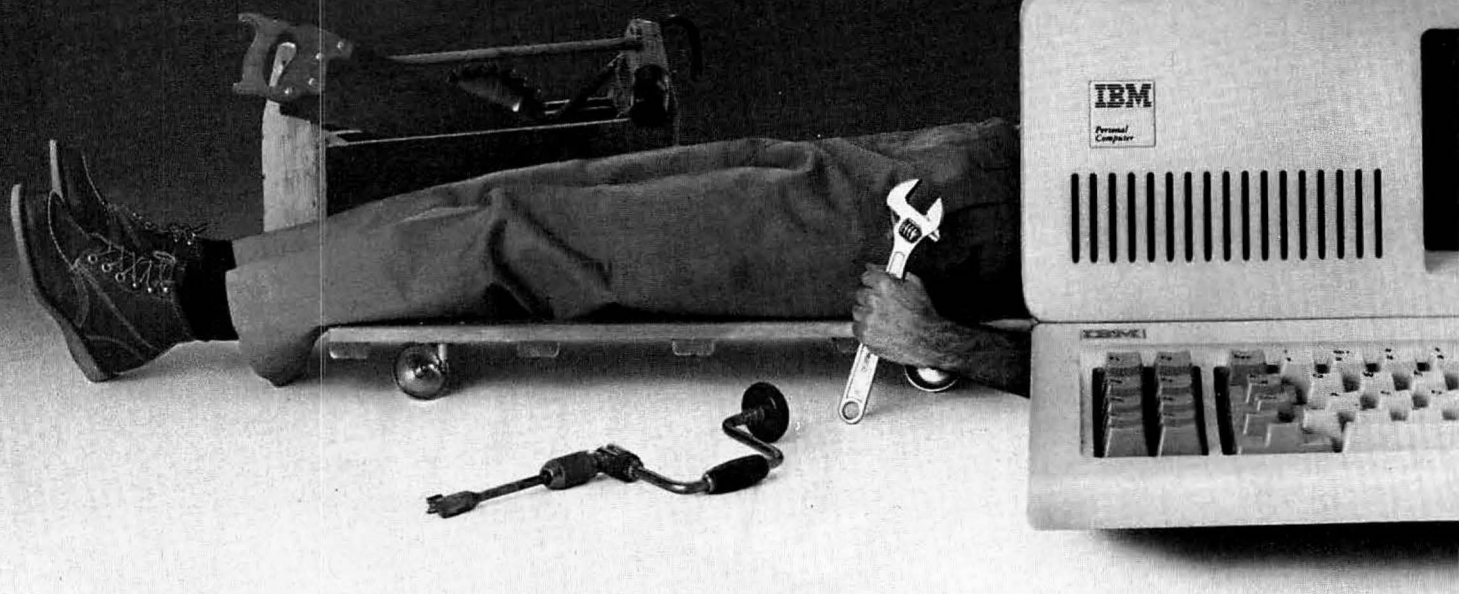
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## About Our Gatefold

The image inside the gatefold cover was created by artist Mike Sullivan using an IBM PC, the Plantronics COLORPLUS card, and the *Color-Magic* graphics processor. Mike is graphics director at International Software Marketing Limited, creator of *Color-Magic*. Judging from Mike's contribution to last month's gatefold, a portrait of Reggie Jackson, Mike goes in for well-known subjects.

Of his technique, Mike said, "I begin by making the screen purple, and then I outline my figures in black. In this portrait I filled in the shirt with white, the face with pink, and the arm with yellow. I choose from two shades, usually opting for the lighter color to highlight my image." This technique can be seen in the highlighting of the spotlights and the metal on the drummer's equipment. Mike used the Block Copy option after drawing one spotlight to create more than one copy of it on the screen. Next he used the Block Swap option to vary the colors, finishing by adding patterns such as a mixture of vertical and diagonal lines for added texture.

The Plantronics gatefold is a regular feature of *PC World*. Each month we ask an artist, an architect, or a designer to experiment with the system and create an image. At the end of the year a *PC World* blue-ribbon panel will evaluate the series and award a cash prize and a plaque to the artist who makes the most dazzling use of COLORPLUS. If you would like to be considered for the contest, please contact the editorial department.

November 1983



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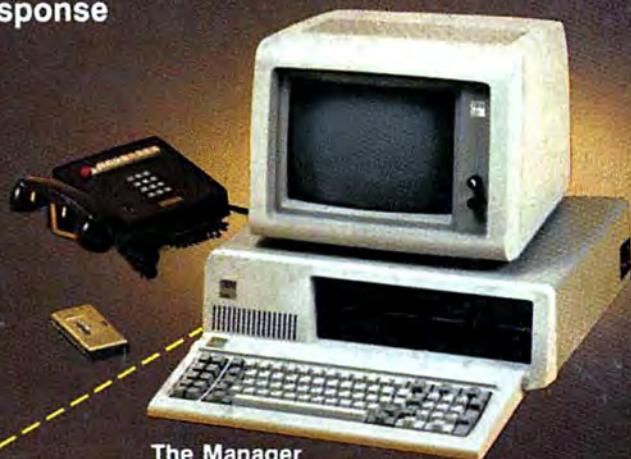


The Executive

ELAN is designed to meet your total communications needs, including computer-to-computer (i.e., networking), person-to-computer, and person-to-person communication requirements for data and voice. The industry-standard high speed Ethernet network protocol is employed in ELAN, permitting many IBM Personal Computers to be linked together by ordinary thin coaxial cable. In addition to his own computer, an ELAN system user can access the other devices attached to the cable — such as printers and large disks.

All versions of ELAN include an Ethernet interface with equipment to convert voice into data and back again. This enables the user to give and receive spoken messages from any location as well as store them for later use. In addition, with the Executive version, all ELAN software packages can be operated through verbal commands, through the telephone keypad or through the IBM PC keyboard. The computer can then respond verbally, either by telephone or 'in person'.

\*ELAN (Extended Local Area Network) formerly ComNet



The Manager

The MANAGER system adds a modem for telephone data communications and by adding a separate handset, will permit voice communications. The modem enables the MANAGER to receive unattended voice and data from any telephone in the U.S. Also, the MANAGER can accept commands through decoding the tones from the telephone keypad.

The EXECUTIVE is the most complete implementation of ELAN, adding computer recognition of spoken commands. An executive might phone the PC to leave or retrieve messages or request specific information. The PC, in a spoken voice, can request a user's access code or prompt the user for a command. The executive can respond either by pushing buttons on the telephone, or by actually speaking back to the computer.

The SECRETARY is the basic ELAN system. It includes an Ethernet interface and all other ELAN features except modem and voice recognition.

Whether you choose the EXECUTIVE, MANAGER or SECRETARY, an ELAN system will improve your productivity and expand the versatility of your IBM PC.



The Secretary

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Circle 190 on reader service card